International Center for

Numerical Methods in Engineering

1987-2017

CIMNE

30 years

Annual Report 2016

ANNUAL REPORT

2016

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Director's letter

CIMNE. 30 YEARS GENERATING KNOWLEDGE AND SOLUTIONS

Eugenio Oñate
(onate@cimne.upc.edu)
Executive Vicepresident and
Director of CIMNE

The International Center for Numerical Methods in Engineering (CIMNE) was created in 1987. This year 2017, therefore, CIMNE celebrates its 30th anniversary.

CIMNE mission is the development and dissemination of original research in the field of Numerical Methods in Engineering (NME), the education of researchers and the transfer of the research outputs to industry.

NME is the discipline that provides the scientific basis for computer analysis of all engineered systems. Researchers in NME have outstanding skills on mathematical modelling, engineering concepts, numerical algorithms and programming.

The NME field was created in 1969 when the *International Journal for NME* (Wiley) was created by initiative of the prestigious Prof. O.C. Zienkiewicz (Fellow of the Royal Society), a visiting scientist in CIMNE for 20 years until his death in 2009. Nowadays there are some 30 international scientific journals related to NME. Research fields analogous to NME are Computational Engineering and Computational Mechanics. These three fields have led in the last 40 years to the creation of several international scientific societies.

CIMNE is a leader as an international center of excellence in the field of NME through four main action vectors:

1. Excellence in research on NME for multidisciplinary engineering applications, in terms of scientific outputs and software-based tools.
2. International dimension.
3. Active participation and management in scientific societies.
4. Commitment with technology transfer to industry.

Research at CIMNE focuses on the development of NME of interest to the following scientific fields: structural mechanics, geomechanics, fluid dynamics, material sciences, optimization, biomechanics coupled multi-physics processes and high performance computing. Applications include problems in civil, mechanical, aeronautics, naval/marine, biomedical and environmental engineering, energy efficiency and fusion technology, among others.

Since 1987 CIMNE has evolved to become a prestigious international research center on NME. Its research staff (90% of whom are engineers) includes (by March 2017) 19 Full Research Professors, 13 Associated Research Profs., 11 Assistant Research Profs, 23 Postdocs, 49 PhD Students, 5 Staff Scientists, 48 Research Engineers, 2 visiting Researchers and 37 Administration Staff from 23 countries. 25 researchers of CIMNE (most of them in the two upper research categories) are faculty members from the Technical University of Catalonia (UPC) who develop their research duties in CIMNE. These distinguished affiliated researchers play an important role as liaison between researchers at different groups of UPC and CIMNE.

RESEARCH PRIORITIES AND APPLICATIONS

The priorities of CIMNE for research excellence target new NM and software codes in order to help engineers to better predict, design and optimize systems affecting our lives, including our environment, our security and safety, and the products we use and export. Indeed these goals can only be attempted from a multidisciplinary perspective.

Consistently with these broad goals, research progress at CIMNE requires the synergic work of interdisciplinary teams with the necessary critical mass. With the depth of these intellectual developments and their wide range of applications, the NM and software codes developed at CIMNE have emerged as powerful tools for solving a wide range of engineering problems and have helped to making of CIMNE a worldwide reference in the NME field.

Some relevant problems where the NMs developed at CIMNE are applied include: structural analysis of constructions and vehicles; safety of structures to natural hazards; geotechnical engineering and ground water flow; oil and gas engineering; thermal-mechanical analysis of structures and mechanical systems; metal forming processes (sheet forming, casting, welding, additive manufacturing, machining, etc.); shape and material optimization; aerodynamics of aircrafts, sail boats and road vehicles; blast, crashworthiness and impact problems; ship hydrodynamics; analysis of coastal and offshore structures; flow of granular materials in the mining, construction, food and pharmaceutical industries and fusion technology, among other applications.

ORGANIZATION OF RESEARCH

Research in CIMNE is structured in research lines (RLs) covering several challenging topics applicable to different engineering disciplines. See current CIMNE RLs at *"Research"* section.

Researchers at CIMNE carry out their activity within Research and Technical Development (RTD) Groups managed by a Group Leader. The research activities are coordinated by one or more Principal Investigators (PIs). For a better visibility of the research, RTD Groups are gathered in RTD Areas that target fields such as Civil & Mechanical engineering, Transport (naval, aeronautics and land transport), Energy & Environment, Information and Communication Technologies and Biomedical Engineering.

INTERNATIONAL PRESENCE

CIMNE has established 2 legal international branches: CIMNE Latin America (Santa Fe, Argentina); and CIMNE USA (Washington DC, USA) and has also set up an international network of Joint Labs (the Aulas CIMNE) with 30 members: 6 in Spain and 24 in Latin America; *aulas.cimne.com*.

RESEARCH OUTPUTS

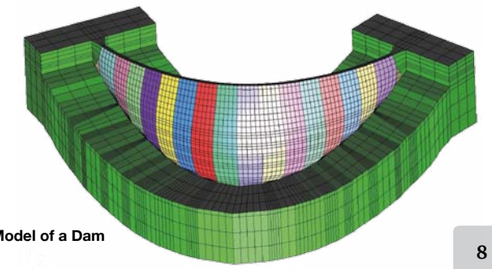
Since 1987 CIMNE researchers have published some 2,500 JCR journal papers, 46 text books, 82 edited books, 250 monographs, 415 RTD reports, 643 technical reports and organized 210 international scientific conferences. CIMNE has 6 patents.

CIMNE scientists are chief editors or associated editors of 6 international JCR journals and members of the editorial board of 15 JCR journals.

Since 1987 CIMNE researchers have taken part in 1,700 RTD projects (including 10 research projects funded by the European Research Council).

In the same period CIMNE managed 2 international MSc courses, 2 PhD programs and organized an average of 2 short courses and 23 seminars annually. Its research staff has supervised 160 PhDs and some 720 MSc students.

Research at CIMNE has lead to many software codes that are useful for solving specific problems in each of the engineering areas addressed. *Section "Products"* of this report lists the main software codes developed at CIMNE in 1987-2017.



Numerical Model of a Dam

CITATION RECORDS

By March 29, 2017 CIMNE scientists had an h index of 109 and over 50,000 citations (h=68 and some 24,000 citations since 2011); *Source: Google Scholar*. Scopus records for 2012-16 are 375 JCR papers and 2014 citations.

In January 2016 CIMNE was ranked best research centre in Mathematics & Interdisciplinary Applications by the Group for the Dissemination of the h Index. Several CIMNE researchers are ranked in the first positions in that area and others of engineering (refer to *indice-h.webcindario.com* for more information of CIMNE benchmarking).

By April 2017 the Ranking Web of World Research Centers *(research.webometrics.info)* placed CIMNE in the 90th/1458th position in a list of 511/8000 research centers in Spain/The World.

The same study reports that 7/16 CIMNE researchers are among the 1000/5000 best scientists in Spain in terms of citations *(webometrics.info/en/node/167)*.

MANAGEMENT OF SCIENTIFIC ORGANIZATIONS

CIMNE is the permanent Secretariat of the following scientific organizations:

- International Association for Computational Mechanics *(iacm.info)*
- European Community on Computational Methods in Applied Sciences *(eccomas.org)*
- Spanish Association for Numerical methods in Engineering *(semni.org)*
- Pilot Centre of the European Research Community in Flow, Turbulence and Combustion *(ercoftac.org)*
- Unesco Chair on Numerical Methods in Engineering of UPC *(cimne.com/unesco)*. This is the first UNESCO Chair in the world, created in 1989.

TECHNOLOGY TRANSFER

CIMNE has a vocation for technology transfer. Since 2001 it has launched 20 spin-off companies (16 companies in 2012-16). These companies market a number of products emanating from CIMNE technology. Details of the companies are given in Section 8 and in *cimne.com/spin-offs*.

AWARDS TO CIMNE AND ITS SCIENTISTS

Since 1987 CIMNE and its scientists have received some 70 awards by national and international organizations. The list of CIMNE Awards can be seen in *cimne.com/awards*.

As an example, scientists received 3 Advanced Grants of the European Research Council (ERC) (S. Idelsohn, E. Oñate and X. Oliver), 2 ERC Starting Grants (S. Badia and M. Arroyo), 5 ERC Proofs of Concept (S. Idelsohn, E. Oñate, 2, and S. Badia, 2).

In last four years following CIMNE scientists have received honorary doctorates from international universities: E. Oñate (Univ. "Marta Abreu" of Las Villas in Santa Clara, Cuba; Institut National des Sciences Appliquées (INSA, France), A. Gens (Univ. de Grenoble - Joseph Fourier, France) and A. Barbat (Technical Univ. "Gh. Asachi" of Iasi, Romania; Technical Univ. of Cluj-Napoca, Romania).

ORGANIZATION OF SCIENTIFIC CONFERENCES

The organization of international scientific conferences and workshops is a relevant activity of its research strategy. The CIMNE Conference Bureau Dpt., acts as a professional organizer of international events of scientific and technical interest to CIMNE.

Since 1987 CIMNE has organized some 200 international events. Some 20 events are planned for 2017-2020.

Further details of future and past events can be found in *congress.cimne.com*.

RTD ALLIANCES

CIMNE is a founding partner of the FLUMEN Institute in River Dynamics and Hydraulic Engineering (*www.flumen.es*).

On July 2016 CIMNE completed the construction of a new building of 2,270 m2 that hosts the premises of the Flumen Institute and spaces for CIMNE and UPC researchers. The construction of the building was co-funded by European Regional Development Funds.

On June 2016 it was agreed that CENIT (Center for Innovation in Transport, *cenit.es*) will merge its current structure into that of CIMNE, thus broadening the scope of the research activities of CIMNE in the field of transport engineering. The merging will be implemented during 2017.

CIMNE has established research alliances with numerous prestigious institutions around the world. A compilation of the most outstanding collaborations can be found in Section "Alliances".

DISSEMINATION AND COMMUNICATION STRATEGY

Dissemination and communication tasks in CIMNE involve various activities to bring the research outcomes to the attention of as many relevant people as possible. Dissemination initiatives of CIMNE also aim to demonstrate the ways in which CIMNE research is contributing to solve relevant engineering problems.

Dissemination and outreach actions are also important initiatives to draw the attention of relevant stakeholders, attract the interest of potential partners and supporters, and generate further market demands for the products and services developed at CIMNE.

The Publications Dpt. *(cimne.com/publications)* of CIMNE publishes research and technical reports, monographs, text and edited books and software codes. The Aulas CIMNE network is also used for dissemination actions.

SCIPEDIA: CIMNE STRATEGY TOWARDS THE HOLISTIC 4.0 OPEN-ACCESS SCIENCE

Conscious of the importance of dissemination and communication of new knowledge and the results of research, in March 2016 CIMNE, via its spin-off company Scipedia SL, launched the innovative web platform Scipedia. Scipedia *(scipedia.com)* provides free publishing and Open Access services to disseminate the results of scientific and technical work. Scipedia aims to connect researchers and professionals in science and technology and facilitate the sharing of knowledge, expertise and the outcome of their work.

A SELF-SUSTAINED ORGANIZATION

CIMNE has implemented an (almost) self-sustainable financial model with limited annual public funding. This has been possible by combining public seed funding (mainly from the Generalitat de Catalunya) with income from RTD projects (sponsored by public and private organizations), dissemination activities, revenues from its spin-off companies and an efficient management structure. Since 1987 the self-obtained income obtained each year by CIMNE has amounted (in average) to 96% of its total annual budget.

I finish these lines by thanking CIMNE staff and its many partners and friends in universities, research centers and industry worldwide for so many years of good cooperative work that has contributed in making of CIMNE a center of reference in its field. Happy 30th anniversary!

Eugenio Oñate

Executive Vicepresident of CIMNE

CIMNE in numbers

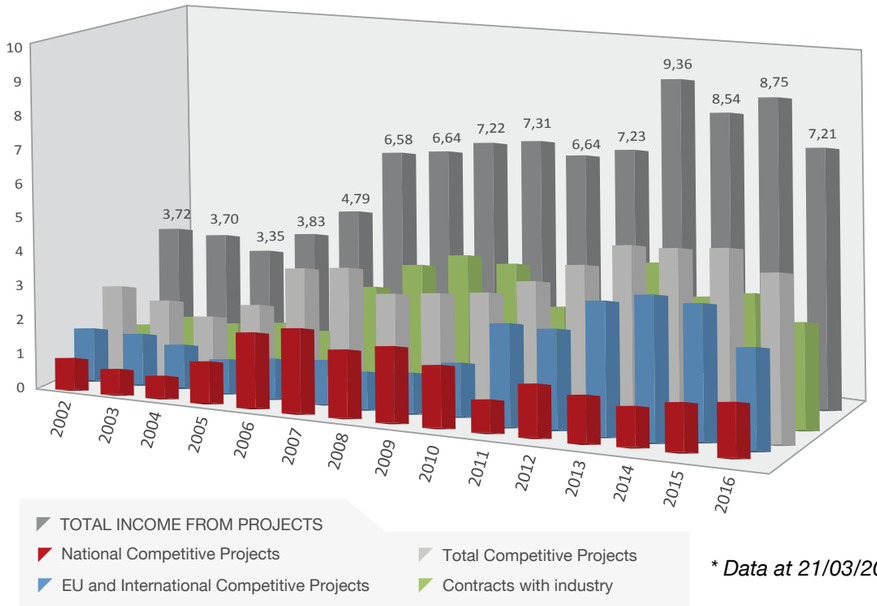
ACTIVITIES	2016
Postgraduate Studies	**4**
Conferences	**4**
Seminars	**23**
Courses	**9**
Coffee Talks	**11**
Publications	**118**
Books	1
Monographs	15
Research Reports	1
Papers in Journals	101
Spin-off Companies	**16**
Aulas CIMNE	**30**
Patents	**0 (5)**
Contracts with Industry	**56 (98)**
Competitive Projects	**26 (86)**
National Projects	13 (40)
International Projects	13 (46)

In brackets, the total number of on-going contracts and RTD projects.

STAFF / POSITION TITLE	2016
Management Staff	**3**
Administration Staff	**39**
Research Staff	**95**
Full Research Professors	29
Associate Research Professors	15
Assistant Research Professors	12
Staff Scientists	7
Post Docs	32
Research Engineers	**63**
Research Students	**95**
PhD Students	62
Master Students	30
Ungraduate Students	3
TOTAL Staff	**295**

in M€

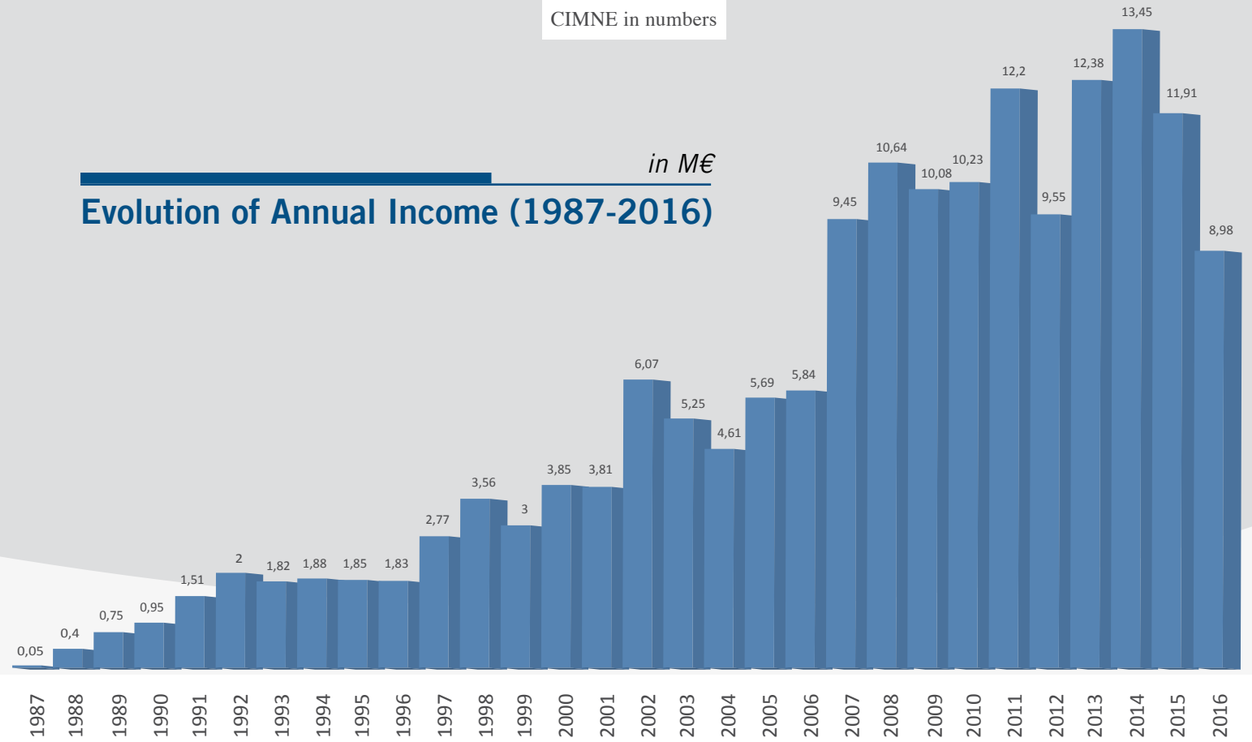
Income from projects (2002-2016)



** Data at 21/03/2017*

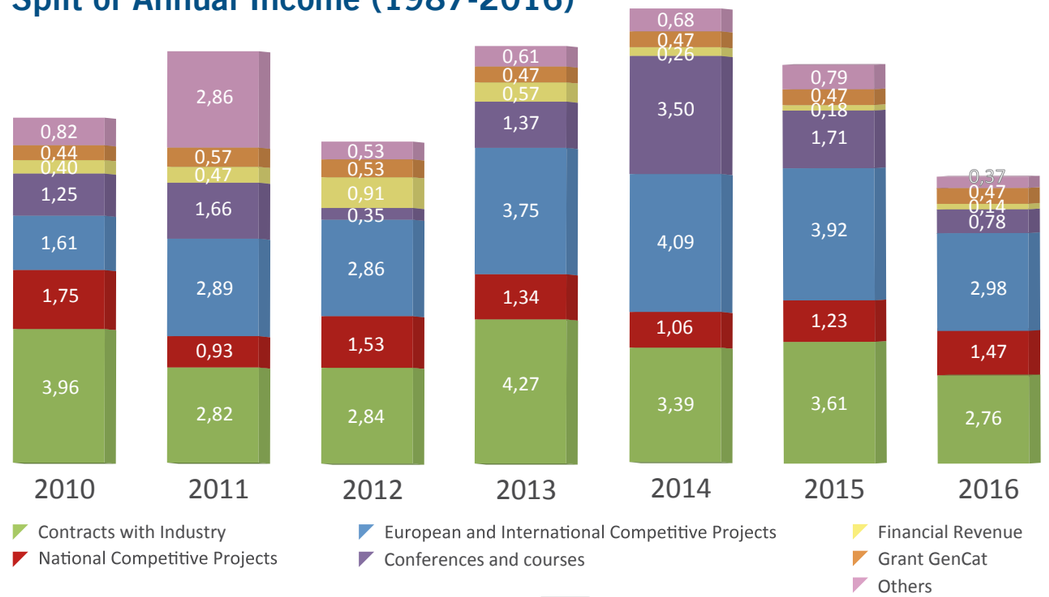
in M€

Evolution of Annual Income (1987-2016)



in M€

Split of Annual Income (1987-2016)



** Data at 21/03/2017*

Governing Bodies

Governing Council

President
Mr. Santi Vila
Conseller Empresa i Coneixement, Generalitat de Catalunya

Executive Vice-President
Dr. Eugenio Oñate
Catedràtic (UPC · BarcelonaTech)

Representing Catalan Government
Mr. Santi Vila
Conseller Empresa i Coneixement, Generalitat de Catalunya

Ms. Núria Betriu
Directora General d'Indústria

Mr. Ricard Font
Secretari d'Infrastructures i Mobilitat

Representing UPC · BarcelonaTech
Dr. Enric Fossas
Rector (UPC · BarcelonaTech)

Dr. Eugenio Oñate
Catedràtic (UPC · BarcelonaTech)

Dr. Pedro Díez
Catedràtic (UPC · BarcelonaTech)

Representing UNESCO
Dr. Lluís Ramallo
President of the Spanish Commission of UNESCO

Executive Council

President
Dr. Eugenio Oñate
Catedràtic (UPC · BarcelonaTech)

Members
Mr. Xavier Baulies
Departament de Territori i Sostenibilitat, Generalitat de Catalunya

Dr. Esteve Codina
UPC · BarcelonaTech

Ms. Francisca García-Sicilia
UNESCO

Dr. Antonio Gens
UPC · BarcelonaTech

Dr. Alejandro Josa
UPC · BarcelonaTech

Dr. Juan Miquel
UPC · BarcelonaTech

Dr. Fernando Orejas
UPC · BarcelonaTech

Dr. Esther Real
UPC · BarcelonaTech

Dr. Lluís Rovira
Institució Centres de Recerca de Catalunya

Ms. Ana Simon
ACCIÓ, Generalitat de Catalunya

Dr. Antoni Susin
UPC · BarcelonaTech

Sitting down (from left to right): B Schrefler,R. Löhner, R. Owen and P. Wriggers | Standing up (from left to right): M. Casteleiro, M. Kleiber, X. Oliver, A. Combescure, M. Doblaré, E. Oñate, M. Papadrakakis, B. Kröplin and S. Idelsohn

Scientific Advisory Council

Chairman
Dr. Roger Owen
Swansea University, UK

Members
Prof. Javier Bonet
University of Greenwich, UK

Prof. Manuel Casteleiro
Universidade da Coruña, Spain

Prof. Michael Kleiber
Polish Academy of Sciences, Poland

Dr.-Ing. Dietrich Knörzer
Former EC Officer

Prof. Bernd Kröplin
University of Stuttgart, Germany

Prof. Rainald Löhner
George Mason University, USA

Prof. Herbert A. Mang
Technische Universität Wien, Austria

Prof. Xavier Oliver
Technical University of Catalonia, Spain

Prof. Manolis Papadrakakis
National Technical University of Athens, Greece

Prof. Ekkehard Ramm
University of Stuttgart, Germany

Prof. Bernhard Schrefler
University of Padova, Italy

Prof. Mateu Turro
Technical University of Catalonia, Spain

Prof. Gabriele von Voigt
Leibniz University, Germany

Prof. Peter Wriggers
Leibniz University, Germany

Organization chart

GOVERNING COUNCIL
President: S. Vila

EXECUTIVE COUNCIL
President: E. Oñate

SCIENTIFIC ADVISORY COUNCIL
Chairman: R. Owen

DIRECTOR
E. Oñate

SCIENTIFIC DIRECTOR
P. Díez

GENERAL MANAGER
A. Font

RESEARCH AND TECH. DEVELOPMENT

RTD AREAS AND GROUPS

BIOMEDICAL ENGINEERING AREA

Biomechanics Group
Leader - E. Soudah

CIVIL ENGINEERING AREA

Fluid Mechanics Group
Leader - R. Codina

Geomechanics Group
Leaders - E. E. Alonso and A. Gens

Industrial Processes Group
Leaders - M. Chiumenti and O. Fruitós

Structural Mechanics Group
Leader - E. Oñate

TRANSPORT AREA

Aerospace Engineering Group
Leader - J. Pons

Innovation in Transport Group
(Joined in 2017) Leader - S. Saurí

Naval and Marine Engineering Group
Leader - J. García

COMPUTATIONAL AND INFORMATION TECH. AREA

Information and Technology Group
Leader - J. Jiménez

Large-Scale Scientific Computing Group
Leader - S. Badia

Mathematical and Computational Modelling Group
Leader - A. Huerta

Pre and Post-Processing Group
Leader - A. Coll

ENERGY AND ENVIRONMENT AREA

Building, Energy and Environment Group
Leader - J. Cipriano

Nature Group
Leader - P. Arnau

Risk Assessment Group
Leader - A. Barbat

ADMINISTRATION

ACCOUNTANCY AND FINANCES
Leader - M.C. Linares

COMMUNICATION
Leader - L. Bermúdez

CONGRESS BUREAU
Leader - C. Forace

HUMAN RESOURCES
Leader - M. Linares

POST-GRADUATE TRAINING
Leader - L. Zielonka

PROJECT MANAGEMENT
Leader - S. Pérez

PUBLICATIONS
Leader - M.J. Samper

SYSTEMS
Leader - M. Alonso

CIMNE Staff

This is the list of all the professionals who have collaborated with CIMNE along 2016.

Research and Technology Development

Full Research Professors

Carlos Agelet de Saracibar
Eduardo E. E. Alonso
Marino Arroyo
Santiago Badia
Alex Barbat
Gabriel Bugeda
José A. Canas
Ignacio Carol
Miguel Cerrolaza
Miguel Cervera
Michele Chiumenti
Ramón Codina
Pedro Díez
Antonio Gens
Manuel Gómez
Antonio Huerta
Sergio R. Idelsohn
Juan Miquel
Sebastián Olivella
Xavier Oliver
Sergio Oller
Eugenio Oñate
Antonio Rodríguez-Ferran
Enrique E. Romero
Riccardo Rossi
Mercedes Sondon
Benjamín Suárez
Jean Vaunat
Sergio I. Velásquez

Associate Research Professors

Marcos Arroyo
Joan Baiges
Juan C. Cante
Lucila Candela
M. Liliana Carreño
Daniel Di Capua
Roberto M. Flores
Julio Garcia
Joaquín A. Hernández
Joel Jurado
Alberto Ledesma
Xavier Martínez
Melba Navarro
R. Javier Príncipe
Francisco Zárate

Assistant Research Professors

Pedro A. Arnau
Josep M. Carbonell
Pooyan Dadvand
Joaquin A. Hernández
Jaime E. Martí
Julio M. Marti
Prashanth Nadukandi
Núria M. Pinyol
Pavel Ryzhakov
Borja Serván
Antonia Larese
Hieu T. Nguyen

Staff Scientists

Michael Barker
Stoyan Danov
Alessandra Di Mariano
Francisco J. Mora
Fernando G. Rastellini
Omar Salomón
Cecilia Soriano

Post Docs

Lucía Barbu
Pablo A. Becker
M. Carmen Chaparro
Jordi Cipriano
Abel Coll
Ester Comellas
Jordi Cotela
Giousef Damianidis
Vicente C. De Medina
Narges Dialami
Cuauhtemoc Escudero
Alessandro Franci
José Manuel González
Alfredo Güemes
M. Inés Hidalgo
Christian A. Hoffmann
Bàrbara Llacay
Oriol Lloberas
Alberto F. Martín
Pedro J. Martín
Enrique Ortega
Immaculada Ortigosa
Fermín Otero
Jordi Pons
Anna Ramón
Anaïs Ramos
Marcelo Raschi
Emilio Salsi
Josep Sarrate
Eduardo Soudah
Francesc Verdugo
Víctor Vilarrasa

Research Engineers

Andrés Adam
Gonzalo Auría
David Ballester
Allen Bateman
Enrique Bonet
Jesús Carbajosa
Alexis Cid
Jaime Clapes
David Codony
Jonathan Colom
Marti Coma
Jesús Conde
Fernando Cortés
Xavier Cubillas
Meredith Davis
Silvia De Simone
Gaia Di Carluccio
Marc Diviu
Josep Dolz
Enrique Escolano
Míriam Febrer
Alberto Férriz
Pablo M. Franzolini
Óscar Fruitós
Javier Gárate
Raúl Giménez
Lorenzo Gracia
Marcos Griñón
Irene Jaqués
Jordi Jiménez
Alejandro Josa
Ivet Llonch
Jose Santos López
Merce López
M. Ángel Marazuela
Andreu Marí
Eudald Martínez
Josep Mayos
Adrià Melendo
Anna Monros
Gerard Jordi Mor
Rafael Moran
Daniel Niñerola
Gonzalo Olivares
José Luis Oñate
Gilbert Peffer
Jorge S. Pérez
Daniel Pérez
Ángel D. Priegue
Fabio Renda
Javier Roca Aris
Carlos Alejandro Roig
Álvaro E. Ruiz
Javier San Mauro
Víctor Sande

Javier Soraluce
Andreu Tarracó
Alberto Tena
Javier Tous
Ignacio Valero
Sergio Valero
Cristina Valhondo
Claudio Zinggerling

Research Students

PhD Students

Ferran Arrufat
Ramón Barboza
Francesc Campà
Jordi Carbonell
Miguel Ángel Celigueta
Javier Cipriano
Agustín Cuadrado
Alexandre Jarauta
Salvador Latorre
M. Cristina Marulanda
Miguel Pasenau
Ivan Puig
Fernando Salazar
Daniel Tarragó
J. Oriol Colomes
Núria Sau
Erdem Toprak
Alba Hierro
Ceren Gurkan
Àlex Ferrer
Joaquín Irazábal
Clara Alvarado
María Teresa Yubero
Daniel Ruiz
Javiera Valdivia
Laura González
Ignasi De Pouplana
Mario Andrés Salgado
Mauricio Alberto Tapias
Stefano Zaghi
Marc Olm
Victor Serri
Arnau Pont
Mauricio Alvarado

Camilo A. Bayona
Miguel Ángel Manica
Bashar Alfarah
Jesús Bonilla
Rubén Zorrilla
Ilaria Iaconeta
Deniz C. Tanyildiz
Mostafa Barzegar
Alejandro Núñez
Edwin S. Alférez
Sajjad Mirsalehi
David De La Torre
Vicente Mataix
Fabian Lajas
David Roca
Enkhbayar Dandar
Michela Trabucchi
David J. Vicente
Eric Miranda
Tomás Varona
Saeed Tourchi
Arisleidy Mesa
Alessandro Fraccica
Laura Moreno
Rahmat Kazemi
Alessandro Fraccica
Laura Moreno
Rahmat Kazemi

Master Students

Carlos Casanovas
Panagiotis Firtinidis
Anshuman Singh
Margarita Smolentseva
Mazhar Ali
Artemii Sattarov
Mohammad Mohsen Abedinnejad
Bruno Aguirre
Waleed A. Mirza
Sanjay Komala
Daniel Yago
Boyi Ye
Paris Mulye
Joan Josep Moya
R. Deepak Baldota

Ajay Singh Nehra
Pau Vilar Ribo
Antonio Calvo
Alejandro Cornejo
Ahmed Ismail
Anqi Li
Arjun Ajay
Arzu Ahmadova
Gabriel Valdes
Kamal Darlami
Karthik Neerala
Mohammad M. Zadehkamand
Sai Chandana Divi
Anna Muñoz
Pau Martinez

Undergraduate Students

Martí Beck
Esteban Pérez
Pol Sin

Visiting Scientists

CIMNE promotes the visits of academics and researchers from around the world. Visiting Scientists at CIMNE in 2016:

Professors

Enmanuel Amaya
José Simeón Cañas Central American University (UCA), El Salvador

Andrés Luis Brasil
Brasília University, Brasil

Gustavo Buscaglia
Institute of Mathematical and Computer Sciences University of Sao Paulo, Brasil

Carlos A. Felippa
University of Colorado at Boulder, US

Raju Gandikota
CIMNE USA, US

Kazuo Kashiyama
Chuo University, Japan

Rainald Löhner
George Mason University, US

Liz Nallim
National University of Salta, Argentina

Norberto Nigro
CIMEC-INTEC, Argentina

Szymon Nosewicz
Institute of Fundamental Technological Research Polish Academy of Sciences, Poland

Jean-Charles Passieux
INSA, France

Jacques Periaux
UNESCO Chairman, France

Jerzy Rojek
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Students

Quirin Aumann
Technical Universität München (TUM) Statics Chair, Germany

Víctor Buitrago
Escola Virolai, Spain

Roger Cañellas
La Salle Mollerussa, Spain

Alejandro Dapena
Escola Virolai, Spain

Kostas Giannis
Tu-Braunschweig / IPAT, Germany

Dimitrios Iliopoulos
TUM, Germany

Pau Jiménez Daban
Escola Virolai, Spain

Mohamed Khalil
TUM, Germany

Melissa Matzen
BAM, Germany

Szymon Nosewicz
Institute of Fundamental Technological Research Polish Academy of Sciences, Poland

Tobias Teschemacher
TUM, Germany

Xingkun Zhou
China University of Petroleum-Beijing, China

Administration

Director
Eugenio Oñate

General Manager
Anna Font

Scientific Director
Pedro Díez

Administration staff in CIMNE is formed by highly qualified professionals who address the increasing needs of researchers and scientific personnel in the center.

Accountancy and Finances
Mª Carmen Linares (Head of Unit)
Mónica Camanforte
Valentín Catalán
Nuria Holgado
Cristina Luque
Raúl Porras

Congress Bureau
Cristina Forace (Head of Unit)
Laia Aranda
Alessio Bazzanella
Iztok Potokar
Marcela Silhankova
Cristina Vizcaya

Director Secretary
Mercè Alberich

Human Resources
Merce Linares (Head of Unit)
Irene Latorre

International Branches
Francisca García-Sicilia
Manuel López
Gabriel Molina
Javier Piazzese
Sònia Sagristà

Legal and Procurement
Roger Casanova

Project Management
Sandra Pérez (Head of Unit)
Joaquim Asensio
Daniel Cuadrat
Francisco J. De La Rosa
Elena Martín
Elena Herrero
Jon Rodríguez

Postgraduate Training
Lelia Zielonka
Cristina Pérez

Publications and Communication
Mª Jesús Samper (Head of Unit)
Laura Bermúdez
Sonia López

Reception
Jordi López

Secretary
Teresa Penalba

Systems
Miguel Alonso (Head of Unit)
Alberto Burgos
Joaquim Lozano
Aitor Lázaro

where we are

Headquarters

CIMNE's main premises are located at the heart of the North Campus of Universitat Politècnica de Catalunya · BarcelonaTech.

The offices are situated at the C1 Building, adjacent to the Civil Engineering School of UPC and occupy some 1,000 m² of modern office facilities and state of the art equipment with last generation computers linked via a fast intranet and a multicore cluster for parallel computing.

This space, created in 1987, hosts around 90 CIMNE researchers and the main administration offices.

CIMNE-BARCELONA
Campus Nord UPC, CIMNE Building C1
C/ Gran Capità, S/N, 08034 Barcelona, Spain
+34 93 401 74 95

B0 Building

In September 2014 CIMNE started the construction of a new building of some 2,000 m² at the North Campus of the Universitat Politècnica de Catalunya · BarcelonaTech.

The new building (B0), that hosts the Flumen Institute, was completed **by the end of 2015**. Researchers have moved to the new facilities during the first months of 2016. This new building is **equipped with modern experimental facilities for model scale testing of river dynamic and hydraulic problems** and it also provides work areas for researchers at the graduate level (master, doctoral and postdoc) and for senior researchers from CIMNE and UPC · BarcelonaTech.

CIMNE premises

Apart from CIMNE's headquarters, located in Barcelona, CIMNE counts with six other branches: four in Spain (Castelldefels, Ibiza, Madrid and Terrassa) and two around the world (US and Latin America). The worldwide presence of the research center is also represented by the 30 Aulas CIMNE (joint labs with universities all around the world).

The objective of CIMNE is to take part in international RTD projects in cooperation with research centers, universities and companies worldwide. In the following section we briefly present the different branches including the international ones in South America (Santa Fe, Argentina) and North America (Washington DC, USA).

Premises in Spain

CIMNE - TERRASSA

CIMNE's offices in Terrassa opened in 2001. The premises cover an area of 150m² and house part of the department of Building Energy and Environment Group (BeeGroup).

Director: J. Cipriano

CIMNE - TERRASSA
Campus de Terrassa UPC
Edifici GAIA (TR14)
C/ Rambla Sant Nebridi, 22
08222 Terrassa (Barcelona), Spain
+34 93 789 91 69

CIMNE - CASTELLDEFELS

CIMNE's headquarters in Castelldefels were inaugurated on October 15th 2008. The facilities are located in the building CIMNE-C3 of the Mediterranean Technology Park, and occupy 1,500m² in a new building constructed in collaboration with the UPC. The premises are shared with the Technical School of Castelldefels.

Director: J. Mora

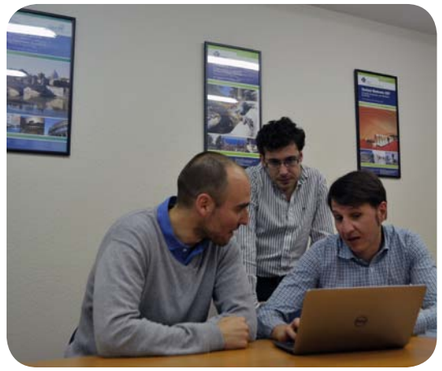
CIMNE - TERRASSA
Campus del Baix Llobregat UPC
CIMNE Building C3
C/Esteve Terradas, 5
08860 Castelldefels, Barcelona, Spain
+34 93 413 41 86

CIMNE - MADRID

CIMNE - MADRID started its activities in September 2007 and on May 2008 CIMNE opened its premises located in the center of the city (150m²). The main goal of CIMNE Madrid is to build a strong research team in Madrid and foster the links between CIMNE, the Central Government of Spain and partner companies and research centers based in Madrid.

Director: F. Salazar

CIMNE - MADRID
Paseo General Martínez Campos, 41, 9º
28010 Madrid, Spain
Tel. +34 91 319 13 59



CIMNE - IBIZA

CIMNE inaugurated the CIMNE - IBIZA branch in 2009. It has 80m² and is located in the city of Ibiza.

CIMNE Ibiza activities focus on the delevopment and application of numerical methods and decision support systems to problems of interest to the environment and the sustainability of island communities.

Director: G. Molina

CIMNE - IBIZA
C/Bisbe Azara, 4, 3º 2ª
07800 Ibiza, Spain
Tel. +34 97 193 11 94

International branches

CIMNE-USA (Washington DC, USA)

CIMNE-USA is an educational and scientific research organization, affiliated with the International Center for Numerical Methods in Engineering (CIMNE).

The objective of CIMNE-USA is leading scientific research and development projects supported by government, foundations and industry sources.

The branch also carries out educational activities related to advanced numerical methods. It participates in national and international conferences and symposia and works jointly with Aulas CIMNE, in cooperation with US and international universities. CIMNE-USA also supports visiting scientists.

www.cimne.com/usa

Dr. David Cranmer *(on the left side photo)*, CIMNE US Acting Executive Director, is a senior scientist at the National Institute of Standards and Technology (NIST) and advisor of many US companies. Mr. Varadaraju (Raju) Gandikota *(on the right side photo)* is CIMNE USA Scientific Director. Ms. Francisca García-Sicilia coordinates the USA activities.

Selected RTD Projects

WEATHERFORD VII: Development of an advanced Transient 1D Multi-Phase Hydraulics Network Solver for MPD operations.
Weatherford International Ltd. — *01/10/2014 - 01/01/2016*

MUD MOTORS: Agreement between Mind Mesh LTD and CIMNE for the development of a software package for the computer simulation of Mud Motors.
Mind Mesh — *01/11/2016 - 01/05/2018*

ALTAIR/KRATOS: Kratos App for Casting.
Altair — *22/10/2015 - 22/07/2018*

CIMNE-Latin America (Santa Fe, Argentina)

The formal establishment of CIMNE in Latin America has been initiated by creating a Foundation to foster the activity of CIMNE in that region.

The CIMNE-Latin American Foundation (FCL) is located in the city of Santa Fe (Argentina), the place where the first CIMNE Classroom in the Latin American region was created in cooperation with University of Litoral.

The activity of CIMNE in the region is coordinated by the Civil Engineer Javier Piazzese.

Since the beginning, CIMNE-Latin American Foundation has developed a wide range of activities in Latin America related to training, research and dissemination of advances in numerical methods.

Many of these projects are developed with the support of CIMNE, Aulas CIMNE, universities and public organizations.

The projects in which FCL participates can be classified into the following research areas:

- Engineering and Environment
- Industrial Processes
- Numerical Methods

FCL also takes part and organises courses, seminars, workshops, among others.

Javier Piazzese

Selected RTD Projects

COMP-DES-MAT: Advanced tools for computational design of engineering materials. FP7 - Ideas - EC
01/02/2013 - 31/01/2018

CIMNE BEE DATA URUGUAY: Contrato para la prestación de los servicios CIMNE BEE DATA en modo SAAS
UTE Uruguay, Uruguay — *08/03/2016 - 08/05/2017*

Dynamic studies of mechanical parts for truck trailers
PATRONELLI SA, Argentina — *15/11/2015 - 17/02/2016*

Global Risk Update: General Scientific Guidance, Global Earthquake and Cyclone Models, collaboration on Exposure, Vulnerability and Risk assessment for different hazards and application of Global Risk Update Results to national profiles in selected Asian countries
UNISDR — *04/03/2015 - 31/03/2016*

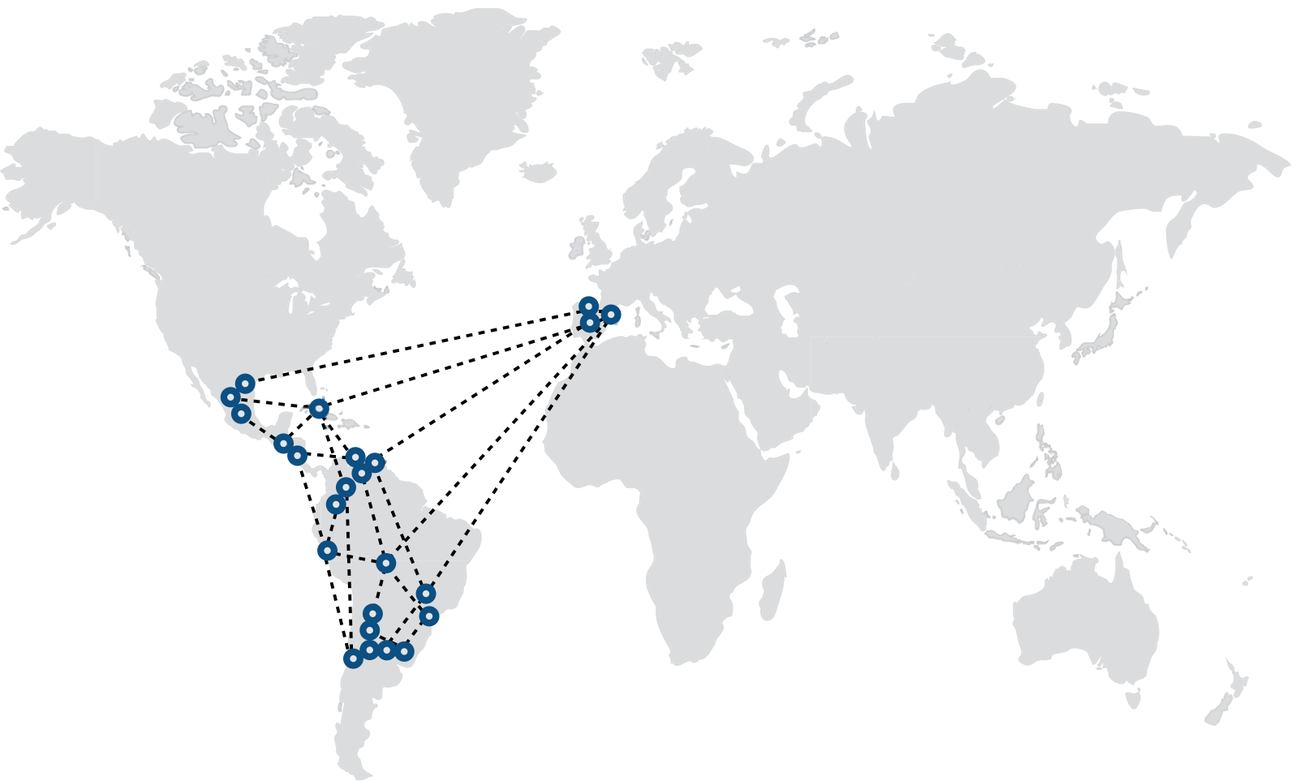
Estudio de la capacidad de bombeo del hormigón fresco utilizado en el revestimiento del túnel de conducción del proyecto constructivo de la Central Hidroeléctrica Renace III
OBRAS SUBTERRÁNEAS — *18/01/2016 - 30/06/2016*

BID Argentina: Desarrollo del perfil de riesgo de desastres
Interamerican Development Bank, Argentina
04/07/2014 - 31/03/2016

BIODIGESTORES 2016: Asistencia técnica internacional al Programa Nacional de Biodigestores
HIVOS — *01/01/2016 - 15/03/2016*

BARBADOS: Consulting Services for Contract 3 of Component 1 of the Coastal Risk Assessment and Management Program in Barbados
Government of Barbados — 15/09/2014 - 30/04/2016

www.cimne.com/fcl



Argentina	●●●●●●
Brazil	●●●
Chile	●
Colombia	●●
Cuba	●●
El Salvador	●
Guatemala	●
Mexico	●●●●
Peru	●
Spain	●●●●●●
Venezuela	●●●

TOTAL: 30 AULAS CIMNE

Aulas CIMNE

Aulas CIMNE are physical spaces for cooperation in education, research and technological development (RTD) activities created jointly by CIMNE and one or several universities. The thirty Aulas CIMNE promote educational and training activities at graduate and postgraduate level and development of RTD projects in cooperation with companies around the world.

AULA FICH – CIMNE (Argentina)

Universidad Nacional del Litoral
Director: Gerardo Franck
Created on: October 2002
Activity: Applications of numerical methods to problems related to water resources, mechanical and computer engineering.

AULA ITBA – CIMNE (Argentina)

Instituto Tecnológico de Buenos Aires
Director: Sebastián d'Hers
Created on: April 2015
Activity: Application development of numerical methods in the field of mechanical, naval, petroleum, chemical, electronics, electrical, industrial engineering and bioengineering.

AULA IUA – CIMNE (Argentina)

Instituto Universitario Aeronáutico
Director: Carlos Sacco
Created on: September 2002
Activity: Applications of numerical methods to problems related to fluid mechanics, structures, heat transfer, etc.

AULA UNER – CIMNE (Argentina)

Universidad Nacional de Entre Ríos
Director: José Di Paolo
Created on: March 2013
Activity: Applications of numerical methods to problems related to Bioengineering.

AULA UNSA – CIMNE (Argentina)

Universidad Nacional de Salta
Director: Liz Nallim
Created on: April 2008
Activity: Development of computer models for application in civil engineering.

AULA UNT – CIMNE (Argentina)

Universidad Nacional de Tucumán
Director: Eduardo Martel
Created on: November 2002
Activity: Development of computational models of bridges (degradation and repair mechanisms).

AULA FEMEC – CIMNE (Brazil)

Universidad Federal de Uberlândia
Director: Sonia Goulart
Created on: April 2004
Activity: Forming process applications, structural design and biomechanics.

AULA IFRO – CIMNE (Brazil)

Instituto Federal de Educaçao, Ciência e Tecnologia de Rondônia
Director: George Madson Dias
Created on: July 2009
Activity: Applications of numerical methods in civil engineering, electromechanical and environment.

AULA IFSP – CIMNE (Brazil)

Instituto Federal de Educaçao, Ciência e Tecnologia de Sao Paulo
Director: Écio Naves
Created on: July 2009
Activity: Applications of numerical methods in engineering problems in forming processes, solid mechanics and biomechanics.

AULA DIMEC – CIMNE (Chile)

Universidad Técnica Federico Santa María
Director: Franco Perazzo
Created on: March 2004
Activity: Numerical methods in mechanical engineering. Development of numerical methods without mesh. Applications in Engineering.

AULA UNC – CIMNE (Colombia)

Universidad Nacional de Colombia
Director: Jairo Andrés Paredes
Created on: June 2005
Activity: Numerical methods applied to civil engineering.

AULA UNIANDES – CIMNE (Colombia)

Universidad de los Andes
Director: René Meziat
Created on: January 2003
Activity: Teaching and research in numerical methods, optimization, variational principles and computational mechanics.

AULA UCI – CIMNE (Cuba)

Universidad de las Ciencias Informáticas
Director: Jorge Gulín
Created on: October 2015
Activity: Development of computational models and tools with application in high performance computation.

AULA UCLV – CIMNE (Cuba)

Centro de Investigación de métodos computacionales y numéricos en la ingeniería. Universidad Central de las Villas
Director: Carlos Recarey
Created on: July 2003
Activity: Modelling and analysis of structures and grounds to the application of numerical methods.

AULA UCA – CIMNE (El Salvador)

Universidad Centroamericana "José Simeón Cañas" UCA
Director: Mauricio Pohl
Created on: February 2010
Activity: Civil engineering applications and multi objective optimization and applications.

AULA UMG – CIMNE (Guatemala)

Universidad Mariano Gálvez
Director: Rolando Torres
Created on: February 2011
Activity: Development of computer models for application in civil engineering.

AULA CIMAT – CIMNE (Mexico)

Centro de Investigaciones en Matemáticas
Director: Salvador Botello
Created on: June 2006
Activity: Applied mathematics, numerical methods, engineering and statistical analysis.

AULA UGTO – CIMNE (Mexico)

Universidad de Guanajuato
Director: Mabel Mendoza
Created on: January 2002
Activity: Civil engineering applications and multi objective optimization and applications.

AULA MORELIA – CIMNE (Mexico)

Universidad Michoacana de San Nicolás de Hidalgo
Director: Francisco Domínguez
Created on: October 2015
Activity: Civil, mechanic and electric engineering.

AULA ITESM – CIMNE (Mexico)

Inst. Tecnológico de Estudios Superiores de Monterrey
Director: Sergio Gallegos
Created on: May 2009
Activity: Applications of numerical methods in civil engineering.

AULA PUCP – CIMNE (Peru)

Universidad Católica de Peru
Director: Rosendo Franco
Created on: April 2009
Activity: Modelling and analysis of structures and grounds to the application of numerical methods.

AULA ESEIAAT – CIMNE (Spain)

UPC · BarcelonaTech Terrassa
Directors: Roberto Flores; Óscar Fruitós
Created on: April 2007
Activity: Industrial and aeronautical engineering

AULA EEBE – CIMNE (Spain)

Escuela Técnica de Ingeniería Industrial
Directors: Daniel Di Capua
Created on: July 2001
Activity: Development of numerical methods in industrial and civil engineering.

AULA FNB – CIMNE (Spain)

Facultad de Náutica de Barcelona
Director: Julio García
Created on: March 2002
Activity: Applications of numerical methods to problems related to marine engineering.

AULA UDL – CIMNE (Spain)

Universidad de Lleida
Directors: Manuel Ibáñez; Jordi Cipriano
Created on: July 2004
Activity: Numerical methods applied to the physics of buildings and renewable energy.

AULA UPM – CIMNE (Spain)

Universidad Politécnica de Madrid
Director: Rafael Morán
Created on: May 2010
Activity: Applications of numerical methods in civil engineering.

AULA UVA – CIMNE (Spain)

Universidad de Valladolid
Director: Antonio Foces
Created on: April 2002
Activity: Civil engineering projects, ports, marine, industrial, aerospace and architecture.

AULA INABIO – CIMNE (Venezuela)

Universidad Central de Venezuela
Director: Miguel Cerrolaza
Created on: February 2004
Activity: Applications of numerical methods to problems related to Bioengineering.

AULA UC – CIMNE (Venezuela)

Universidad de Carabobo
Director: David Ojeda
Created on: April 2009
Activity: Applications of numerical methods in optimization and inverse problems in engineering failure analysis.

AULA UCLA – CIMNE (Venezuela)

Universidad Centrooccidental "Lisandro Alvaro" (UCLA)
Director: Juan Carlos Vielma
Created on: October 2008
Activity: Applications of numerical methods to civil engineering problems.

http://aulas.cimne.com

Activities in Asia Pacific

China

For more than 10 years, CIMNE has been collaborating with the People's Republic of China in a number of fruitful cooperation agreements, RTD projects and some educational activities.

CIMNE has strong links with the most renowned scientific institutions in China, such as Peking University, Tsinghua University and several research centres of the Chinese Academy of Sciences or the Chinese Aeronautics Establishment.

Supported by the 6th and 7th Framework Programme and the Horizon 2020 of the European Union, CIMNE has carried out the coordination on the European side of a series of projects aimed at promoting joint EU-China research in aeronautics. CIMNE also participates in research projects in areas of risk assessment of natural disasters.

The most relevant activities with China in 2016 have been:

» GRAIN 2: GReener Aeronautics International Networking. FP7 - Cooperation - EC - Coordinated by CIMNE *01/10/2013 - 31/05/2016*

» TCAiNMaND: TriContinental Alliance in Numerical Methods applied to Natural Disasters. FP7 - People - EC Coordinated by CIMNE — *01/01/2014 - 31/12/2017*

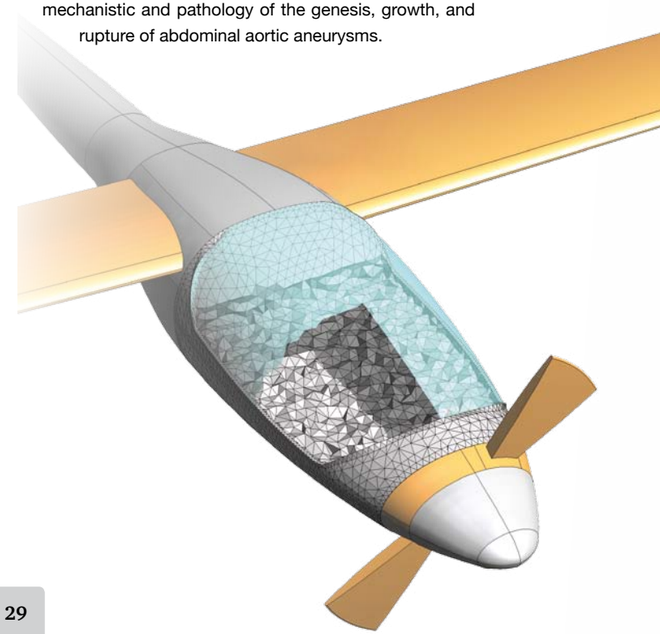
» IMAGE: Innovative Methodologies and technologies for reducing Aircraft noise Generation and Emission. H2020-MG-2015
Coordinated by Chalmers — *01/04/2016 - 31/03/2019*

» ECO-COMPASS: Ecological and Multifunctional Composites for Application in Aircraft Interior and Secondary Structures (H2020-MG-2015)
Coordinated by DLR — *01/04/2016 - 31/03/2019*

Singapore

CIMNE has collaborated for many years with Singaporean entities in the field of biomedicine, energy and marine engineering.

The most outstanding example of research collaboration with Singaporean institutions is the study carried out in cooperation with the Tan Tock Seng Hospital and NTU on mechanistic and pathology of the genesis, growth, and rupture of abdominal aortic aneurysms.



research

Research overview

All the research carried out at CIMNE is developed around 9 research lines, which cover several challenging topics:

1. ALGORITHMS FOR MULTIPHYSICS PROBLEMS. Numerical methods for complex coupled problems such as fluid-soil-structure interaction, aero-acoustics, electromagnetics, magneto-hydrodynamics and atmospheric/thermal flows, etc.

2. COMPUTATIONAL FLUID DYNAMICS. Numerical methods for incompressible and compressible flows. Applications to internal and external flows, free-surface flows, multifluids, flow in porous media, aerodynamics and acoustics.

3. COMPUTATIONAL GEOMECHANICS. FEM and particle methods for dry, saturated and partially saturated soils and rocks. Applications to geotechnical engineering: foundations, underground structures, tunnels, dams and slopes.

4. MATHEMATICAL AND COMPUTATIONAL MODELLING. Mathematical models and algorithms for error estimation, mesh adaption and quality of the numerical solution. Reduced order models for (quasi) real time solution of complex engineering systems.

5. COMPUTATIONAL MODELLING OF ENGINEERING MATERIALS. Methods for multiscale analysis of materials and structures. Applications to the design of new smart structural materials.

6. COMPUTATIONAL SOLID AND STRUCTURAL MECHANICS. FEM and particle-based procedures for linear and nonlinear analysis of solids and structures. Applications to most engineering fields.

7. OPTIMIZATION. Robust optimization procedures for shape and material design and process optimization in civil, mechanical, aerospace and naval engineering.

8. COMPUTATION AND INFORMATION TECHNOLOGIES. Methods for mesh generation and visualization of huge sets of numerical results in parallel computers using data mining and cloud storage techniques. Integration of decision support systems in engng.

9. NUMERICAL METHODS AND TECHNOLOGIES FOR ENERGY AND ENVIRONMENT. Holistic risk prediction and risk management of constructions and landscape under hazards. Methods for producing fresh water via evaporation techniques. Energy management and reduction in buildings.

Researchers are appointed to research groups which are related to relevant engineering areas. In 2016, CIMNE counted with 14 research groups organized in 5 different research areas:

- Civil and Mechanical Engineering
- Energy and Environment
- Biomedical Engineering
- Computational and Information Technologies
- Transport

Research lines often cover basic aspects applicable to different engineering areas. Hence it is common that researchers from different RTD groups contribute to a same research line.

CIMNE has an important scientific structure divided into different Research and Technological Development (RTD) Areas and Groups that cover a wide spectrum of research fields.

The following table shows the different Research Lines (RL) and their corresponding Research and Technological Development (RTD) Areas and Groups. Principal investigators (PI) leading the different research lines of each group are also shown in the table below:

RESEARCH LINES (RL)	RTD AREAS AND GROUPS	
1. Algorithms for Multiphysics Problems	**Civil and Mechanical Engineering Area**	**Biomedical Engineering Area**
2. Computational Fluid Dynamics	**FLUID MECHANICS GROUP** PI's: R. Codina, S. Idelsohn, E. Oñate, R. Rossi and J. Baiges RL's: 1 and 2.	**BIOMECHANICS GROUP** PI's: M. Arroyo, E. Soudah, R. Rossi, J. Pérez and S. Oller RL's: 1, 2, 6 and 8.
3. Computational Geomechanics	**GEOMECHANICS GROUP** PI's: E. E. Alonso, E. Gens, S. Olivella, X. Sánchez-Vila RL: 3.	**Computational and Information Technologies Area**
4. Mathematical and Computational Modelling	**INDUSTRIAL PROCESSES GROUP** PI's: M. Chiumenti and C. Agelet de Saracibar RL's: 1 and 7.	**INFORMATION AND COMMUNICATION TECHNOLOGY GROUP** PI: J. Jiménez | RL: 8.
5. Computational Modelling of Engineering Materials	**STRUCTURAL MECHANICS GROUP** PI's: E. Oñate, M. Chiumenti, M. Cervera, X. Oliver and S. Oller RL's: 1, 5 and 6.	**LARGE-SCALE SCIENTIFIC COMPUTING GROUP** PI: S. Badia | RL: 1.
6. Computational Solid and Structural Mechanics	**Energy and Environment Area**	**MATHEMATICAL AND COMPUTATIONAL MODELLING GROUP** PI's: A. Huerta and P. Díez | RL: 4.
7. Optimization	**BUILDING, ENERGY AND ENVIRONMENT GROUP** PI: J. Cipriano | RL: 9.	**PRE AND POST-PROCESSING** PI: A. Coll | RL: 8.
8. Computation and Information Technologies	**NATURE GROUP** PI: P. Arnau | RL: 9.	**Transport Area**
9. Numerical Methods and Technologies for Energy and Environment	**RISK ASSESSMENT GROUP** PI: A. Barbat | RL: 6 and 9.	**AEROSPACE ENGINEERING GROUP** PI's: J. Pons, E.Ortega and G. Bugeda | RL: 2 and 7.
10. Transport System Analysis		**CENIT - INNOVATION IN TRANSPORT GROUP** PI's: S. Saurí | RL: 10 and 7.
		NAVAL AND MARINE ENGINEERING GROUP PI: J. Garcia | RL: 2 and 7.

PI: **Principal Investigator**
RL: **Research Line**

Research Lines (RL) and Research Topics

1. Algorithms for Multiphysics Problems	
• FEM and particle-based methods for fluid-soil-structure interaction. NM for the oil and gas industry.	**PI:** E. Oñate
• Numerical methods for coupled thermal-mechanical problems for constructions and mechanical components.	**PI's:** M. Chiumenti and M. Cervera
• Aeroacoustics: Acoustic analogies in incompressible flows, direct numerical simulation of sound, aeroacoustics in time dependent domains, application to human voice simulation.	**PI's:** R. Codina and J. Baiges
• FEM and particle methods for analysis of industrial forming processes (casting, mold filling, sheet metal stamping, 3D printing, friction stir welding, etc.).	**PI's:** M. Chiumenti and C. Agelet
• FEM for electro-magnetic-mechanical problems. Numerical methods for plasma physics and fusion technology.	**PI:** S. Badia
• Numerical modeling thin objects in nano and bio-systems.	**PI:** M. Arroyo
• Optical quality of observation sites: Numerical simulation of turbulence, estimation of optical parameters of turbulent atmospheres, application to telescope visibility.	**PI:** R. Codina
• Reduced order models (ROM): Domain decomposition, fluid-structure interaction, thermally coupled flows.	**PI's:** R. Codina and S. Idelsohn

2. Computational Fluid Dynamics	
• Stabilized finite element methods for problems involving waves, viscoelastic flows, compressible flows, shallow water flows, magneto-hydro-dynamics and approximation of eigenvalues.	**PI:** R. Codina
• Fractional step schemes for incompressible flows.	**PI:** R. Codina
• Weak imposition of boundary conditions.	**PI:** R. Codina
• Meshless methods in CFD.	**PI's:** S. Idelsohn and E. Oñate
• FEM and particle methods for multifluids, flow in porous media and free surface flows.	**PI's:** S. Idelsohn, R. Codina and R. Rossi
• FEM and meshless methods for aerodynamics analysis and drag reduction in aeronautics.	**PI's:** J. Pons and E. Ortega
• FEM and particle methods for ship hydrodynamics and aero/hydrodynamics analysis of marine structures (offshore platforms, wind tower structures, wave energy production, etc).	**PI:** J. Garcia
• FEM and particle methods for blood flow and air flow in lungs.	**PI's:** R. Rossi and E. Soudah

3. Computational Geomechanics	
• Constitutive models and FEM for analysis of unsaturated soils and rocks.	**PI:** E. E. Alonso
• FEM for coupled problems in geotechnical engineering. Particle-based and discrete element methods for geomechanical problems.	**PIs:** A. Gens and S. Olivella

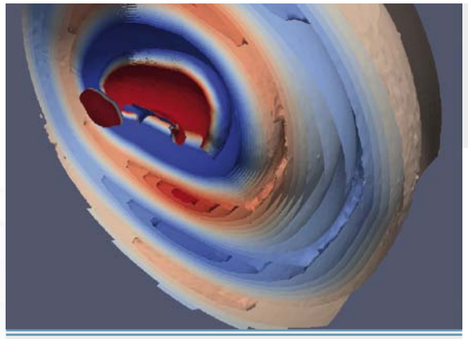
4. Mathematical and Computational Modelling	
• Advanced NM for computational mechanics (X-FEM, G-FEM, meshless methods, etc). High-order solvers with high-fidelity geometrical resolution.	**PI:** A. Huerta
• Reduced-order modeling for fast and multiple queries, real time optimization and uncertainty quantification. Goal-oriented error assessment and mesh adaptivity.	**PI:** P. Diez

5. Computational Modelling of Engineering Materials	
• Constitutive models for metallic and frictional materials (concrete, rocks, soil, ceramics, etc). Multi-scale FEM analysis of materials. Optimum material design.	**PI:** X. Oliver
• Constitutive models for FEM analysis of composite and bio-materials. Parameter identification in constitutive models.	**PI:** S. Oller
• Material models for discrete element methods (DEM)	**PI:** E. Oñate

6. Computational Solid and Structural Mechanics	
• FEM for non-linear analysis of solids and structures. Fracture analysis in solids.	**PIs:** M. Cervera and X. Oliver
• Rotation-free shell elements. Meshless and particle-based methods in solid mechanics. Multifracture analysis of solids with the DEM and coupled DEM-FEM procedures.	**PI:** E. Oñate
• FEM for dynamic and seismic analysis of structures.	**PI:** A. Barbat
• Analysis, Design and evaluation of human implant using FEM.	**PI:** E. Soudah
• Numerical simulation and constitutive modelling of human body tissues.	**PI:** S. Oller

7. Optimization	
• Numerical methods for optimization of industrial forming processes.	**PI:** M. Chiumenti
• Optimization algorithms for robust optimal design, shape optimization and material design in aeronautics.	**PI:** G. Bugeda
• Optimal design of ship hulls, wind energy structures and offshore structures.	**PI:** J. Garcia
8. Computation and Information Technologies	
• Decision support systems in engineering. Internet tools. Embedded ICT systems. App technology. Internet of Things.	**PI:** J. Jiménez
• Parallel structured and unstructured mesh generation. Graphical visualization of big data sets. Development of the GiD pre-postprocessor, www.*gidhome.com*.	**PI:** A. Coll
• Medical image processing and analysis: 3D/4D medical images processing to create computational models	**PI's:** E. Soudah and J. Pérez
9. Numerical Methods and Technologies for Energy and Environment	
• Numerical methods for energy efficiency analysis and design of buildings and urban areas.	**PI:** J. Cipriano
• Evaporation methods for fresh water production. Computational methods for analysis and preservation of biosphere in ocean and coastal areas.	**PI:** P. Arnau
• Holistic risk prediction of structures under hazards.	**PI:** A. Barbat

Fluid Mechanics Group



The Fluid Mechanics Group focuses on the development of mathematical models and numerical methods for the solution of a wide range of problems in engineering and other applied sciences involving external and internal flows.

Applications include, among others, high speed compressible flows, turbulent flows, shallow water flows, flow in porous media, bio-flows and many multidisciplinary coupled problems involving fluids, such as magneto-hydro-dynamics, fluid-structure interaction and thermal flows.

Staff

Ramon Codina (Leader)
Joan Baiges
Camilo A. Bayona
Sergio Idelsohn
Arnau Pont

www.cimne.com/fluid-mechanics

On-going RTD Projects

EUIN ELASTIC-HEAT - Desarrollo e innovación de equipos de intercambio de calor basados en fluidos viscoelásticos

PLAN ESTATAL (2013-16) - MINECO
Coordinator: CIMNE — 01/09/2015 -31/08/2016

ELASTIC-FLOW - Aumento de la Eficiencia en Procesos de Mezcla y Transmisión de Calor utilizando Fluidos Viscoelásticos en Régimen Laminar y Turbulento

Fomento I+D+i orientada a retos sociedad - MINECO
Coordinator: CIMNE — 01/01/2016 - 31/12/2018

EUNISON - Extensive UNIfied-domain SimulatiON of the Human Voice

FP7 (2007-2013) - FP7 - COOPERATION - EC
Coordinator: KTH — 01/03/2013 - 31/05/2016

SOLARNET - High-Resolution Solar Physics Network

FP7 (2007-2013) - FP7 - CAPACITIES - EC
Coordinator: IAC — 01/04/2013 - 31/03/2017

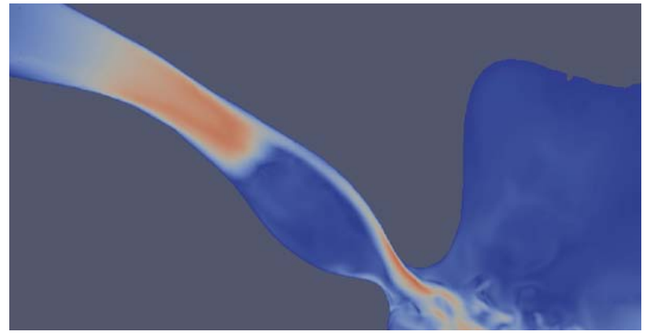
Research Topics

COMPUTATIONAL FLUID DYNAMICS

- Stabilized finite element methods for problems involving waves, viscoelastic flows, compressible flows, shallow water flows, magneto-hydro-dynamics and approximation of eigenvalues. PI: R. Codina
- Fractional step schemes for incompressible flows. PI: R. Codina
- Weak imposition of boundary conditions. PI: R. Codina
- Meshless methods in Computational Fluid Dynamics. PI's: S. Idelsohn and E. Oñate
- FEM and particle methods for multifluids, flow in porous media and free surface flows. PI's: R. Codina, S. Idelsohn and R. Rossi

ALGORITHMS FOR MULTIPHYSICS PROBLEMS

- Aeroacoustics: Acoustic analogies in incompressible flows, direct numerical simulation of sound, aeroacoustics in time dependent domains, application to human voice simulation. PI's: R. Codina and J. Baiges
- Optical quality of observation sites: Numerical simulation of turbulence, estimation of optical parameters of turbulent atmospheres, application to telescope visibility. PI: R. Codina
- Reduced Order Models: Domain decomposition, fluid-structure interaction, thermally coupled flows. PI's: R. Codina and S. Idelsohn



Geomechanics Group

The research achievements of the Geomechanics Group focus on several aspects: the contribution to fundamental understanding and modelling of soil and rock behavior, the development of advanced computational tools and testing techniques at laboratory scale and the participation in applied engineering projects.

Achieving a proper balance among these aspects has been a permanent objective of the group over the years. The research of the group and the software developed are a reference in the analysis of coupled thermal, hydraulic, mechanical and chemical processes in porous media applied to the analysis and design of underground structures (tunnels, foundations, geo-reservoirs, etc), earth and rockfill dams and fluid-soil-structure interaction problems. The research activity of the Geomechanics Group has particular relevance for the solution of multidisciplinary problems in the fields of civil, geological and mining engineering, among others.

Research Topics

COMPUTATIONAL GEOMECHANICS

- Coupled chemo-thermo-hydro-mechanical models and numerical methods for porous media. **PI:** *E. E. Alonso*
  - *Particle Methods in Geomechanics*
  - *Unsaturated Soil Mechanics*
  - *Landslides*
  - *Crystal growth in Geomechanics*
- FEM for coupled problems in geotechnical engineering. Particle-based and discrete element methods for geomechanical problems. **PI's:** A. Gens and S. Olivella
- Bio-geo-chemical processes in artificial recharge practices. **PI:** *X. Sanchez-Vila*
- Reactive transport, emerging contaminants and associated risk. **PI:** *X. Sanchez-Vila*

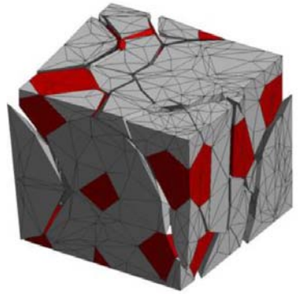
On-going RTD Projects

PARTING - Métodos de Partículas en Geomecánica

PLAN ESTATAL (2013-16) - Fomento I+D+i orientada a retos sociedad - Retos Investigación: Proyectos de I+D+i - MINECO
Coordinator: CIMNE — *01/01/2014 - 31/12/2017*

TERRE - Training Engineers and Researchers to Rethink geotechnical Engineering for a low carbon future

H2020 (2014-2020) - Excellent Science - MSCA - Curie actions - EC
Coordinator: University of Strathclyde — *01/11/2015 - 31/10/2019*



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www.cimne.com/geomechanics

Industrial Processes Group

The Industrial Processes Group is composed of a team of professionals specialized in the field of metal forming parts, elastomers, composites and environmental impact.

The group collaborates with universities, research centres and companies to make them available their expertise on the following topics:

- Studies of improved manufacturing processes (additive manufacturing, sheet stamping, casting, welding, machining, etc.)
- Development of pre/post processing interfaces for simulation softwares for specific industrial applications, including adaptations for users with disabilities.

In addition, the activities of this group are included in the context of the Help Center Network for Technology Innovation of Catalonia Regional Government and national railway sector and industry cluster RAILGRUP.

The Industrial Processes Group colaborates with Aula CIMNE of the School of Industrial, Aerospace and Audiovisual Engineering located in Terrassa (ESEIAAT).

Research Topics

ALGORITHMS FOR MULTIPHYSICS PROBLEMS

- FEM and particle methods for analysis of industrial forming processes (casting, mold filling, sheet metal stamping, 3D printing, friction stir welding, etc.).
  PI's: M. Chiumenti and C. Agelet de Saracibar

OPTIMIZATION

- Numerical methods for optimization of industrial forming processes.
  PI: M. Chiumenti

On-going RTD Projects

CAxMan - Computer Aided Technologies for Additive Manufacturing

H2020 (2014-2020) - EC
Coordinator: SINTEF — *01/09/2015 - 31/08/2018*

FLEXICAST - Robust, and FLEXible CAST iron manufacturing

FP7 (2007-2013) - FP7 - COOPERATION - EC
Coordinator: UPC — *01/11/2012 - 31/10/2016*

HYPERMEMBRANE - DEMO - Development of an Adaptable Structure for Architecture Application

FP7 (2007-2013) - FP7 - CAPACITIES - EC
Coordinator: Eurocomercial de Nuevas Tecnologías, S.L.
01/01/2014 - 31/07/2016

ICMEG - Integrative Computational Materials Engineering Expert Group

FP7 (2007-2013) - FP7 - COOPERATION - EC
Coordinator: ACCESS e.V. — *01/10/2013 - 30/09/2016*

Staff

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www.cimne.com/industrial-processes

Structural Mechanics Group

The Structural Mechanics Group of CIMNE is specialized in the development of next-generation of numerical methods and software for the accurate and efficient solution of scale multidisciplinary engineering problems in structural mechanics, design of new materials, simulation and optimization of industrial forming processes.

The research activities of the Structural Mechanics Group have spread over a range of multidisciplinary fields to which it has contributed relevant theories and methods of practical relevance. The research achievements of the Structural Mechanics Group can be found in the field of numerical methods for the analysis and design of structures, new materials, fluid-structure interaction problems and industrial manufacturing processes are internationally recognised.

The scientific contributions and software derived from the Structural Mechanics Group research activity are of particular relevance to the solution of multidisciplinary problems in the fields of civil, industrial, aerospace, marine and naval engineering, among others.

Research Topics

ALGORITHMS FOR MULTIPHYSICS PROBLEMS

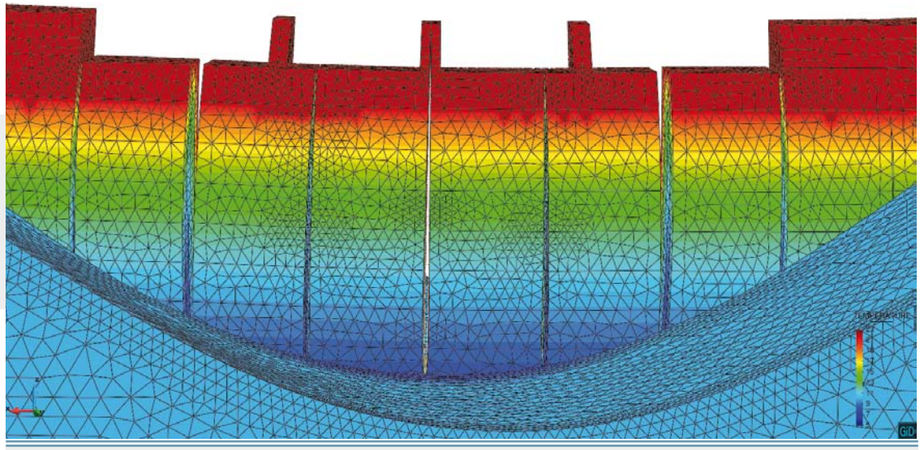
- FEM and particle-based methods for fluid-soil-structure interaction. Numerical Methods for the oil and gas industry. **PI:** E. Oñate
- Numerical methods for coupled thermal-mechanical problems for constructions and mechanical components. **PI's:** M. Chiumenti and M. Cervera

COMPUTATIONAL MODELLING OF ENGINEERING MATERIALS

- Constitutive models for metallic and frictional materials (concrete, rocks, soil, ceramics, etc). Multi-scale FEM analysis of materials. Optimum material design. **PI:** X. Oliver
- Constitutive models for FEM analysis of composite and bio-materials. Parameter identification in constitutive models. **PI:** S. Oller
- Material models for discrete element methods (DEM). **PI:** E. Oñate

COMPUTATIONAL SOLID AND STRUCTURAL MECHANICS

- FEM for non-linear analysis of solids and structures. Fracture analysis in solids. **PI's:** M. Cervera and X. Oliver
- Rotation-free shell elements. Meshless and particle-based methods in solid mechanics. Multifracture analysis of solids with the DEM and coupled DEM-FEM procedures. **PI's:** E. Oñate



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Francisco Zárate
Rubén Zorrilla
Daniel Yago

www.cimne.com/structural-mechanics

On-going projects

ACOMBO - Análisis Termo-Tenso-Deformacional Complejo de las Presas Bóveda

PLAN ESTATAL (2013-16) - MINECO
Coordinator: JGICSA
01/09/2015 - 31/08/2018

AIDA - Umbrales de emergencia para seguridad de presas

PLAN ESTATAL (2013-16) - MINECO
Coordinator: CIMNE
01/01/2014 - 31/12/2016

CALA - Mejora de la seguridad hidrológica e incremento de la capacidad de embalse de presas de fábrica mediante la implementación de Canales Laterales

MINECO - Retos Colaboración: Proyectos I+D
Coordinator: CITECHSA
01/09/2016 - 31/08/2019

CAxMan - Computer Aided Technologies for Additive Manufacturing

H2020 (2014-2020) - EC
Coordinator: SINTEF
01/09/2015 - 31/08/2018

COMETAD - Técnicas computacionales y experimentales para análisis y diseño de polímeros retardantes al fuego

PLAN ESTATAL (2013-16) - MINECO
Coordinator: CIMNE
01/01/2015 - 31/12/2017

COMP-DES-MAT - Advanced tools for computational design of engineering materials

FP7 (2007-2013) - FP7 - IDEAS - EC
Coordinator: CIMNE
01/02/2013 - 31/01/2018

COMP-MAT-DYN - Diseño computacional de materiales resistentes a acciones dinámicas en ingeniería estructural

PLAN ESTATAL (2013-16) - MINECO
Coordinator: CIMNE
01/01/2015 - 31/12/2017

DRAGY - Drag Reduction in Turbulent Boundary Layer via Flow Control

H2020 (2014-2020) - SC4-Smart, green & integrated transport
Coordinator: CIMNE
01/04/2016 - 31/03/2019

DIABLO - Código de diseño óptimo de aliviaderos formados por bloques en forma de cuña

PLAN ESTATAL (2013-16) - MINECO
Coordinator: PREHORQUI
01/09/2014 - 31/12/2017

DSS4RA - Técnicas de Inteligencia Artificial para el manejo rutinario de la Artritis Reumatoide

PLAN ESTATAL (2013-16)
Coordinator: Hospital de la Princesa
01/01/2015 - 31/12/2017

EACY - Marco computacional de alta precisión para localización de deformaciones y mecanismos de fallo

PLAN ESTATAL (2013-16) - MINECO
Coordinator: CIMNE
01/01/2014 - 31/12/2016

ECOVENT - Nuevo sistema de ventilación para túneles

PLAN ESTATAL (2013-16) - MINECO
Coordinator: OSSA
01/09/2015 - 31/08/2017

ELASTIC-FLOW - Aumento de la Eficiencia en Procesos de Mezcla y Transmisión de Calor utilizando Fluidos Viscoelásticos en Régimen Laminar y Turbulento

MINECO - Retos Investigación: Proyectos de I+D+i
Coordinator: CIMNE
01/01/2016 - 31/12/2018

EMUSIC - Efficient Manufacturing for Aerospace Components USing Additive Manufacturing, Net Shape HIP and Investment Casting

H2020 - SC4-Smart, green & integrated transport
Coordinator: Univ. Birmingham
01/04/2016 - 31/03/2019

FLEXICAST - Robust, and FLEXible CAST iron manufacturing

FP7 (2007-2013) - FP7 - COOP. - EC
Coordinator: UPC
01/11/2012 - 31/10/2016

FLOODSAFE - Simulation software for the study and mitigation of the effect of floods on constructions and landscapes

H2020 (2014-2020) - EC
Coordinator: CIMNE
01/07/2015 - 30/06/2016

FORECAST - Assessment and Initial Steps for the Exploitation of a fast Simulation Software for Casting Manufacturing Operations

H2020 (2014-2020) - EC
Coordinator: CIMNE
01/05/2015 - 30/04/2016

FORTISSIMO (Castincloud) - Sustainable CLOUD Services for bringing High Performance CASTINg Simulations to the SMEs

FP7 (2007-2013) - FP7 - COOP. - EC
Coordinator: QUANTECH
01/10/2014 - 31/12/2016

FORTISSIMO (X-Sheaks) - HPC-enabled System for enHanced sEeakeeping and stAtion-Keeping design

FP7 (2007-2013) - FP7 - COOP. - EC
Coordinator: COMPASS Ingeniería y Sistemas, S.A.
01/07/2015 - 31/12/2016

GRAIN 2 - Greener Aeronautics International Networking

FP7 (2007-2013) - FP7 - COOP.- EC
Coordinator: CIMNE
01/10/2013 - 31/05/2016

HIRMA - Desarrollo y Validación de una aplicación para la determinación del Hidrograma de Rotura de Presas de Materiales Sueltos, a partir de la Configuración Geomecánica Particular

MINECO - Retos Colaboración: Proyectos I+D
Coordinator: INCLAM
01/09/2016 - 31/08/2019

HYPERMEMBRANE-DEMO - Development of an adaptable structure for architecture application

FP7 (2007-2013) - FP7 - CAPACITIES - EC
Coordinator: Eurocomercial de Nuevas Tecnologías, S.L.
01/01/2014 - 31/07/2016

ICEBREAKER - Proof of Concept

H2020 - ERC-2016 - PoC
Coordinator: CIMNE
01/10/2016 - 30/09/2017

IMPRESIÓN - Desarrollo de una herramienta para el tratamiento de imágenes de presas tomadas mediante drones y su integración en el sistema de auscultación de la presa

MINECO - Retos Colaboración: Proyectos I+D
Coordinator: TECOPY
01/10/2016 - 31/12/2018

LAYERS - Learning Layers - Scaling up Technologies for Informal Learning in SME Clusters

FP7 (2007-2013) - FP7 - COOP. - EC
Coordinator: CIMNE
01/11/2012 - 31/10/2016

MODFUEL - Modelling and simulation of Fuel Cells

PLAN ESTATAL (2013-16) - MINECO
Coordinator: CIMNE
01/04/2015 - 01/04/2016

MONICAB - Desarrollo de herramientas para la modelación numérica del efecto de la contaminación del balasto con arena en líneas de alta velocidad

MINECO - Retos Colaboración: Proyectos I+D
Coordinator: CIMNE
01/01/2016 - 31/12/2018

MOVASE - Desarrollo de nuevos métodos y herramientas para la optimización del proceso de fabricación de envases de vidrio

MINECO - Retos Colaboración: Proyectos I+D
Coordinator: CIMNE
01/07/2016 - 31/12/2018

NICE-SHIP - Development of new Lagrangian computational methods for ice-ship interaction problems

ONR - NICOP
Coordinator: CIMNE
30/09/2016 - 01/10/2019

NUMA - Desarrollo de una plataforma para la integración de modelos NUméricos de base física y Modelos basados en datos en la gestión de la Auscultación de presas

MINECO - Retos Colaboración: Proyectos I+D
Coordinator: DACARTEC
01/06/2016 - 31/12/2018

NUMEXAS - NUMerical methods and tools for key EXAScale computing challenges in engineering and applied sciences

FP7 (2007-2013) - FP7 - COOP. - EC
Coordinator: CIMNE
01/10/2013 - 30/09/2016

OMMC - Optimización Multi-escala y Multi-objetivo de Estructuras de Laminados Compuestos

PLAN ESTATAL (2013-16) - MINECO
Coordinator: CIMNE
01/01/2015 - 31/12/2017

PARFLOW - Métodos computacionales para análisis de flujos ambientales de partículas

PLAN ESTATAL (2013-16) - MINECO
Coordinator: CIMNE
01/01/2014 - 31/12/2016

ResCiclo - Evaluación de la resistencia residual de estructuras de hormigón armado sometidas a eventos sísmicos

MINECO - Retos Investigación: Proyectos de I+D+i
Coordinator: CIMNE
01/01/2016 - 31/12/2018

EUIN RES-SAFE - Seguridad y resiliencia estructural bajo desastres naturales de origen geológico

PLAN ESTATAL (2013-16) - MINECO
Coordinator: CIMNE
01/09/2015 - 31/08/2017

SCAVE - Espacio inmersivo, interactivo e itinerante para la gestión colaborativa de proyectos constructivos

MINECO - Retos Colaboración: Proyectos I+D
Coordinator: PMS
01/10/2016 - 31/03/2019

SGR 2014 - Anàlisi numèrica i computació científica

Ajuts de suport a la recerca - SGR - AGAUR
Coordinator: UPC
01/01/2014 - 31/12/2016

SGR 2014 - Mètodes Numèrics en Enginyeria

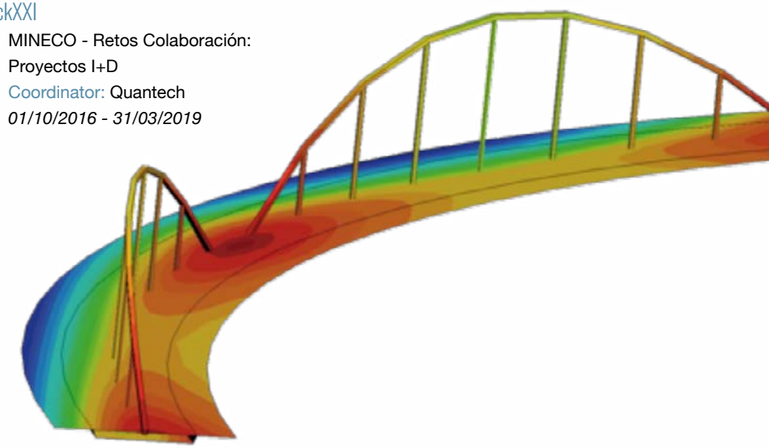
Ajuts de suport a la recerca - SGR -AGAUR
Coordinator: CIMNE
01/01/2014 - 31/12/2016

SimPhoNy - Simulation framework for multi-scale phenomena in micro and nanosystems

FP7 (2007-2013) - FP7 - COOP. - EC
Coordinator: Fraunhofer
01/01/2014 - 31/12/2016

StampackXXI - Desarrollo de un nuevo código para simulación de procesos de conformado de piezas laminares-StampackXXI

MINECO - Retos Colaboración: Proyectos I+D
Coordinator: Quantech
01/10/2016 - 31/03/2019



TCAiNMaND - Tri Continental Alliance in Numerical Methods applied to Natural Disasters

FP7 (2007-13) - FP7 - PEOPLE - EC
Coordinator: CIMNE
01/01/2014 - 31/12/2017

T-MAPPP - Training in Multiscale Analysis of multi-Phase Particulate Processes

FP7 (2007-13) - FP7 - PEOPLE - EC
Coordinator: Univ. of Edimburgh
01/03/2014 - 28/02/2018

UMRIDA - Uncertainty Quantification Robust Design Aeronautics

FP7 (2007-13) - FP7 - COOP. - EC
Coordinator: NUMECA
01/10/2013 - 30/09/2016

VELaSSCo - Visualization for Extremely Large-Scale Scientific Computing

FP7 (2007-13) - FP7 - COOP. - EC
Coordinator: CIMNE
01/01/2014 - 31/12/2016

VOLADAPT - Voladura mediante técnicas predictivas y adaptativas minimizando emisiones

PLAN ESTATAL (2013-16) - MINECO
Coordinator: OSSA
01/02/2014 - 31/03/2017

Building, Energy and Environment Group

The Building, Energy and Environment Group (BEE Group) involves researchers from different disciplines (Physics, Engineering, ICT, Environmental Science and Statistics specialists).

It was founded in 2001 and has two main offices: one in the GAIA building of the UPC Campus in Terrassa and the other in the CREA building of the University of Lleida.

BEE Group meets the challenge of employing knowledge and experience to help users to get the best possible use out of the energy that they consume. The group collaborates with leading research centers and builds bridges between companies, users and researchers.

Research Topics

NUMERICAL METHODS AND TECHNOLOGIES FOR ENERGY AND ENVIRONMENT

› Numerical methods for energy efficiency analysis and design of buildings and urban areas. **PI:** J. Cipriano

› BiG Data analytics applied to energy efficiency and smart grids. **PI:** J. Cipriano

On-going RTD Projects

EDI-Net - The Energy Data Innovation Network
H2020 - SC3-Secure, clean & efficient energy
Coordinator: DMU
01/03/2016 - 01/03/2019

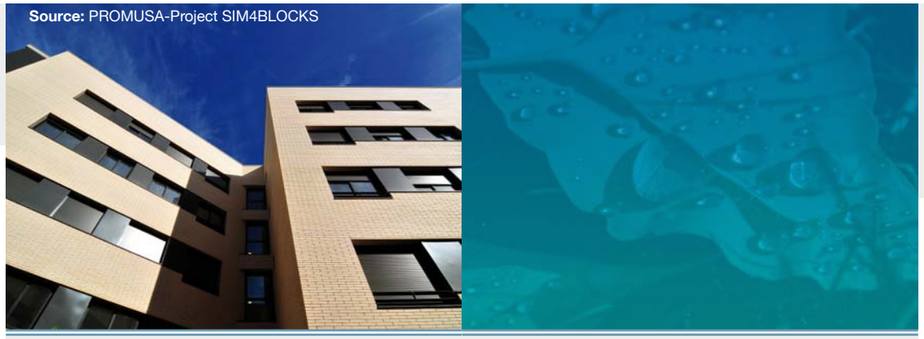
FLEXEDINET - Gestió activa intel·ligent d'energia en edificis terciaris: mercat, usuaris, càrregues i manteniment
ACC1Ó - Comunitats RIS3CAT
Coordinator: RSM GASSÓ CIMNE ENERGY S.L.
01/06/2016 -30/11/2017

REFER - Reducció Energètica i Flexibilitat en Edificis en Rehabilitació
ACC1Ó - Comunitats RIS3CAT
Coordinator: COMSA EMTE, S.L.
01/06/2016-31/05/2019

SHERPA - Shared knowledge for Energy renovation in buildings by Public Administrations
EC - MED Programme 2014-2020
Coordinator: GENCAT
01/12/16 - 30/11/2019

Sim4Blocks - Simulation Supported Real Time Energy Management in Building Blocks
H2020 - SC3-Secure, clean & efficient energy
Coordinator: ZAFH
01/04/2016-31/03/2020

ZEBRA 2020 - Nearly Zero-Energy Building Strategy 2020
CIP (2007-2013) - IEE - EC
Coordinator: TU Wien
01/04/2014 - 30/09/2016



Source: PROMUSA-Project SIM4BLOCKS

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www.beegroup-cimne.com

Nature Group

This environmental department was created in 2008 as a response to a growing need for scientific investigations addressing contemporary environmental issues. The group has coordinated and actively participated in national and international research projects to understand and predict the behavior of the natural environment and its resources.

The main activity of the Nature Group is to advance knowledge and technology to approach contemporary environmental issues, mainly in water desalination, energy storage, climate adaptation and areas related with technological convergence and risk events studies.

The group develops knowledge and technology in global environmental research by bringing together and managing skilled scientists and engineers to develop strategic and applied environmental solutions.

Research Topics

NUMERICAL METHODS AND TECHNOLOGIES FOR ENERGY AND ENVIRONMENT

› Evaporation methods for fresh water production. Computational methods for analysis and preservation of biosphere in ocean and coastal areas. **PI:** P. Arnau

On-going RTD Projects

IPIDO - Implementación de un prototipo pre-industrial de desalinización en un entorno operacional
PLAN ESTATAL (2013-16) - MINECO
Coordinator: FWN
01/02/2015 - 31/07/2017

MMSC - Validación del sistema desalinizador Modular Multi-Stage Core
RIS3CAT (2014-2020) - AGAUR
Coordinator: CIMNE
01/09/2014 - 29/02/2016

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www.cimne.com/nature

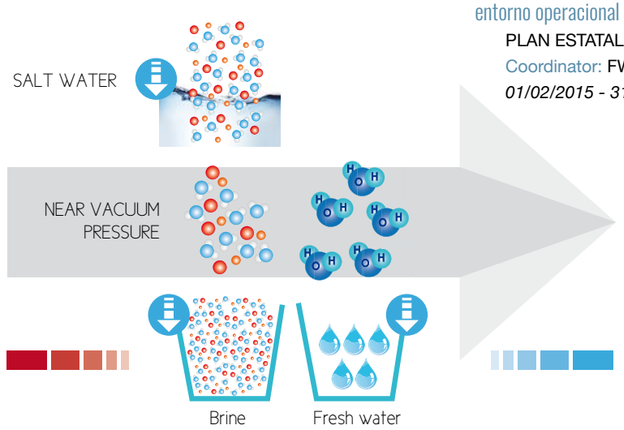


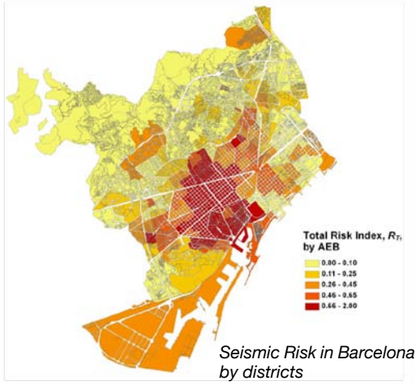
Fig. **Basics of Cool Steam process developed by Nature group, a fresh water production technology based on low temperature distillation**

Risk Assessment Group

The Risk Assessment Group has made important contributions to seismic vulnerability and risk studies in Spain, Europe and Latin America. This group has developed numerous natural hazards and risk modelling studies for several countries in the Latin America and Caribbean Region, Europe, South-East Asia and Indic Ocean.

These studies have been developed for different resolution levels and with different objectives; thus, their results have been used for risk reduction, land use planning, financial risk transfer, insurance and re-insurance, and for integrated disaster risk management.

The developments performed on the vulnerability and risk evaluation and on the holistic risk approach, as well as on the development and use of risk indicators and the development of urban risk scenarios, are well known in the scientific community. More recently, contributions have been made in the fields of probabilistic modelling of hazard and risk, economic evaluations for risk transfer and financial protection.



Seismic Risk in Barcelona by districts

Staff

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Mario A. Salgado

Research Topics

COMPUTATIONAL SOLID AND STRUCTURAL MECHANICS

› Seismic vulnerability assessment of structures. **PI**: A. H. Barbat

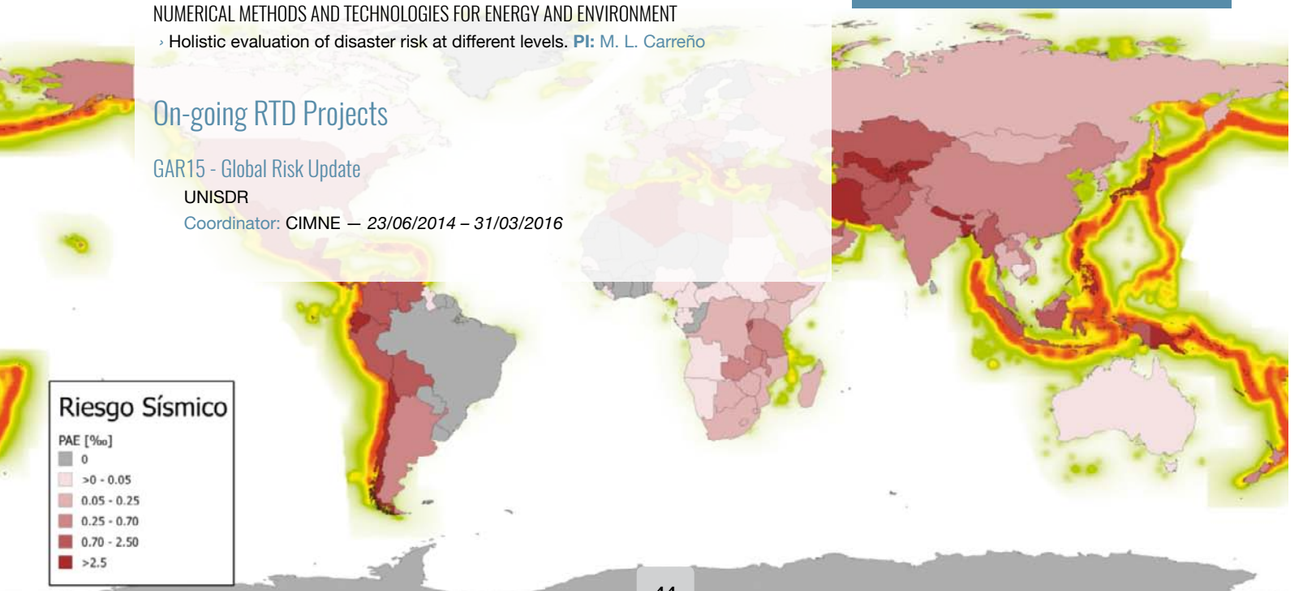
NUMERICAL METHODS AND TECHNOLOGIES FOR ENERGY AND ENVIRONMENT

› Holistic evaluation of disaster risk at different levels. **PI:** M. L. Carreño

On-going RTD Projects

GAR15 - Global Risk Update

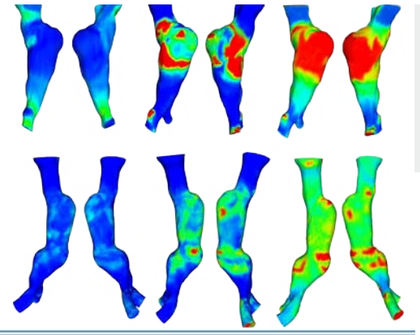
UNISDR
Coordinator: CIMNE — *23/06/2014 – 31/03/2016*



www.cimne.com/risk-assessment

Biomechanics Group

The Biomechanics Group is focused in the development of numerical techniques, new methodologies and edge-front strategies in computational biomechanics. It is also devoted to the development of numerical methods for modelling and simulation of biomechanical and biomedical problems.



The group is oriented towards the analysis and design in biomechanics, including topics such as:

› Modelling the function of cardiovascular system.
› Develop patient-specific computational tools.
› Medical image processing and meshing, from medical image directly to a computational mesh.
› Bone simulation and modelling.
› Platform for the virtual modelling and representation of the human body.
› Software development in biomechanics and bioengineering.

Staff

Eduardo Soudah (Leader)
Marino Arroyo
Ester Comellas
Pau Martínez
Anna Muñoz
Sergio Oller
Jorge Pérez
Riccardo Rossi
Javiera Valdivia

Research Topics

ALGORITHMS FOR MULTIPHYSICS PROBLEMS

› Numerical modelling thin objects in nano and bio-systems. **PI:** M. Arroyo

COMPUTATIONAL FLUID DYNAMICS

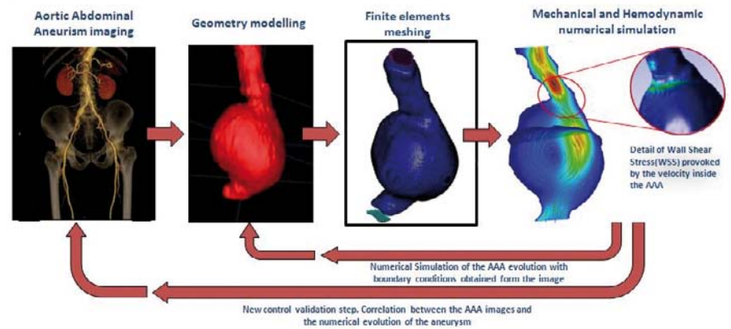
› FEM and particle methods for blood flow and air flow in lungs. **PI's:** R. Rossi and E. Soudah

COMPUTATIONAL SOLID AND STRUCTURAL MECHANICS

› Numerical simulation and constitutive modelling of human body tissues. **PI:** S. Oller

COMPUTATION AND INFORMATION TECHNOLOGIES

› Medical image processing and analysis: 3D/4D medical images processing to create computational models. **PI's:** E. Soudah and J. Pérez



On-going RTD Projects

DSS4RA - Support System Decisions based on Artificial Intelligence techniques for routine management of Rheumatoid Arthritis

PLAN ESTATAL (2013-16) - ISCIII
Coordinator: Hospital de la Princesa
01/01/2015 - 31/12/2017

TOTAL.KNEE - New generation of knee prostheses using advanced computational biomechanics

FP7 (2007-2013) - FP7 - PEOPLE - EC
Coordinator: CIMNE
01/04/2012 - 31/03/2016

WITH ME - The European Platform to Promote Healthy Lifestyle and improve care

FP7 (2007-2013) - COOP. - EC
Coordinator: ATOS — *01/06/2013 - 30/06/2016*

www.cimne.com/biomechanics

Information and Communication Technology Group

The Information and Communication Technology Group is a R&D group of CIMNE expert in research, development and innovation of new and disruptive tecnologies, applying them in multiple engineering areas.

It is also dedicated to improving simulation tools, smart embedded systems, AI and GIS in order to develop Decision Support Systems (DSS) and prediction systems for advancing knowledge and technology in engineering and applied sciences.

Staff

Jordi Jiménez (Leader)
Francesc Campà
Alexis Cid
Pablo Franzolini
Rahmat Kazemi
Andreu Marí
José Luis Oñate
Ángel Diego Priegue
Fabio Renda
Andreu Tarracó
Alberto Tena
Javier Tous
Sergio Valero
Sergio I. Velásquez
Claudio Zinggerling

www.cimne.com/ict

Research Topics

COMPUTATION AND INFORMATION TECHNOLOGIES — PI: J. Jiménez

- Decision Support Systems
- Smart Management Systems
- Internet of Things
- App Technology
- Embedded ICT Systems
- Internet Tools
- GIS (2D/3D)
- WSN Deployments
- BOT Technology
- Blockchain
- Machine Learning
- Virtual and Augmented Reality

On-going RTD Projects

GAINN4MOS - Sustainable LNG Operations for Ports and Shipping
CEF Programme 2014-2020 - INEA
Coordinator: Valencia Port
01/01/2015 - 30/09/2019

GAINN4SHIP INNOVATION - LNG Technologies and Innovation for Maritime Transport
CEF Programme 2014-2020 - INEA
Coordinator: Valencia Port
01/01/2015 - 31/12/2018

IMPRESIÓN: Desarrollo de una herramienta para el tratamiento de imágenes de presas tomadas mediante drones y su integración en el sistema de auscultación de la presa
MEIC - Retos Colaboración: Proy. I+D
Coordinator: TECOPY
01/10/2016 - 31/12/2018

LAYERS - Learning Layers - Scaling up Technologies for Informal Learning in SME Clusters
FP7 (2007-2013) - FP7 - COOP. - EC
Coordinator: CIMNE
01/11/2012 - 31/10/2016

MODELGES - Modelos flexibles adaptados a sensores embebidos para la gestión de infraestructuras
PLAN ESTATAL (2013-16) - MINECO
Coordinator: COPASA
01/10/2015 - 30/09/2017

PICASSO - Preventing Incident and Accident by Safer Ships on the Oceans
INEA - CEF Programme 2014-2020
Coordinator: Sasemar
01/05/2016 - 30/06/2018

This group has also developed an innovative product that is already being marketed by Amazon: the OKO Smart Frame.

RCMS - Rethinking Container Management Systems
H2020 (2014-2020) - Societal Challenges - EC
Coordinator: Circle
01/05/2015 - 31/01/2017

SCAVE - Espacio inmersivo, interactivo e itinerante para la gestión colaborativa de proyectos constructivos
MINECO - Retos Colaboración: Proyectos I+D
Coordinator: PMS
01/10/2016 - 31/03/2019

STM Validation Project
CEF Programme 2014-2020 - INEA
Coordinator: Swedish Maritime Administration
01/01/2015 - 31/12/2018

TERRE - Training Engineers and Researchers to Rethink geotechnical Engineering for a low carbon future
H2020 (2014-2020) - Excellent Science - EC
Coordinator: Univ. of Strathclyde
01/11/2015 - 31/10/2019

ULISES - Desarrollo de una Plataforma Autónoma para Vigilancia y Defensa en Entornos Offshore
PLAN ESTATAL (2013-16) - MINECO
Coordinator: Industrias Ferri
28/01/2014 - 31/07/2017

WITH ME - The European Platform to Promote Healthy Lifestyle and improve care
FP7 (2007-2013) - FP7 - ARTEMIS - JU - COOPERATION - EC
Coordinator: ATOS
01/06/2013 - 30/06/2016

Large-scale Scientific Computing Group

The large scale scientific computing group develops advanced numerical methods for the simulation of problems governed by PDES, e.g., solid and fluid mechanics and electromagnetics, together with the design and implementation of scalable solvers for the arising linear systems.

The team is particularly focused on the scalability of the whole simulation process on the largest supercomputers today. In this sense, it develops novel domain decomposition preconditioners and implementations that are scalable at extreme scales. Recent advances include space-time parallelism and robust algorithms for highly heterogeneous systems.

Research Topics

ALGORITHMS FOR MULTIPHYSICS PROBLEMS

PI: S. Badia

- High order physics-compatible discretization for multiphysics problems.
- Monotonic finite element methods.
- Scalable domain decomposition (space-time, heterogeneous problems).
- Unfitted methods and octree-based adaptive mesh refinement.

On-going RTD Projects

CLOUDFLOW - Computational Cloud Services and Workflows for Agile Engineering

FP7 (2007-2013) - EC
Coordinator: STAM
01/07/2013-30/04/2017

EFES - Algoritmos de elementos finitos para exaescala y su implementación en código libre

PLAN ESTATAL (2013-16) - MINECO
Coordinator: CIMNE
01/01/2015 - 31/12/2018

EUROFUSION

H2020 (2014-2020) - EC
Coordinator: MPG
01/01/2014 - 31/12/2018

EUIN EXACO2 - Exascale computational science for CO2 sequestration modelling

PLAN ESTATAL (2013-16) - MINECO
Coordinator: CIMNE
01/07/2015 - 30/06/2016

FEXFEM - Open source extreme scale finite element software

H2020 (2014-2020) - EC
Coordinator: CIMNE
01/01/2015 - 31/08/2016

FORTISSIMO (Superconducting) - Multi-physics simulation of high temperature superconducting devices

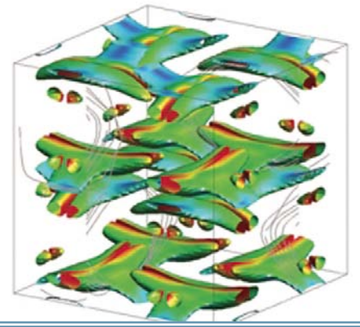
FP7 (2007-2013) - FP7 - COOP. - EC
Coordinator: OXO — *01/10/2014 - 31/12/2016*

NUMEXAS - NUMerical methods and tools for key EXAScale computing challenges in engineering and applied sciences

FP7 (2007-2013) - FP7 - COOP. - EC
Coordinator: CIMNE
01/10/2013 - 30/09/2016

NuWaSim - On a Nuclear Waste Deep Repository Simulator

EC - ERC-2016-PoC
Coordinator: CIMNE
01/11/2016 - 30/04/2018



Staff

Santiago Badia (Leader)
Jesús Bonilla
Josep Oriol Colomés
Alba Hierro
Alberto Francisco Martín
Hieu Nguyen
Marc Olm
Javier Príncipe
Víctor Sande
Francesc Verdugo

www.cimne.com/large-scale

Mathematical and Computational Modelling Group

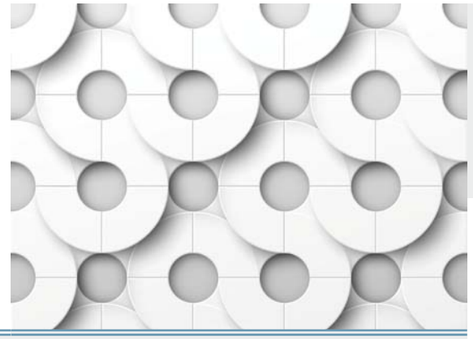
The mission of the Mathematical and Computational Modelling Group is to be a reference research unit with scientific and socio-economic impact, with technology transfer to industry and consolidated training in the field of mathematical modelling and numerical simulation in applied sciences and engineering.

The group is diverse in terms of the basic training of its members (engineers, mathematicians, physicists), the research topics and funding sources (industrial projects, cutting-edge research projects, international consortia), but group members have a powerful common denominator in research and training: mathematical modelling, numerical methods, and interest in their applicability.

Research Topics

MATHEMATICAL AND COMPUTATIONAL MODELLING

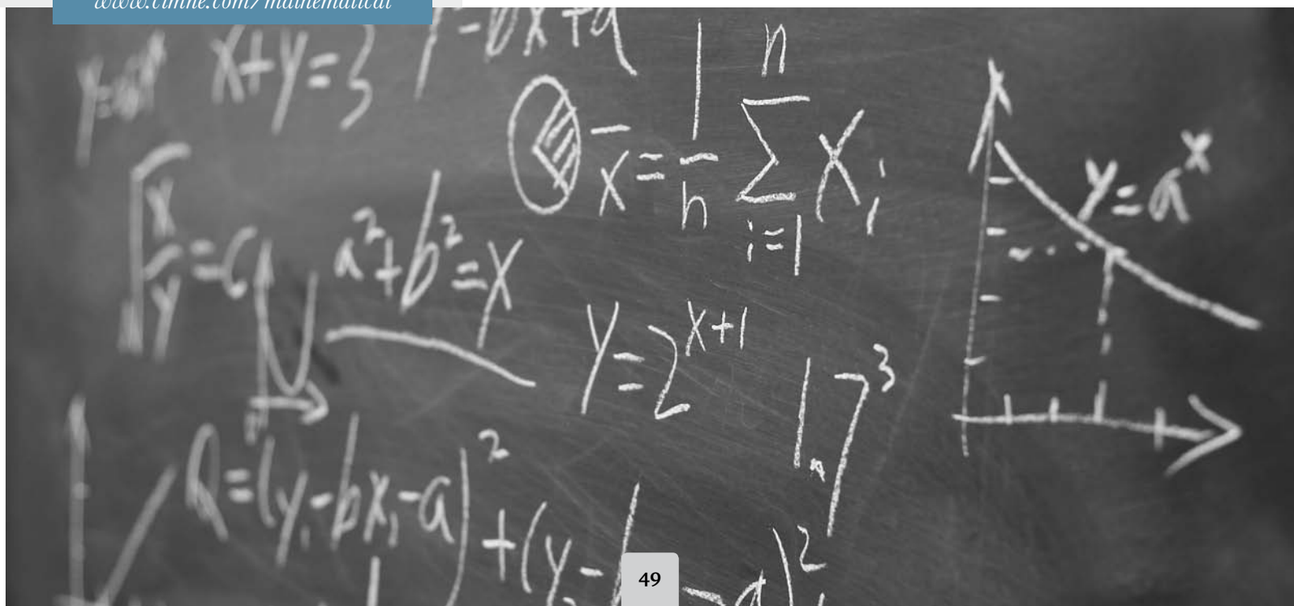
- Advanced NM for computational mechanics (X-FEM, G-FEM, meshless methods, etc). **PI:** A. Huerta
  - *High-order solvers with high-fidelity geometrical resolution.*
- Reduced-order modelling for fast and multiple queries, real time optimization and uncertainty quantification. **PI:** P. Díez
  - *Goal-oriented error assessment and mesh adaptivity.*



Staff

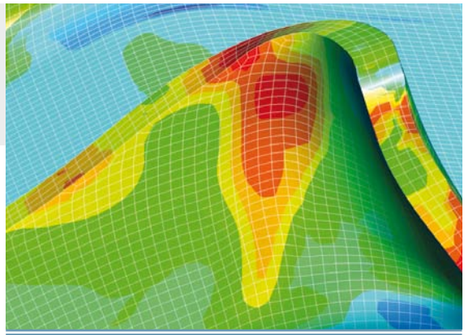
Antonio Huerta (Leader)
E. Santiago Alférez
Martí Beck
Marino Arroyo
Pedro Díez
Antonio Rodríguez-Ferran
José Sarrate
Pol Sin Arumí
Boyi Ye

www.cimne.com/mathematical



Pre and Postprocessing Group

The Pre and Postprocessing Group works on the development of advanced methods for efficient generation of data for numerical simulations and visualization of computational results.



These include:

- Geometry creation, importation and edition (CAD).
- Mesh generation.
- Interfacing between preprocessor, solvers and postprocessor.
- Visualization of huge amount of data in a 3D environment.
- Advanced visualization techniques for stereoscopic and realistic visualization.

The main commercial product of the group is the software GiD, which is a universal pre and postprocessor (*www.gidhome.com*) able to be connected with several numerical simulation codes and provide them with several advanced tools in the geometry creation and edition, mesh generation, assignation of data to the geometry or mesh, advanced visualization tools, and results visualization.

Staff

Abel Coll (Leader)
Enrique Escolano
Javier Gárate
Adrià Melendo
Anna Monros
Miguel A. Pasenau
Jorge S. Pérez

www.cimne.com/pre-post

Research Topics

COMPUTATION AND INFORMATION TECHNOLOGIES

PI: A. Coll

- Parallel structured and unstructured mesh generation.
- Graphical visualization of huge simulation data using big data technologies.
- Development of the GiD pre-postprocessor.

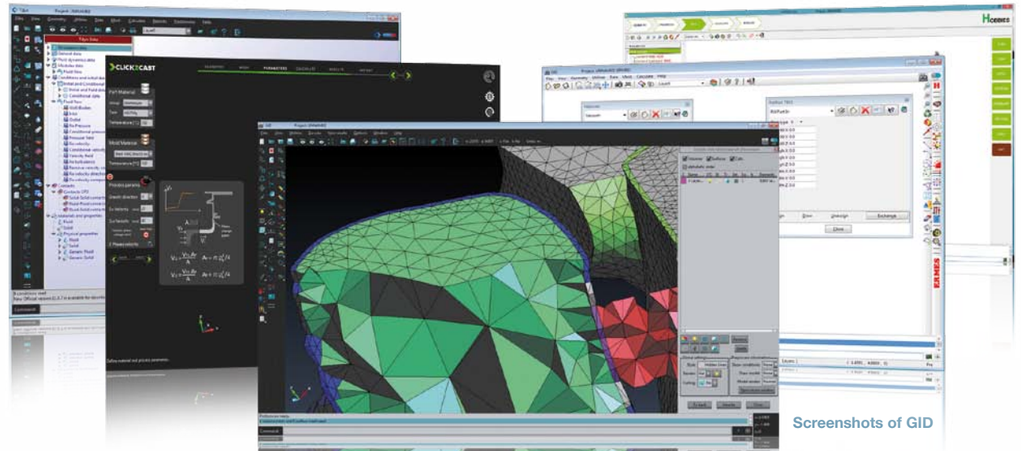
On-going RTD Projects

NUMEXAS - NUMerical methods and tools for key EXAScale computing challenges in engineering and applied sciences

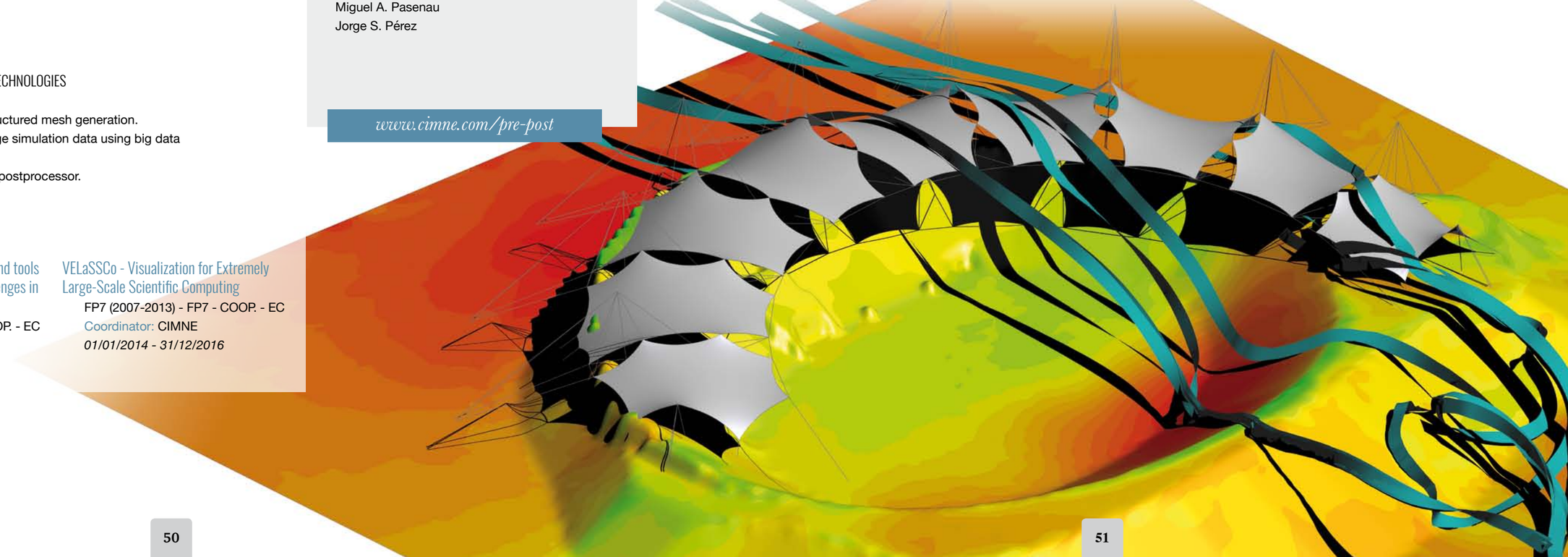
FP7 (2007-2013) - FP7 - COOP. - EC
Coordinator: CIMNE
01/10/2013 - 30/09/2016

VELaSSCo - Visualization for Extremely Large-Scale Scientific Computing

FP7 (2007-2013) - FP7 - COOP. - EC
Coordinator: CIMNE
01/01/2014 - 31/12/2016



Screenshots of GID



Aerospace Engineering Group

The Aerospace Engineering Group deals with the development of new and amazing projects in the aeronautical field, optimization and data modelling, as well as fuel cells.

The group deals with research in fluid dynamics, optimization, and fuel cells technology and also collaborates with other CIMNE groups in Composites materials analysis or IT technology applied to sensoring and data management.

Research Topics

COMPUTATIONAL FLUID DYNAMICS

› FEM and meshless methods for aerodynamics analysis and drag reduction in aeronautics. **PI's:** J. Pons and E. Ortega

OPTIMIZATION

› Optimization algorithms for robust optimal design, shape optimization and material design in aeronautics. **PI:** J. Pons and G. Bugeda

Staff

Jordi Pons (Leader)
Gabriel Bugeda
Martí Coma
Pedro Díez
Roberto Flores
Àlex Jarauta
Enrique Ortega

www.cimne.com/aero

On-going RTD Projects

DRAGY - Drag Reduction in Turbulent Boundary Layer via Flow Control

H2020 (2014-2020) - SC4-Smart, green & integrated transport
Coordinator: CIMNE
01/04/2016 - 31/03/2019

e-CAERO 2 - European Collaborative Dissemination of Aeronautical research and applications

H2020 (2014-2020) - Societal Challenges - SC4 - EC
Coordinator: CIMNE
01/12/2014 - 30/11/2017

ECO-COMPASS - Ecological and Multi-functional Composites for Application in Aircraft Interior and Secondary Structures

H2020 (2014-2020) - SC4-Smart, green & integrated transport
Coordinator: DLR
01/04/2016 - 31/03/2019

GRAIN 2 - Greener Aeronautics International Networking

FP7 (2007-2013) - FP7 - COOP. - EC
Coordinator: CIMNE
01/10/2013 - 31/05/2016

IMAGE - Innovative Methodologies and technologies for reducing Aircraft noise Generation and Emission

H2020 (2014-2020) - SC4-Smart, green & integrated transport
Coordinator: CIMNE
01/04/2016 - 31/03/2019

UMRIDA - Uncertainty Quantification Robust DesIgn Aeronautics

FP7 (2007-2013) - FP7 - COOP. - EC
Coordinator: NUMECA
01/10/2013 - 30/09/2016

Naval and Marine Engineering Group

CIMNE has a large experience in conducting RTD projects in naval and marine engineering.

The main activities in these fields are related to the development and application of computational methods and computer aided design and verification tools on the following topics:

› Hydrodynamic analysis of vessels
› Optimum shape design methods for ships
› Ship structures
› Composite materials and fluid-structure interaction effects
› Assessment of offshore structures
› Fluid-structure interaction
› Environmental problems in naval and marine engineering
› Decision support systems in naval and marine engineering
› Near-time simulation (operational) tools or ocean wave converters
› GPU computing
› Assessment of offshore wind turbines and ocean energy harvesting devices

Research Topics

COMPUTATIONAL FLUID DYNAMICS

› FEM and particle methods for ship hydrodynamics and aero/hydrodynamics analysis of marine structures.
PI: J. Garcia

OPTIMIZATION

› Optimal design of ship hulls, wind energy structures and offshore structures.
PI: J. Garcia

Staff

Julio García (Leader)
Jonathan Colom
Joel Jurado
Immaculada Ortigosa
Borja Serván

www.cimne.com/naval-marine

On-going RTD Projects

FORTISSIMO (X-Sheaks) - HPC - enabled System for enHanced sEeakeeping and stAtion-Keeping design

FP7 (2007-2013) - FP7 - COOP. - EC
Coordinator: COMPASS Ingeniería y Sistemas, SA
01/07/2015 - 31/12/2016

GAINN4MOS - Sustainable LNG Operations for Ports and Shipping

CEF Programme 2014-2020 - INEA
Coordinator: Valencia Port
01/01/2015 - 30/09/2019

GAINN4SHIP Innovation - LNG Technologies and Innovation for Maritime Transport

CEF Programme 2014-2020 - INEA
Coordinator: Valencia Port
01/01/2015 - 31/12/2018

MOVASE - Desarrollo de nuevos métodos y herramientas para la optimización del proceso de fabricación de envases de vidrio

MINECO - Retos Colaboración: Proyectos I+D
Coordinator: COMPASS Ingeniería y Sistemas, SA
01/07/2016 - 31/12/2018

NICE-SHIP -Development of new Lagrangian computational methods for ice-ship interaction problems

ONR - NICOP
Coordinator: CIMNE
30/09/2016 - 01/10/2019

STM Validation Project - STM Validation Project

CEF Programme 2014-2020 - INEA
Coordinator: Swedish Maritime Administration
01/01/2015 - 31/12/2018

X-SHEAKS - Análisis del comportamiento en la mar de aerogeneradores flotantes

PLAN ESTATAL (2013-16) - MINECO
Coordinator: CIMNE
01/01/2015 - 31/12/2016

CENIT - Innovation in Transport Group

Staff

Sergi Saurí (Leader)
Marc Busquets
Pau Morales
Cilly Ottavi
Domingo Peñalver
Aleix Pons
Ester Raventós
Jaume Roca
Francisco Rodero
Jose Ignacio Torres
Luis Ubalde

www.cimne.com/cenit

The Centre for Innovation in Transport (CENIT) has been incorporated to CIMNE on July 1st, 2017, as a new research group in the area of transport.

The Centre for Innovation in Transport (CENIT) was created in 2001 as a public consortium between the Government of Catalonia (Department of Territory and Sustainability) and the Technical University of Catalonia · Barcelona Tech (UPC). Its main goals are promoting the knowledge and research in transport and providing technical support to the institutions working in this field.

With the integration of CENIT in CIMNE, synergies in research, development and technology transfer on the transport field is enhanced. This contributes to provide solutions on the transport and mobility area of interest to society from a cross-cutting point of view.

Research Topics

TRANSPORT SYSTEM ANALYSIS

- Urban mobility
- Port logistics and maritime transport
- Transport infrastructure management

PI: S. Saurí

OPTIMIZATION

- Assessment of transport investments and policies, improvement of public transport networks, optimization of operations, application of technology to transportation, demand modeling and urban mobility.

PI: S. Saurí

On-going RTD Projects

INTERMODEL - Simulation using Building Information Modeling Methodology of Multimodal, Multipurpose and Multiproduct Freight Railway Terminals Infrastructures

H2020 (2016-2019) - SC4-Smart, green & integrated transport
Coordinator: IDP Ingeniería y Arquitectura, SL
01/09/2016 - 31/08/2019

NOVELOG - New cooperative business models and guidance for sustainable city logistics infrastructures

H2020 (2016-2019) - SC4-Smart, green & integrated transport
Coordinator: CERTH
01/06/2015 - 31/05/2018

ELIPTIC -Electrification of public transport in cities

H2020 (2016-2019) - SC4-Smart, green & integrated transport
Coordinator: FHB
01/06/2015 - 31/05/2018

GrowSmarter - Transforming cities for a smart, sustainable Europe

H2020 (2016-2019) - SC4-Smart, green & integrated transport
Coordinator: STOCKHOLMS STAD
01/01/2015 - 31/12/2019

REG4SSEA - Estrategias regulatorias para fomentar el transporte sostenible a través del Short Sea Shipping

MINECO - Retos Investigación: Proyectos de I+D+i
Coordinator: CENIT
30/09/2016 - 29/12/2019

Research rankings

CIMNE is ranked in the 52th position in terms of visibility in Spain, according to Webometrics ranking.

In the world ranking, CIMNE is in the 1458th position in a list of 7953 research centers worldwide in production and scientific activities.

CIMNE is ranked in the 90th position on a list of 511 research centers in Spain in terms of production and scientific activities.

Sorted by the number of papers and citations for each academic domain, CIMNE is positioned at number 427 in the world (based on the database of Google Scholar Citations -GSC-).

In April 2017, Webometrics has published a list of the most cited Spanish scientists. The study, based on citations from Google Scholar, includes 60 researchers of CIMNE among the 29,038 most cited scientists of Spain.

Information as in April 2017

Also, we note the presence of seven CIMNE scientists in the top 1,000 list:

» **Prof. Eugenio Oñate** has the 152th position in the list with an h-index of 64 and 16518 citations.

» **Prof. Antonio Gens**, the 317th position; **Prof. Eduardo E. Alonso**, the 515th position; **Prof. Antonio Huerta**, the 616th position; **Prof. Ramon Codina**, the 859th position; **Prof. Sergio Idelsohn**, the 923th position; and **Prof. Xavier Oliver,** the 973th position.

www.cimne.com/research-rankings

60 RESEARCHERS OF CIMNE, AMONG THE 29,038 MOST CITED SCIENTISTS OF SPAIN

RANK	NAME	INSTITUTION	H-INDEX	CITATIONS
152	Eugenio Oñate	CIMNE[1], UPC[2]	64	16518
317	Antonio Gens	CIMNE[1], UPC[2]	54	13460
515	Eduardo Alonso	CIMNE[1], UPC[2]	48	11073
616	Antonio Huerta	CIMNE[1], UPC[2]	46	9145
859	Ramon Codina	CIMNE[1], UPC[2]	42	7083
923	Sergio Idelsohn	CIMNE[1], UPC[2]	41	6729
973	Xavier Oliver	CIMNE[1], UPC[2]	40	8685
1179	Álex Barbat	CIMNE[1], UPC[2]	38	4819
1303	Miguel Cervera	CIMNE[1], UPC[2]	37	4355
1630	Sergio Oller	CIMNE[1], UPC[2]	34	5197
2679	Enrique Romero	CIMNE[1], UPC[2]	28	4731
2706	Sebastià Olivella	CIMNE[1], UPC[2]	28	3835
3028	Marino Arroyo	CIMNE[1], UPC[2]	27	2896
4446	Santiago Badia	CIMNE[1], UPC[2]	23	1990
4745	Melba Navarro	CIMNE[1], UPC[2]	22	2178
4977	Carlos Agelet de Saracibar	CIMNE[1], UPC[2]	22	1494
5111	Antonio Rodríguez Ferran	CIMNE[1], UPC[2]	21	3354
5327	Michele Chiumenti	CIMNE[1], UPC[2]	21	1575
5386	Pedro Díez	CIMNE[1], UPC[2]	21	1456
5939	Riccardo Rossi	CIMNE[1], UPC[2]	20	1279
6006	Miguel Cerrolaza	CIMNE[1], UPC[2]	20	1189
7844	José Sarrate	CIMNE[1], UPC[2]	17	943
8012	Javier Príncipe	CIMNE[1], UPC[2]	17	768
8461	Gabriel Bugeda	CIMNE[1], UPC[2]	16	952
9031	Martha Liliana Carreño	CIMNE[1], UPC[2]	15	1140
10237	Julio García	CIMNE[1], UPC[2]	14	724
11339	J. Carlos Cante	CIMNE[1], UPC[2]	13	604
12357	Cecilia Soriano	CIMNE[1], UPC[2]	12	560
12546	Cristina Marulanda	CIMNE[1], UPC[2]	12	506
12904	Xavier Martínez	CIMNE[1], UPC[2]	12	398
13243	Luca Pelà	CIMNE[1], UPC[2]	11	625
14600	Francisco Zárate	CIMNE[1], UPC[2]	10	540
14679	Pedro Arnau	CIMNE[1], UPC[2]	10	491
15201	Jaime Martí	CIMNE[1], UPC[2]	10	351
16309	Olga Mavrouli	CIMNE[1], UPC[2]	9	366
16318	Joan Baiges	CIMNE[1], UPC[2]	9	365
16794	F. Javier Mora	CIMNE[1], UPC[2]	9	281
17058	Narges Dialami	CIMNE[1], UPC[2]	9	248
17071	Josep Maria Carbonell	CIMNE[1], UPC[2]	9	246
17356	Alberto F. Martín	CIMNE[1], UPC[2]	9	202
17423	Rafael Morán	CIMNE[1], UPC[2]	9	184
17803	Julio Marti	CIMNE[1], UPC[2]	8	326
18167	Antonia Larese	CIMNE[1], UPC[2]	8	253
19238	Francesc Verdugo	CIMNE[1], UPC[2]	8	114
19477	Daniel Di Capua	CIMNE[1], UPC[2]	7	296
19719	Pavel Ryzhakov	CIMNE[1], UPC[2]	7	231
19872	Francisco Rastellini	CIMNE[1], UPC[2]	7	209
19989	Fernando Salazar	CIMNE[1], UPC[2]	7	196
20149	Omar Salomon	CIMNE[1], UPC[2]	7	183
20414	Roberto Flores	CIMNE[1], UPC[2]	7	163
20948	Jordi Cipriano	CIMNE[1], UPC[2]	7	129
21300	Miguel Ángel Celigueta	CIMNE[1], UPC[2]	6	417
21351	Oriol Lloberas	CIMNE[1], UPC[2]	6	325
21509	Pooyan Dadvand	CIMNE[1], UPC[2]	6	228
21904	Borja Serván	CIMNE[1], UPC[2]	6	160
23295	Roubin Emmanuel	CIMNE[1], UPC[2]	6	85
24398	Eduardo Soudah	CIMNE[1], UPC[2]	5	106
24797	Mario A. Salgado	CIMNE[1], UPC[2]	5	89
24887	Stoyan Viktorov	CIMNE[1], UPC[2]	5	86
24910	Alessandro Franci	CIMNE[1], UPC[2]	5	85

[1] International Center for Numerical Methods in Engineering
[2] Universitat Politècnica de Catalunya · BarcelonaTech

Source: Webometrics.info

Information as in April 2017

Publications

CIMNE publishes books, journals, monographs, scientific reports and educational software on the theory and applications of numerical methods in engineering and applied science. The publications of CIMNE can be visited and ordered via Internet on the website www.cimne.com. Most publications can be freely downloaded from the web.
We list below the publications of CIMNE in 2016.

NUMBER OF CIMNE PUBLICATIONS (1987-2016)	
Edited books	82
Text books	46
Research reports	415
Technical reports	643
Monographs	250
Papers in journals (since 2009)	561

Books

Oñate E. **Cálculo de Estructuras por el Método de los Elementos Finitos**. Vol 1: Análisis Estático Lineal. *CIMNE*, L145, 504pp, 2016. ISBN: 978-84-945689-7-8.

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Archives of Computational Methods in Engineering. **Editors:** Kleiber M., Oñate E. *Springer*, 2016.

Revista internacional de Métodos Numéricos para Cálculo y Diseño en Ingeniería. **Editors:** Oñate E., Idelsohn S.R., *Elsevier*, 2016.

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Aguiar R., Rodríguez M., Mora D. **Análisis sísmico de estructuras con disipadores de energía ADAS o TADAS**, *MIS75*, 2016.

Arrufat F., Celigueta M.A. **Implementation of an Object Oriented Library of Constitutive Models for DEM in the KRATOS Framework**, *M163*, 2016.

Barbu L.G., Oller S., Martínez X., Barbat A.H. **Numerical Simulation of Fatigue Processes Application to Steel and Composite Structures**, *M160*, 2016.

Bernal G.A., Cardona, O. D. **Modelación probabilista de efectos de sitio en ciudades y su aplicación en Bogotá**, *MIS74*, 2016.

Calvillo M. J., Huerta C.I., Espinoza F. **Caracterización de propiedades dinámicas de un puente de autopista en el noroeste de México**, *MIS73*, 2016.

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Gracia L., Salazar F., Larese A. **Development of a Computational Tool for Structural Verification of Dams**, *M162*, 2016.

Lafontaine N. M., Oñate E., Rossi R., Pu C. **Modelado de Multifractura Discreta en Materiales Quasi-Frágiles**, *M158*, 2016.

Otero F., Oller S., Martínez X. **Multiscale Numerical Modelling of Microstructured Reinforced Composites**, *M166*, 2016.

Santasusana, M., Oñate E., Carbonell J.M. **Numerical techniques for non-linear analysis of structures combining discrete element and finite element methods**, *M168*, 2016.

Soudah E., Oñate E., Cervera M. **Computational Fluid Dynamics Indicators to Improve Cardiovascular Pathologies Diagnosis**, *M167*, 2016.

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E. Ortega, R. Flores. **Parachutes. A Computer Program for Calculating Ram-Air Parachutes. Theory Document**, *PL415*, 2016.

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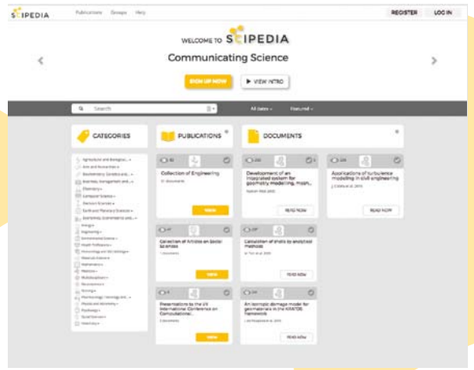

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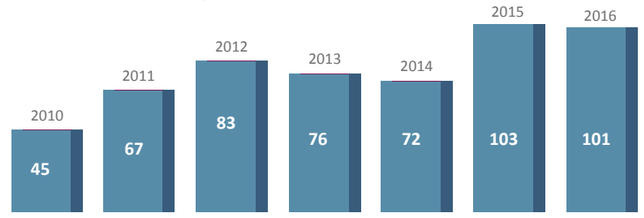

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Videla L., Baloa T., Griffiths D.V., Cerrolaza M. **Cálculo de la matriz de rigidez por integración analítica de un elemento finito cuadrilátero subparamétrico de ocho nodos**, *Revista de la Facultad de Ingeniería, vol.31(2), 128-146, 2016.*

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Yang L., Badia S., Codina R. **A pseudo-compressible variational multiscale solver for turbulent incompressible flows**, *Computational Mechanics, vol.58(6), 1051-1069, 2016.*

Yerro A., Alonso E.E., Pinyol N.M. **Run-out of landslides in brittle soils**, *Computers and Geotechnics, vol.80, 427-439, 2016.*

Yerro A., Pinyol N.M., Alonso E.E. *Internal progressive failure in deep-seated landslides, Rock Mechanics and Rock Engineering, vol.49(6), 2317-2332, 2016.*

Zárate F., Cardoso V.E., Barbat A., Botello S. **Una nueva estrategia para el estudio de la vulnerabilidad de edificios expuestos a explosiones a cielo abierto**, *Revista Internacional de Métodos Numéricos para Cálculo y Diseño en Ingeniería, 2016.*

Innovation

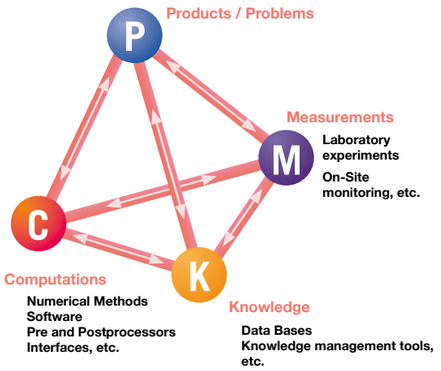
and Technology transfer

CIMNE RTD activities are based on a holistic view.

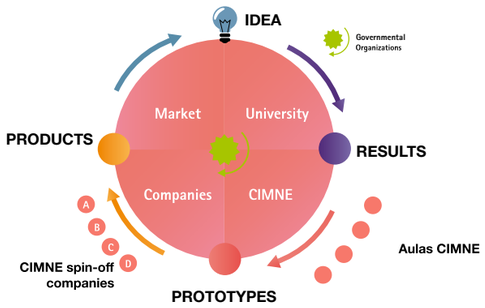
CIMNE aims at providing comprehensive solutions for solving problems that affect human beings, through the integration of existing knowledge in a particular field with quantitative information emanating for prediction methods, such as computational-based techniques, and experimental measurements.

These four concepts: the **problem** to be solved, **computational methods**, **experimental methods** and existing **knowledge** can be represented by the tetrahedron shown in the figure above. Each of the nodes is connected to the other three by lines that represent information transfer pipelines.

The holistic approach for solving problems at CIMNE:



The mission and activity of CIMNE can be explained through the so called **Cycle of Ideas**:



Ideas (scientific advances) usually originate in university environments, where many professionals study, investigate and discover new areas of knowledge. The idea matures until it produces **tangible results** (thesis, papers, computer programs, physical devices, etc.) that have to be filed and protected. Results evolve until they reach the level of a prototype (a software code, a system, a device, etc.). The transit of a result to a **prototype** demands an organization, efficient and capable staff and resources. What it is desirable is that the idea follows its route on specialized institutions, adjacent to the university, such as **CIMNE**, with the mission of transforming knowledge into tangible things (prototypes). The **prototype** develops into a **product** within a company. The cycle follows with the **marketing** of the product and ends up with the **reinvestment** of part of the revenues in the **development of new ideas.**

Download PDF:
www.cimne.com/cicle-ideas

CIMNE Products

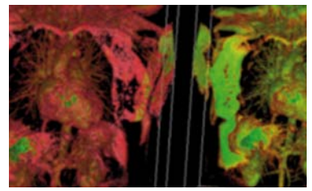
We describe below the products developed and marketed by CIMNE in collaboration with companies.

PRE AND POST PROCESSING SOFTWARE

GID

A universal and adaptive pre and post-processor for computer simulation in engineering and applied science.
Developed & marketed by CIMNE since 1998. 🔗 *www.gidhome.com*

DIPPO



Versatile platform for digital image processing combined with numerical modelling and simulations.
Developed and marketed by CIMNE since 2011.

ENGINEERING SYSTEMS AND HARDWARE

INFATABLE STRUCTURES

Inflatable pavilions, shelters and bridges for applications in engineering and architecture.
Developed by BuildAir and CIMNE.
Marketed by BuildAir since 2002.
🔗 buildair.com

OKO

Interactive frame for displaying images and videos.
Developed by CIMNE.
Marketed by Tecnologías Avanzadas para el Ocio, SL since 2016.
🔗 okoproject.com

WATER-PS

Fresh water production system.
Developed by CIMNE and Fresh Water Nature, Ltd.
Marketed by Fresh Water Nature, Ltd. since 2016.

COLLABORATIVE WORK PLATFORMS

MI COLEGIO EN RED

Communications system and integrated services designed specifically for schools via the Internet. *Developed and marketed by CIMNE since 2000.*
cimne.com/mcr

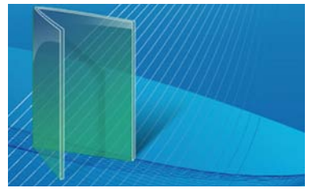
FRAKTALIS

Fully customizable web application that creates virtual communities where users can communicate and share. *Developed and marketed by CIMNE since 2009.*
fraktalis.com

LHINGS

Cloud platform to provide access and links to all kind of things and let users management, share and interaction with them. *Developed and marketed by Lyncos SL and CIMNE.*
lhings.com

SIGPRO



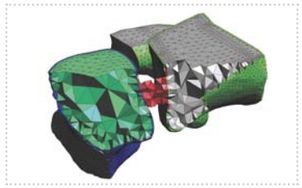
Integrated software platform for the management of the research and financial activities and reports in RTD projects.
Developed by CIMNE.
cimne.com/sigpro

SCIPEDIA

Web platform for free publishing and open access of scientific publications. *Developed by Scipedia, S.L. in cooperation with CIMNE. Marketed by Scipedia, S.L. since 2016*
scipedia.com

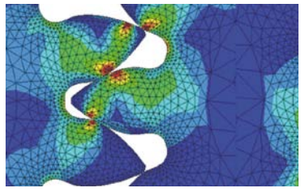
EDUCATIONAL SOFT.

EDUCATIONAL SOFTWARE



Educational software for interactive learning about structural design and finite element method. *Developed and marketed by CIMNE.*
cimne.com/educational

MAT-FEM



Educational program in MATLAB for introduction to the finite element method for analysis of structures and field problems.
Developed by CIMNE.
cimne.com/mat-fem

DECISION SUPPORT SYSTEMS

BEACHING

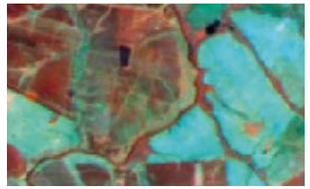
Information system for management of tourism activities in beach areas. *Developed by CIMNE and marketed by TAOC SA since 2011.* beaching.com

RMOP

Integrated platform for robust multiobjective optimization in engineering.
Developed by CIMNE.
tts.cimne.com/RMOP

DECISION SUPPORT SYSTEMS

GIS+



Web-based interactive Geographic Information System.
Developed by CIMNE.

SIE

Information system for management of energy consumption in public buildings and municipalities.
Developed by CIMNE. Marketed since 2005 by Gassó Auditores SL and CIMNE.
inergybcn.com

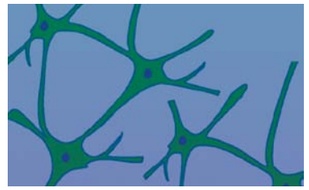
ROEM

Information system for assessment of the environmental quality in reservoirs and lakes.
Developed by CIMNE.

E-TESTING

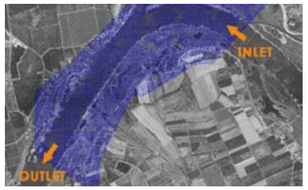
Web-based platform for e-management of experimental tests.
Developed by CIMNE and Applus.

FLOOD



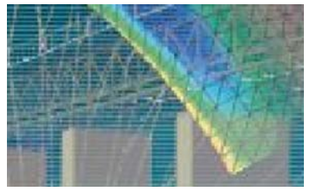
Artificial neuronal network package.
Developed by CIMNE.
cimne.com/flood

RAMFLOOD



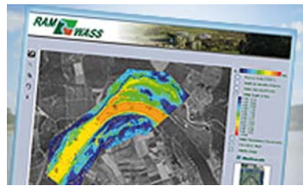
Decision support system (DSS) for risk assessment and managing of floods.
Developed by CIMNE and Flumen.
www2.cimne.com/ramflood

WSNP



An integrated platform for e-monitoring using wireless sensor network technology. *Developed by CIMNE.*
www2.cimne.com/wsnp

RAMWASS



Decision support tool for the risk assessment and management of environmental and human-induced hazards on the water/sediment/soil system in fluvial ecosystems.
Developed by CIMNE.
www.cimne.com/ramwass

BEE DATA

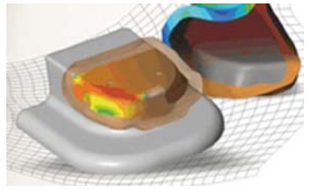
Open source BiG Data Analytics platform for deep analysis of massive data coming from smart metering infrastructure of utility companies.
Developed by CIMNE.
www.beegroup-cimne.com/beedata

SIMULATION SOFTWARE FOR INDUSTRIAL PROCESSES

WELDPACK

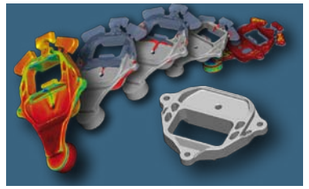
Welding processes software.
Developed by CIMNE.

STAMPACK



Software for sheet metal forming processes. *Developed by Quantech ATZ, SA and CIMNE. Marketed by Quantech ATZ, SA since 1999.* 🔗 stampack.com

CLICK2CAST



Software for fast simulation of casting processes. *Developed by Quantech ATZ in cooperation with CIMNE. Marketed by Altair since 2015.*

SCUT

Software able to simulate cutting processes for the metal manufacturing industry.
Developed by CIMNE.

ADD2MAN

Additive manufacturing processes software.
Developed by CIMNE in cooperation with Eurecat.

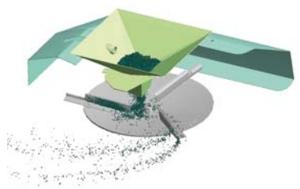
FORGEPACK

Forging manufacturing processes software.
Developed by CIMNE.

MACHPACK

Software able to simulate machining manufacturing processes.
Developed by CIMNE.

SpreadDEM



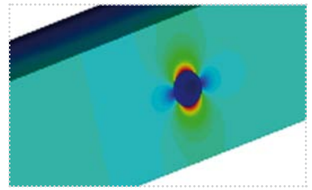
Simulation software for the study of the particle flow on centrifugal fertilizer spreaders. *Developed by CIMNE.*
🔗 cimne.com/spreaddem

SIMULATION SOFTWARE FOR MULTIPHYSICS

KRATOS

Object-oriented software platform for the development and application of finite element codes for multidisciplinary applications. *Developed by CIMNE.*
🔗 cimne.com/kratos

ERMES



Computational electromagnetics using advanced finite element methods.
Developed by CIMNE.
🔗 tts.cimne.com/ermes

PFIRE

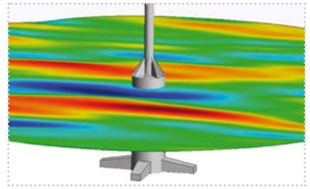
Analysis of propagation of fire and its effect on the burning and melting of objects.
Developed by CIMNE.

SIMULATION SOFTWARE FOR FLUID DYNAMICS

TDYN

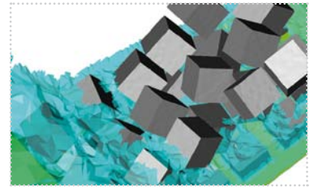
Finite element code for analysis of a wide range of multi-physic problems in engineering and applied science. *Developed by Compass Ingeniería y Sistemas, SA. and CIMNE.*
Marketed by Compass since 2003.
🔗 compassis.com

SEAFEM



Hydrodynamics and seakeeping analysis of ships and marine structures. App for wind tower generators in the sea.
Developed by Compass Ingeniería y Sistemas, SA. and CIMNE.
Marketed by Compass since 2011.
🔗 compassis.com

PFLOW

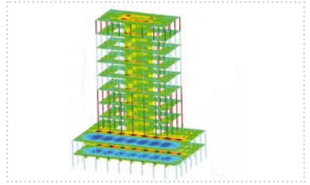


Analysis of fluid dynamics and fluid-structure-soil-thermal interaction problems into the Particle Finite Element Method (PFEM).
Developed by CIMNE.

🔗 cimne.com/pfem

SIMULATION SOFTWARE FOR STRUCTURAL ENGINEERING

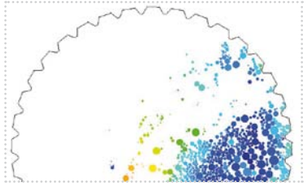
RAMSERIES



Finite element code for analysis of structures in engineering and architecture. *Developed by Compass Ingeniería y Sistemas, SA. and CIMNE. Marketed by Compass since 2003.*

🔗 www.compassis.com

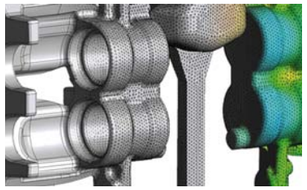
DEMPACK



Analysis of granular systems and multifracturing problems in geomechanics and industrial processes using discrete and finite element methods. *Developed by CIMNE.*

🔗 cimne.com/dem

COMET



Finite element code for none linear analisys of thermomechanical problems in solid and structural mechanics acounting for frictional contact situations. *Developed by CIMNE.*

🔗 cimne.com/comet

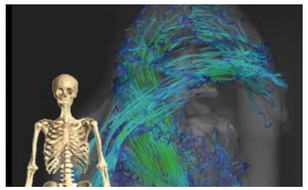
BIOMECHANICS & HEALTH

HEALTH APP

App to control eating disorders. *Developed by HealthApp in cooperation with CIMNE. Marketed by HealthApp SL since 2014.*

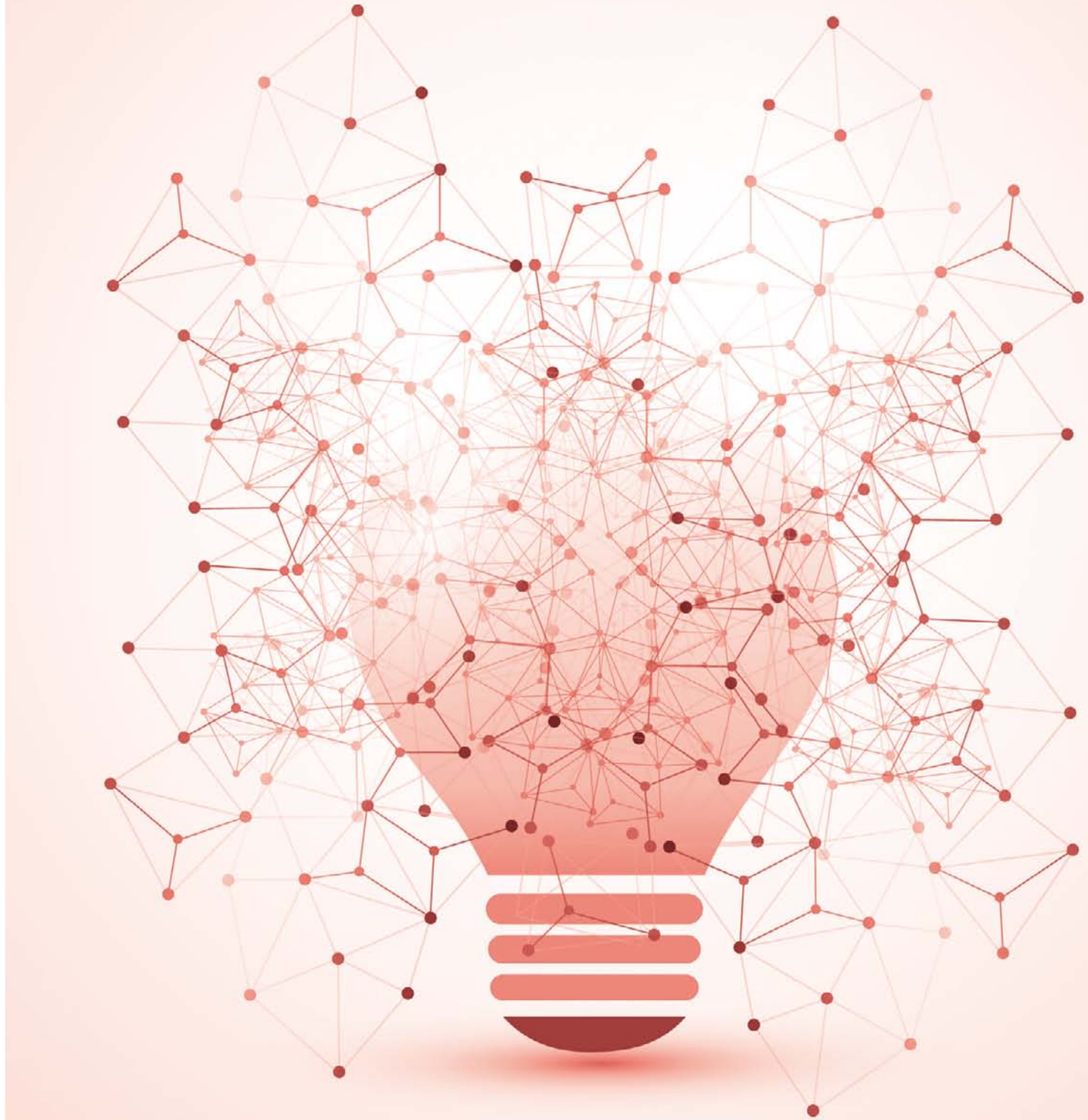
🔗 bcnhealthapp.com

BODYGID



Multiscale representation and analysis of the human body. *Developed by CIMNE.*

🔗 cimne.com/bodygid



Spin-off Companies

[Companies promoted by CIMNE since 2001]

SOLUCIONES INTEGRALES DE FORMACIÓN Y GESTIÓN STRUCTURALIA, SA
Created in 2001
structuralia.com
Training and consulting activities in the civil engineering via Internet. It was sold in 2011 to KAPLAN (The Washington Post Group).

COMPASS INGENIERÍA Y SISTEMAS, SA
Created in 2002
compassis.com
It develops commercial activities related to numerical methods in engineering, with emphasis on civil, naval and maritime engineering. CIMNE owns 24% of COMPASS.

INGENIA AIE
Created in 2006
EIG formed by several companies and CIMNE.
The objective is to promote the participation of its members in projects of aeronautics and the space field, in cooperation with the main international manufacturers in the sector.

QUANTECH ATZ
Created in 1996
quantech.es
Development and marketing of simulation software for production processes.

CIMNE TECNOLOGÍA, SA
Created in 2011
cimnetecnologia.com
Company 100% owned by CIMNE aiming to industrialize and market the products and technology developed at CIMNE. CIMNE Tecnología SA. is also an incubator and promoter of new companies.

BUILDAIR INGENIERÍA Y ARQUITECTURA, SA
Created in 2001
buildair.com
Inflatables structures for engineering and architecture applications.
CIMNE Tecnología SA owns 5% of BUILDAIR.

BEEDATA ANALYTICS, SL
Created in 2017
beegroup-cimne.com/beedata
ICT services based on mass analytical data treatment to users and business intelligence for companies and institutions. CIMNE Tecnología owns 56,82% of Beedata Analytics, SL.

BIOMECHANICS DEVELOPMENTS, SL
Created in 2015
bd-biomechanics.com
Software solutions and services in biomedical field.
CIMNE Tecnología SA owns 43,67% of Biomechanics Developments.

COMPUTATIONAL AND INFORMATION TECHNOLOGIES, SA
Created in 2012
citechsa.com
Computational methods and information technology systems in engineering. 100% owned by CIMNE Tecnología SA.

FRESH WATER NATURE, SL
Created in 2013
Solutions for obtaining fresh water from desalination and destillation of waste water.
The company is 92,99% owned by CIMNE Tecnología SA.

HEALTHAPP, SL
Created in 2013
bcnhealthapp.com
Software for treatments of eating disorders. It improves the links therapist / patient. 18,51% owned by CIMNE Tecnología SA.

RSM GASSÓ CIMNE ENERGY, SL
Created in 2012
inergybcn.com
Advanced engineering energy services. 50% owned by Servicios Energéticos Avanzados, SL, which is 100% owned by CIMNE Tecnología, SA.

INLOC ROBOTICS, SL
Created in 2014
inlocrobotics.com
Positioning and navigation solutions for mobile robots in buried environments. CIMNE Tecnología owns 7,73% of INLOC Robotics since October 2015.

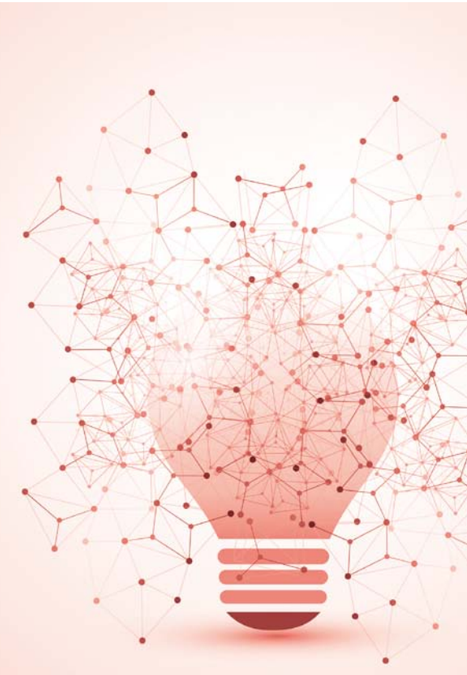
LYNCOS TECHNOLOGIES, SL
Created in 2012
lhings.com
Software and systems for the Internet of Things.
CIMNE Tecnología SA owns 15% of Lyncos Technologies, SL.

PORTABLE MULTIMEDIA SOLUTIONS, SL
Created in 2013
portablemultimediasolutions.com
Mobile pavilions with multimedia technology for leisure, sport and events. 17,96% owned by CIMNE Tecnología SA.

PNEUMATIC STRUCTURES TECHNOLOGIES, SL
Created in 2015
ps-technologies.com
Pneumatic structures for a wide range of engineering problems.
10% owned by CIMNE Tecnología SA.

SCIPEDIA, SL
Created in 2015
scipedia.com
Free publishing and open access for scientific publications. CIMNE Tecnología owns 16,67% of Scipedia, SL.

TECNOLOGÍAS AVANZADAS PARA EL OCIO, SL - Created in 2012
beaching.com
Information systems for leisure sectors (tourism, music…). 100% owned by CIMNE Tecnología SA.



Alliances

Prof. Olgier Zienkiewicz, UNESCO Chair until his death (2009)

Host of UNESCO Chair of Numerical Methods in Engineering
1989

CIMNE, leader in research on computational engineering has established relevant alliances with international institutions and companies since its creation in 1987.

Secretariat of SEMNI
1989

Pilot Center of ERCOFTAC in Spain
1989

Secretariat of ECCOMAS
1992

Secretariat of IACM
1994

Partner of FLUMEN
2012

Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura

Cátedra UNESCO de Métodos Numéricos en Ingeniería Universidad Politécnica de Cataluña. BarcelonaTech

Unesco Chair in Numerical Methods in Engineering

In 1989, UNESCO and UPC · BarcelonaTech reached an agreement to create the first UNESCO chair in the world: the UNESCO Chair of Numerical Methods in Engineering.

The main mission of the Chair is to **promote the development, dissemination and application of numerical methods in engineering at an international level**, through education, research and technology transfer, with the aim of contributing to the solution of complex problems in lower income countries.

Prof. O. C. Zienkiewicz held the UNESCO Chair since its creation in 1989 until his death on January 2nd, 2009. Since 2009, the Unesco Chair of Numerical Methods in Engineering is held by **Dr. Jacques Périaux**. He is a recognized expert in the field of numerical methods applied to aerospace engineering. Dr. Périaux contributions have resulted in a significant increase in the RTD activities of CIMNE in the aerospace sector, in particular with academic organizations and industry in China, the organization of numerous training courses, exchanges with leading scientists worldwide and several RTD projects at international level.

Dr. Jacques Périaux

It is important to note that **computational methods are especially useful in resource-limited countries** because they enhance the ability of people to predict outcomes and optimize solutions before committing resources to specific investments.

An important UNESCO Chair activity over the years has been the **creation of a series of "Aulas CIMNE" (CIMNE Classrooms)**, physical spaces of collaboration with other research groups in universities and research centers located mainly in Latin America and Europe. All nodes in the network connected to each other are using, transforming and broadcasting knowledge generated in CIMNE over the last thirty years.

Both the **people and the knowledge** generated by the network members easily **circulate within the network**. "Aulas CIMNE" is now a growing network of centers of excellence in research and training in the field of numerical methods.

A priority in the network is the **promotion of joint projects in research and training using international competitive funds** and existing programs that target specific local needs. Links with scientific groups and other organizations established locally are also actively encouraged. The network is the seed for creating other expected nodes in countries of Africa and Asia.

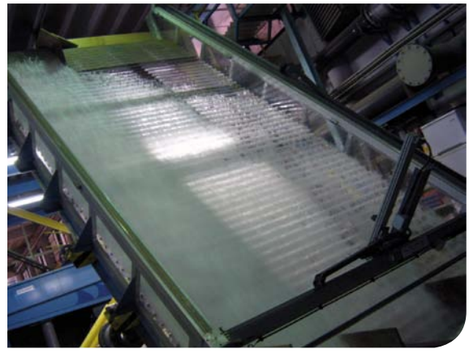
cimne.com/unesco

flumen
Dinàmica fluvial i enginyeria hidrològica

In 2012, the Government of Catalunya created the FLUMEN Institute for River Dynamics and Hydrologic Engineering as a partnership between CIMNE and UPC · BarcelonaTech.

FLUMEN Institute is the outcome of merging the prestigious Flumen RTD group existing since 2005 at the School of Civil Engineering of UPC · BarcelonaTech and CIMNE, bringing together the numerical and experimental expertise of Flumen RTD group in hydraulics with the broad experience of CIMNE on numerical methods, computer simulation and integration of decision support systems.

The objectives of FLUMEN are the promotion of RTD and technology transfer activities in the field of river dynamics and hydrologic engineering. The Flumen Institute is directed by Prof. J. Dolz.



New premises

The new building that hosts the Flumen Institute **was completed by the end of 2015**. Researchers moved to the new facilities during the first months of 2016. This new building, located at the North Campus of UPC · BarcelonaTech is **equipped with modern experimental facilities for model scale testing of river dynamic and hydraulic problems**. It also provides work areas for researchers at the graduate level (masters, doctoral and postdoc) and for senior researchers from CIMNE and UPC · BarcelonaTech.

Members

UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH

CIMNE

Unió Europea
Fons europeu de desenvolupament regional
Una manera de fer Europa

www.flumen.upc.edu

SEMNI
Sociedad Española de Métodos Numéricos en Ingeniería

In 1989, CIMNE contributed to the creation of the Spanish Society for Numerical Methods in Engineering (SEMNI).

The basic aims of SEMNI are the **organization and coordination of all activities related to numerical methods in engineering in Spain** and being the Spanish representative in the International Association for Computational Mechanics (IACM).

SEMNI is **linked to similar associations in other countries,** such as the European Community on Computational Methods in Applied Sciences (ECCOMAS), the International Association for Computational Mechanics (IACM), the *Groupe pour l'Avancement des Méthodes Numériques de l'Ingénieur in France*, the United States Association for Computational Mechanics in the United States, and the *Asociación Argentina de Mécanica Computacional*, among others.

The headquarters and the **secretariat of SEMNI are based in CIMNE**. Currently, SEMNI has over 400 members worldwide. Some of the main activities of SEMNI include the organization of technical workshops and the organization of the Spanish Conference on Numerical Methods in Engineering.

In July 2017, the **13rd SEMNI Congress** (CMN 2017) will be held at Campus de la Vera, in Valencia (Spain). This is a jointly event SEMNI-APMTAC (Portuguese Association) and will be a forum for the discussion of relevant scientific and technical developments in computational mechanics, numerical methods and engineering applications.

www.semni.org

European Community on Computational Methods in Applied Sciences

ECCOMAS is a scientific organization founded in 1992. It groups European associations with interests in the development and application of computational methods in applied sciences and technology.

The mission of ECCOMAS is to **promote joint efforts of European universities**, research institutes and industries which are active in the broad field of numerical methods and computer simulation in Engineering and Applied Sciences (i.e. Computational Solid and Structural Mechanics, Fluid Dynamics, Acoustics, Electromagnetics, Physics, Chemistry, Applied Mathematics, and Scientific Computing), to address critical societal and technological issues with particular emphasis on multidisciplinary applications and disseminate innovative research.

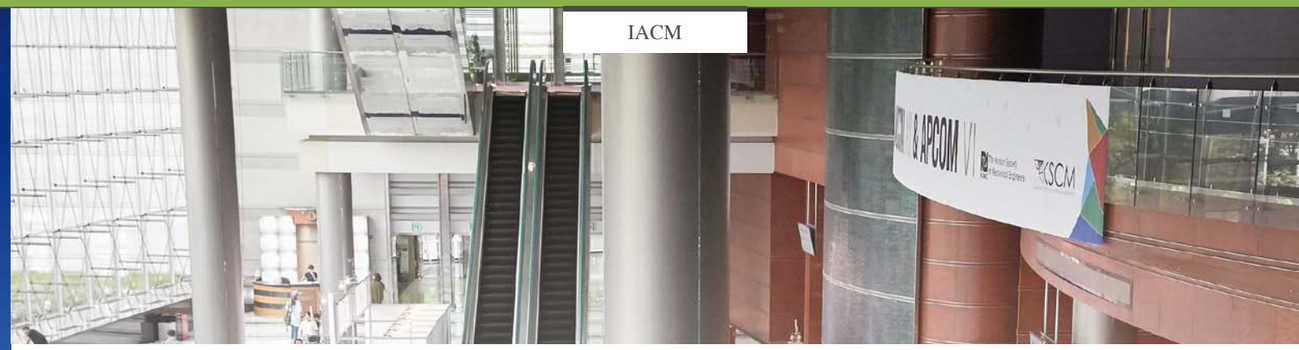
The three main scientific events that ECCOMAS organizes every four years are the **ECCOMAS Congress**, the **ECCOMAS Conference on Computational Solid and Structural Mechanics** (ECCM) and the **ECCOMAS Conference on Computational Fluid Dynamics** (ECFD). They attract approximately 5,000 participants in total.

The ECCOMAS Congress is addressed to **scientists and engineers both in and outside Europe**. Its main objective is to provide a forum for presentation and discussion of state-of-the-art in scientific computing applied to engineering, with emphasis on basic methodologies, scientific development and industrial applications. It also includes invited lectures, Special Technological Sessions (STS), contributed papers from Academy and Industry and organized Minisymposia. Proceedings of the ECCOMAS Congresses are widely disseminated in Europe.

The next **ECCOMAS Congress** will be jointly organized with the 14th World Congress on Computational Mechanics in Paris, France, on 19-24 July 2020.

These series of ECCOMAS global meetings are complemented with more focused thematic conferences on state-of-the-art topics in computational sciences and engineering.

www.eccomas.org



International Association for Computational Mechanics

The International Association for Computational Mechanics (IACM) was founded in 1981 and, since 1994, the IACM Secretariat is located at CIMNE.

The goal of IACM is the **promotion of advances in computational mechanics** in the wide sense. IACM defines computational mechanics as the development and application of numerical methods and digital computers to solve problems in engineering and applied sciences with the objectives of understanding and harnessing the resources of nature.

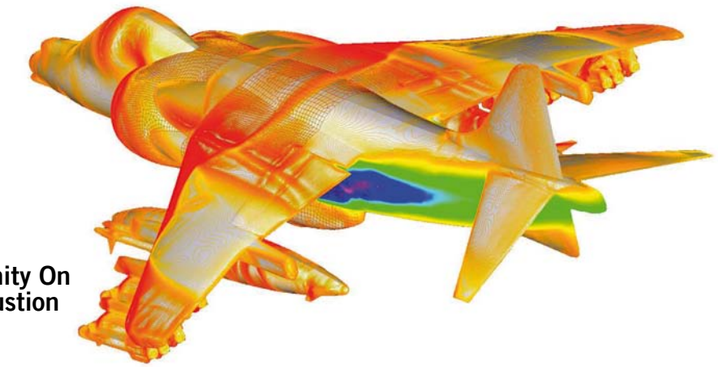
Computational Solid Mechanics (CSM) and Computational Fluid Dynamics (CFD) are at the core of IACM activity. Subjects such as thermodynamics, electromagnetics, rigid body mechanics, control systems and some aspects of particle physics fall naturally within the scope of the IACM. Indeed providing a common forum for discussion, education and research information transfer between the diverse disciplines represented is the main *raison d'être* of IACM.

The International Association for Computational Mechanics (IACM) and the Korean Society for Computational Mechanics (KSCM) organized jointly the **12th World Congress on Computational Mechanics (WCCM XII) and 6th Asia-Pacific Congress on Computational Mechanics (APCOM VI)** in **Seoul**, Republic of Korea, from 24 to 29 July, 2016. The director of CIMNE, Prof. Eugenio Oñate, and the team leader of the Mathematical and Computational Modelling Group, Prof. Antonio Huerta, participated at the opening session.

IACM publishes a biannual bulletin and supports the organization of special interest conferences, IACM Symposia and courses in various fields of computational mechanics.

www.iacm.info

European Research Community On Flow, Turbulence and Combustion



The ERCOFTAC network was founded in 1987. It is promoted by several European aerospace companies and it groups together more than 60 research centers and companies working primarily in the numerical simulation of fluid mechanics problems in engineering.

Since 1989, **CIMNE is a Pilot Center of ERCOFTAC in Spain**.
CIMNE, acting as Pilot Center, has organized a number of activities, including, among others, the 8th European Turbulence Workshop (Barcelona 2000), the Europe-Russia Workshop (Barcelona 2006), the 3rd Workshop on Research in Turbulence (Seville 2008), the 5th Workshop on Research in Turbulence (Tarragona 2010) and ERCOFTAC Spring Festival (Terrassa 2014).

CIMNE has coordinated the FP7 E-Caero projects 1 and 2 (E-CAERO: European Collaborative Dissemination of Aeronautical research and applications, 2009-2013 and 2014-2017). Both projects aim to promote joint activities of different scientific associations in the aeronautic field in Europe. ERCOFTAC is a partner in both of these projects.

www.ercoftac.org

The International Association of Aulas CIMNE (AIAC) is a non-governmental non-profit civil organization with the objective of fostering the advances of numerical methods in a common academic space: the Aulas CIMNE (Joint Labs). Aulas CIMNE are the basis for cooperation in scientific, technological and training among its members, aiming to achieve social and economic improvements in society.

AIAC
Asociación Internacional de
Aulas CIMNE

Mission

To contribute to the development, strengthening and consolidation in:

- **Training**, by promoting and organizing courses of interest to its members.
- **Scientific and technological research**, including the processes of innovation, adaptation and technology transfer in strategic areas.
- The use of numerical methods in engineering as a tool to help developing countries.

The interaction of the members of the Association with the society at large, by disseminating scientific and technological advances that drive progress.

AIAC members benefit from:

- Continuous education, enhancing the set of high-level human resources of Aulas CIMNE and the Network and by the competitive advantage of installed capacity in the regions.
- The development of multi- and inter-disciplinary activities in areas of basic research, applied research and experimental developments.
- Exchange programs for teachers, researchers, students and academic and innovation managers.
- Research and development programs in emerging knowledge areas, related to new professional profiles identified as strategic.

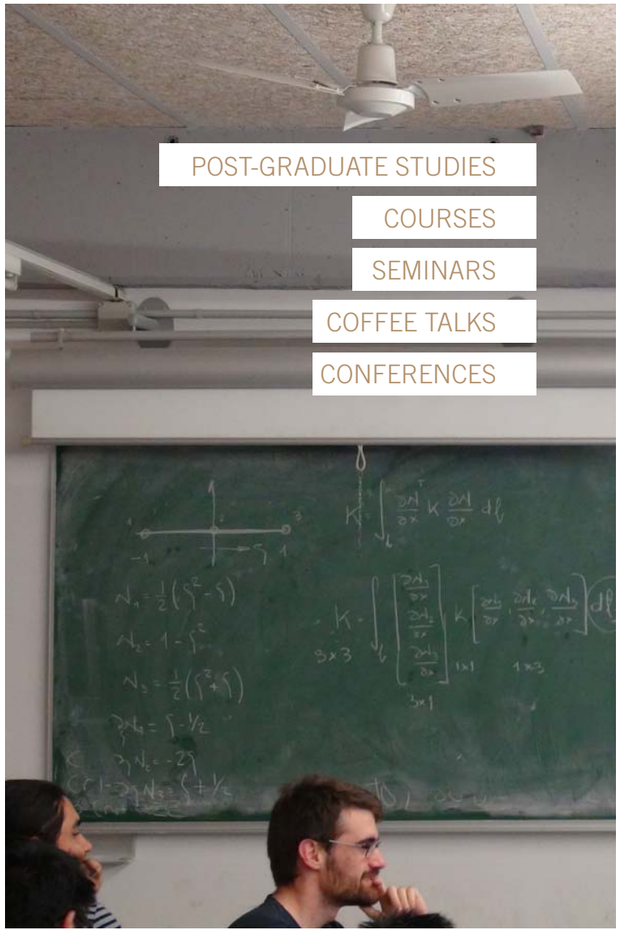
AIAC's vision

To promote a common project and create a network of experts from around the world, which results in the international benchmark in the field of numerical methods in engineering.

AIAC intends to encompass an international environment in which scientists, technical staff and engineers can benefit directly from CIMNE's tools (developed or in development), international collaborations, participation in projects, exchange of information, and industry technology transfer, among others.

aiac.cimne.com

dissemination



Knowledge transfer is of vital importance for CIMNE, which invests great efforts in training and education adressed to its research staff as well as to graduates and professionals from schools of engineering and universities in applied sciences.

CIMNE regularly organises seminars, coffee talks, courses and post-graduate studies related to the theory and application of numerical methods in engineering. It has also developed a web environment for distance learning education via Internet.

The research center plays also an important role as event organizer in the fied of computational engineering. In the following pages, a summary of the conferences organized by CIMNE Congress Bureau during 2016 can be found. The wide agenda of congresses and conferences that will take place during 2017, it is also included.

Training

Post-graduate Studies

Master Degrees

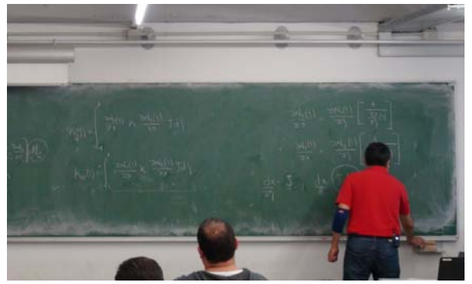
Master on Numerical Methods in Engineering
Duration: 2 academic years, 120 ECTS
cimne.com/mumni

Master of Science on Computational Mechanics
Duration: 2 academic years, 120 ECTS
cimne.com/mcm

Master course on Numerical Methods for Analysis and Design in Engineering
(Last edition: September 2014-June 2015; replaced by the Master on Numerical Methods in Engineering)

Doctoral Degrees

Simulation in Engineering and Entrepreneurship Development- SEED
Duration: PhD studies, 3-4 years period
cimne.com/emjd-seed



Courses

Plaxis Seminar
Barcelona, Spain, *07/03/2016-09/03/2016*

Explosives in Public Works
Barcelona, Spain, *07/04/2016-09/04/2016*

2nd International Workshop on Software Solutions for Integrated Computational Materials Engineering - ICME 2016
Barcelona, Spain, *12/04/2016-15/04/2016*
http://congress.cimne.com/icme2016

CAxMan Workshop
Barcelona, Spain, *02/05/2016*
http://www.caxman.eu

ICCS16 - 2nd International Conference on Concrete Sustainability
Madrid, Spain, *13/06/2016-15/06/2016*
http://www.iccs16.org

8th European Workshop on Structural Health Monitoring
Bilbao, Spain, *05/07/2016-08/07/2016*

GEORAMP 2016 Workshop
Barcelona, Spain, *17/10/2016 -18/10/2016*

Ibercursos
Online courses held in 2016:
- Advanced course dam break and rafts
- Advanced course on water quality
- Hydraulic modelling for structures
- Sediment transport

www.cimne.com/seminars

Seminars

A finite element model for fluid shells under random fluctuation
Prof. Gustavo Buscaglia, University of Sao Paulo, presented a joint work Prof. R. Ausas and PhD F. Mut – *21/01/2016*

Elemento finito jerárquico para vigas laminadas, enriquecido con una cinemática “ZigZag” refinada
Prof. Sergio Oller, UPC/CIMNE – *27/01/2016*

Computational Methods for Fracture and Fragmentation
Dr. John E. Dolbow, Duke University, Durham (US) – *10/02/2016*

CFD atomistic models for the treatment of hydrophobic surfaces and modelling cavitation problems
Dr. Alberto Giacomello, Sapienza-Università di Roma – *16/02/2016*

Towards lighter composite structures: from analysis models to new materials
Prof. Dr. Pedro Camanho, University of Porto – *10/03/2016*

Understanding varying loading fuel cell electrodes by combined experiments and multi-scale, multi-physics numerical simulations
Dr. Marc Secanell, University of Alberta, Canada – *29/03/2016*

BodyGiD: a 4D virtual interactive platform of human body
Prof. Miguel Cerrolaza, CIMNE – *30/03/2016*

Continuous-discontinuous modelling of quasi-brittle failure
Prof. Antonio Rodríguez-Ferran, Dept. Applied Mathematics (UPC) – *27/04/2016*

Topology optimization using topological sensitivity analysis
Prof. Samuel Amstutz, Department of Mathematics at the University of Avignon, France – *28/04/2016*

Computational fluid dynamics indicators to improve cardiovascular pathologies
Dr. E. Soudah, CIMNE – *19/05/2016*

Dimensional hyperreduction of multiscale structural models
Dr. Joaquín Hernández, CIMNE – *25/05/2016*

Unification of Geometrically Nonlinear Finite Element Analysis of Solids and Structures
Prof. Carlos A. Felippa, University of Colorado at Boulder, USA – *14/06/2016*

Advances in Pedestrian Flow Modeling
Prof. Rainald Lohner, Center for Computational Fluid Dynamics, George Mason University, Fairfax, VA (USA) – *30/06/2016*

Recent Developments, Applications and New Horizons in Hybrid Simulation
PhD Khalid M. Mosalam, University of California, Berkeley – *12/07/2016*

Large-scale finite element generation of voice: from biomechanics to sound
Prof. Oriol Guasch, Ramon Llull University, Barcelona – *28/09/2016*

Multi-Level Monte Carlo Methods for stochastic analysis and robust optimum design in aeronautics
Prof. Gabriel Bugeda, CIMNE/UPC, Barcelona – *13/10/2016*

Numerical Analysis of Factors of Safety and Probabilities of Failure in Geotechnical Engineering
Prof. D.V. Griffiths, Colorado School of Mines, USA – *19/10/2016*

Recent advances in large scale finite element solvers
Prof. Santiago Badia, UPC/CIMNE, Barcelona – *09/11/2016*

Where should I seek funding for my research career?
CIMNE Project Department, CIMNE, Barcelona – *15/11/2016*

Modelling Fluvial Processes using the Finite Volume Method
Prof. Ernest Bladé, Deputy Director of Flumen Institute – *23/11/2016*

Good Programming Practices
PhD Pooyan Dadvand and **PhD Joan Baiges**, CIMNE – *30/11/2016*

3D visualization component for simulations of robotic port terminals
Ing. Jairo Rojas and **Prof. José Luis Castrillón**, from the Universidad de las Ciencias Informáticas (Aula UCI-CIMNE, La Habana, Cuba) – 13/12/2016

MUD in pipes, eccentric orbits and interesting facts
Prof. Roberto Flores, CIMNE/UPC – *21/12/2016*

www.cimne.com/seminars

Coffee Talks

CIMNE Coffee Talks are short seminars organized by CIMNE researchers to foster the knowledge transfer in a relaxed atmosphere. Each talk opens with a welcome coffee and ends up with an open discussion on the content of the talk.

InfoDay H2020: New calls in H2020 under the new biannual work programme for 2016-2017
CIMNE Project Department, Barcelona (Spain) — *20/01/2016*

How to align your EC proposal idea with your long term plan and the EC calls for an effective proposal?
MSc Pablo Franzolini, CIMNE, Barcelona (Spain) — 27/01/2016

Hydrodynamics of Self-propelled clusters by Stokesian dynamics
PhD Yousef El Hasadi, CIMNE, Barcelona (Spain) — *24/02/2016*

C++ Object Oriented programming for numerical simulation
Prof. Pooyan Dadvand, CIMNE, Barcelona (Spain) — *10/03/2016*

Parallel octrees using shared and distributed memory schemes
MSc Jorge López Ruiz, CIMAT, Guanajuato, Mexico — *15/06/2016*

A Multi-Patch Isogeometric Analysis using GiD and Kratos Multiphysics
MSc Dimitrios Iliopoulos, Technical University of Munich, Germany — *29/06/2016*

Stability of axially moving paper web using a semi-analytical approach
Dr. Tero Tuovinen, University of Jyväskylä, Finland — *06/07/2016*

Numerical wind tunnel simulations using digital terrain models and an embedded approach
MSc Quirin Aumann, Technical University of Munich, Germany — *11/10/2016*

Implementing a contact formulation based on Mortar Method and Lagrange Multipliers
MSc Mohamed Khalil, Technical University of Munich, Germany — *26/10/2016*

Isogeometric Analysis in KRATOS with a Kirchhoff-Love-Shell
MSc Tobias Teschemacher, Technical University of Munich, Germany — *02/11/2016*

Robust techniques for parallel non-matching grid mapping
Prof. Philipp Bucher, École Polytecnique de Lausanne, Lausanne, Switzerland —13/12/2016

International Conferences

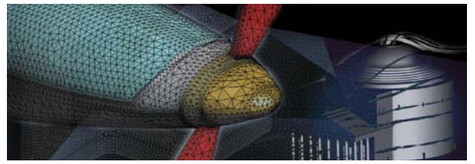
Conferences 2016

Second International Workshop on Software Solutions for Integrated Computational Materials Engineering - ICME 2016

12-15 April, 2016, Barcelona, Spain

Second International Conference on Concrete Sustainability - ICCS16

13-15 June 2016, Madrid, Spain



GID Convention 2016

1-3 June 2016, Barcelona, Spain

8th European Workshop on Structural Health Monitoring

5-8 July 2016, Bilbao, Spain

IGA School 2016

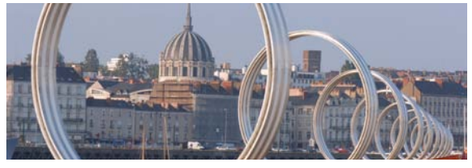
10-12 June 2016, Crete, Greece

Since 1987 CIMNE has organised 200 conferences on different topics of numerical methods and their applications in engineering and applied sciences.

Conferences 2017

19th International Conference on Finite Elements in Flow Problems - FEF 2017
5 April 2017, Rome, Italy

JTC1 Workshop
24-26 May 2017, Barcelona, Spain



VII International Conference on Computational Methods in Marine Engineering - MARINE 2017
15-17 May 2017, Nantes, France

8th Conference on Smart Structures and Materials - SMART 2017
5-8 June 2017, Madrid, Spain

III Seminario Internacional Telescopi: La internalización de la Universidad
17-19 May 2017, Barcelona, Spain

VII International Conference on Coupled Problems in Science and Eng. - COUPLED PROBLEMS 2017
12-14 June 2017, Rhodes Island, Greece

6th Interdisciplinary Workshop on Rockfall Protection
22-24 May 2017, Barcelona, Spain

International Conference on Adaptive Modeling and Simulation - ADMOS 2017
26-28 June 2017, Verbania, Italy

Conferences 2017

IX Simposio Nacional sobre Taludes y Laderas Inestables
27-30 June 2017, Santander, Spain

V International Conference on Particle-based Methods - PARTICLES 2017
26-28 September 2017, Hannover, Germany

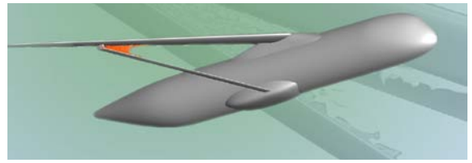
Congress on Numerical Methods in Engineering - CMN 2017
3-5 July 2017, València, Spain

International Conference on Textile Composites and Inflatable Structures - STRUCTURAL MEMBRANES 2017 — *9-11 October 2017, Munich, Germany*

XIV International Conference on Computational Plasticity - COMPLAS 2017
5-7 September 2017, Barcelona, Spain

CM3-2017 - Computation and Big Data in Transport
22-24 November 2017, Brussels, Belgium

IGA 2017 - International Conference on Isogeometric Analysis
11-13 September 2017, Pavia, Italy



Platform for Aircraft Drag Reduction Innovation - PADRI 2017
29 November - 1 December, 2017, Barcelona, Spain

http://congress.cimne.com

Awards

Chronology of the prizes awarded to CIMNE

Below we briefly review some of the awards granted to the research centre along its history.

SPECIAL MENTION TO THE CIUTAT DE BARCELONA AWARD 1998

The city of Barcelona awarded CIMNE a Special Mention to the Ciutat de Barcelona Award 1998 in the category of Technological Research for the work carried out by Drs. P. Roca, M. Cervera and E. Oñate on the modelling and structural analysis of the Barcelona Cathedral.

NARCÍS DE MONTURIOL PLATE AWARD TO THE SCIENTIFIC AND TECHNOLOGICAL MERIT 1999

On November 3rd, 1999, the Generalitat de Catalunya granted to CIMNE the Narcís de Monturiol Plate Award for Scientific and Technological Merit:

- For its contribution to the development of new methods for analysis and design for products and processes in engineering.
- For fostering the cooperation between industry and university research groups.
- For the organisation of training activities and the promotion of science and technology at an international level.

2002 IST PRIZE TO THE BEST PRODUCT OF THE INFORMATION SOCIETY TECHNOLOGIES, EUROPEAN COMMISSION (EC)

The EC granted the IST Award to the pre/post processor system GiD developed at CIMNE.

CIUTAT DE BARCELONA 2002 AWARD IN TECHNOLOGICAL RESEARCH

On February 11th, 2003, the Ciutat de Barcelona Award in Technological Research was awarded to the CIMNE research team formed by Eugenio Oñate, Ramon Ribó, Enrique Escolano, Miquel Pasenau and Jorge Suit Pérez.
The prize recognized the development of the pre/postprocessor GID. This simulation software is an innovative and user-friendly graphic interface that allows the geometric modelling and visualization of the results of numerical simulations.

AWARD DURAN I FARRELL FOR RESEARCH AND TECHNOLOGY UNIVERSITAT POLITÈCNICA DE CATALUNYA, 2004

The Award was delivered to CIMNE scientists Dr. Oñate and Dr. García for their work entitled: “Development of a new finite element code for the hydrodynamic study of vessels. Aplications to the design of sailing ships for the America Cup race”.

Recent Awards and honours to CIMNE Scientists

1. EDUARDO ALONSO, NÚRIA PINYOL AND ALBA YERRO

Telford Gold Medal for the Paper “The Material Point Method for Unsaturated Soils”, by The British Institution of Civil Engineers (ICE), 2016.

2. MIGUEL CERVERA

IACM Fellow Award, by the International Association for Computational Mechanics (IACM), 2016.

3. SANTIAGO BADIA

Proof of Concept (NuWaSim), European Research Council (ERC), 2016.
Premio Agustín de Betancourt y Molina, Real Academia de Ingeniería (RAI), 2016.

4. CARLES ESTRUCH

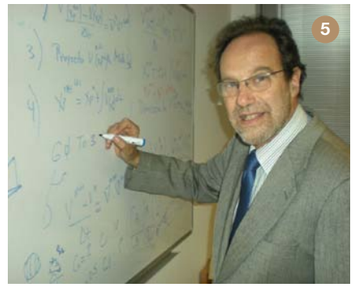
Premi Pioner 2016. Award for the Best PhD Thesis of the CERCA Network. “Nuevo concepto de puente de vigas hinchables ligero, modular y portátil”. Centres de Recerca de Catalunya (CERCA), 2016.

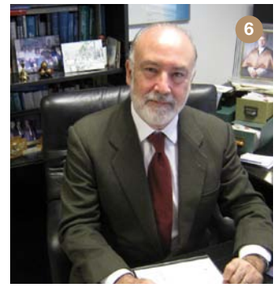
5. SERGIO IDELSOHN

Computational Mechanics Award, International Association for Computational Mechanics (IACM), 2016.

6. EUGENIO OÑATE

Proof of Concept (ICEBREAKER), European Research Council (ERC), 2016.





See full list of CIMNE Awardees in cimne.com/awards

In the media

GAINN4SHIP - February 2016

NAUCHER GLOBAL

"FRED OLSEN PRESENTARÁ UN PROYECTO DE TRANSFORMACIÓN DEL FERRY 'BENCOMO EXPRESS' A GNL"

LA RAZÓN

"UNA 'APP' PARA TRATAR LA ANOREXIA Y BULIMIA"

SERGIO IDELSOHN - March 2016

UNO DE SANTA FE

"UN INVESTIGADOR SANTAFESINO SERÁ PREMIADO EN COREA"

AERONAUTICS PROJECTS IN CHINA - June 2016

"CIMNE- INVESTIGACIÓN EN LA AERONÁTICA CHINA"

LA VANGUARDIA
(published in Spanish and Catalan versions)

"CIMNE AFIANZA SU POSICIÓN EN LA I+D INTER-NACIONAL EN AERONÁUTICA"

AVIACIÓN DIGITAL

"CIMNE PARTICIPA EN 4 PROYECTOS AERONÁUTICOS FINANCIADOS POR LA COOPERACIÓN CHINA-UE"

ACTUALIDAD AEROESPACIAL

"LA AERONÁUTICA CATALANA SE HACE GRANDE DE LA MANO DE CHINA"

ECONOMÍA DIGITAL

NEW CIMNE BUILDING AT UPC CAMPUS NORD - July 2016

"EL NUEVO EDIFICIO DE LA UPC INCLUYE UN LABORATORIO DE DINÁMICA FLUVIAL E INGENIERÍA HIDROLÓGICA"

IAGUA

"UN NUEVO EDIFICIO DE LA UPC INCORPORA UN LABORATORIO DE DINÁMICA FLUVIAL E INGENIERÍA HIDROLÓGICA"

LA INFORMACIÓN

"EL CIMNE INAUGURA UN NOU EDIFICI AL CAMPUS NORD DE LA UPC"

VILAWEB.CAT / ACN

"EL CIMNE HA INAUGURADO UN NUEVO EDIFICIO CON UN LABORATORIO DE DINÁMICA FLUVIAL Y UNA SALA 3D"

NOTICIASPRESS.ES

"UN NOU EDIFICI DE LA UPC INCORPORA UN LABORATORI DE DINÀMICA FLUVIAL I ENGINYERIA HIDROLÒGICA"

ALDIA.CAT

The awarding of prizes to its researchers, the inauguration of a new building at the North Campus of the UPC, the incursion into the Chinese aeronautics R&D market or the society-oriented computer applications have been some of the reasons for which CIMNE has appeared in the media during this year 2016. In these section, we leaf through some of the most outstanding.

"EL CENTRO DE INGENIERÍA CIMNE INAUGURA SU NUEVO EDIFICIO EN LA UPC"

"CAT-INGENIERÍA UPC EL CIMNE INAUGURA UN NUEVO EDIFICIO EN EL CAMPUS NORTE DE LA UPC"

"NOU EDIFICI DEL CIMNE A LA UPC"

LA VANGUARDIA

STRUCTURAL MEMBRANES - November 2016

INTERVIEW - "STRUCTURAL MEMBRANES IS THE ONLY CONFERENCE THAT BLENDS TENSILE STRUCTURES AND INFLATABLE STRUCTURES AT ACADEMIC AND PRACTICAL LEVELS"

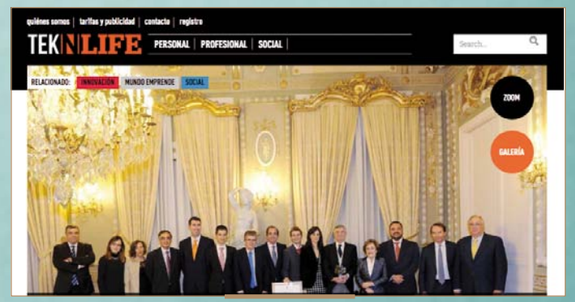
ESPAZIO MAGAZINE

SANTIAGO BADIA / 2016-2017

"MEET SOME INFLUENTIAL MEMBERS OF BARCELONA'S SCIENTIFIC COMMUNITY, AND LEARN ABOUT THEIR GROUNDBREAKING WORK"

TIME OUT STUDENT GUIDE

SANTIAGO BADIA / RAI AWARD - November 2016



"INGENIERÍA COMPUTACIONAL Y WEB SEMÁNTICA: ASÍ SON LAS TRAYECTORIAS PREMIADAS ESTE AÑO POR LA RAI"

TEKNLIFE

twitter.com/cimne

@2016 IN TWEETS

CIMNE carries out an intensive activity through social media, with special attention to Twitter, where the center has 678 followers. Below we highlight some of the 2016 tweets to explain CIMNE's activities through the networks.

El @DirectorCIMNE protagonitza la primera cita del Esmorzars d'Enginyers de l'any 2016

18/01/2016

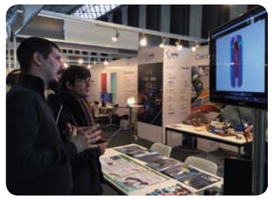
BuildAir (spin-off of @CIMNE) and @pmmsolutions launch two minutes inflatable @elperiodico

22/01/2016

Medalla #NarcísMonturiol de la @gencat al catedràtic #UPC, Antoni Gens. Moltes felicitats!

15/02/2016

L'equip de @GiDprepost al @saloensenyament. Fem la recerca accessible als joves!



09/03/2016

Col·laboració internacional real. Projectes conjunts Europa-Xina. Seguim endavant! @cimne

20/04/2016

Starts the 8th #GiDconvention! Welcome speech by Dr. Eugenio Oñate @cimne

01/06/2016

Participación de @cimne en los Ten-T Days 2016 en Rotterdam promocionando varios proyectos CEFs en los que participa

21/06/2016

Inaugurat avui el nou edifici del @cimne #UPC amb un laboratori de dinàmica fluvial i una sala de realitat virtual

15/07/2016

Great lecture! Professor Eugenio Oñate "Advances in FEM for sheet #metalforming processes" #numisheet2016 @cimne

08/09/2016

PMS's yachts maintenance system, awarded at the Salón Náutico @pmmsolutions @iCERCA

21/10/2016

CIMNE, in the #H2020 project SciShops.eu, developing novel technologies to tackle business and societal challenges

29/12/2016

International Center for Numerical Methods in Engineering

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