



MATHEMATICAL TECHNOLOGY
"Innovation Solutions for the Industry"



ITMATI
Instituto Tecnológico
de Matemática Industrial



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ORGANISATION DETAILS

The Technological Institute for Industrial Mathematics (ITMATI) was founded with the aim of becoming a worldwide reference center of technological research in the field of industrial mathematics. Its mission is to contribute to strengthening and enhancing competitiveness in the industrial and business environment to achieve excellence in research and technology oriented to mathematical transfer to industry. This will generate innovations that create added value for companies.

The leadership position currently occupied by the Galician Industrial Mathematics is recognized nationally and internationally because of the intense work transfer to industry over these last 20 years, his current position is the recognition and excellence. Therefore in order to be a flexible and inclusive dedicated to providing solutions to the needs of the industry created the Industrial Mathematics Institute of Technology that will consolidate in the Mathematics Galician pole-Industry, bringing the capabilities of the Galician groups as an international benchmark.

ITMATI, aims to provide mathematical solutions, and transfer technology to the productive sectors of society, especially businesses, industries and governments. ITMATI promoters are 9 research groups in mathematics from the three Galician universities in the field of Applied Mathematics, Statistics and Operations Research, with more than 150 scientific researchers with extensive experience and recognized expertise in developing solutions for the business world either autonomously or in collaboration with the companies themselves or with other teams areas of expertise. Our role is to transfer the mathematical technology to help improve competitiveness and support innovation in the productive sector.

The priority of ITMATI activity is to enhance competitiveness and innovation in the industrial environment through the application of techniques and mathematical methods in the production sector, operating as a center of mathematical technology transfer to companies, governments and industry in general. The specific aims of the Institute are:



- To approach and coordinate basic and applied research, operating as a center for technology transfer to industry at regional, national and international levels.
- To create technological knowledge and contribute to its implementation for the development and strengthening of the competitiveness of the companies in the field of technology and innovation.
- To act as facilitator and promoter for the introduction and application of techniques and mathematical methods in the production sector Galician, Spanish and international.
- To promote the production, and dissemination of knowledge, especially in the field of Applied Mathematics, Statistics and Operations Research and the training of technical and scientific expertise in technologies and related methods.
- To contribute to the strengthening of the relationship between knowledge agencies and businesses to provide support services to business innovation.
- To promote scientific and academic collaborations with universities and research and transfer centers from Spain and foreign countries, in the field of mathematics and other disciplines, promoting interdisciplinarity

FOCUS TRANSFER AREAS

ITMATI aims to provide solutions to business, industries and governments to support the innovation and improve the competitiveness in the productive sector. Its focus transfer areas are:

- Computer-aided design (CAD), and numerical simulation, usually known as computer-aided engineering (CAE). These techniques are applied to simulate process in the following fields:

- Mechanical or structural.
- Thermal or thermodynamics.
- Manufacturing processes: injection, printing, embossing, forging.
- Electronics and/or electromagnetics.
- Fluids: gases, liquids.
- Acoustics or vibro-acoustics.



- Environmental.
- Other: for example, multiphysics.
- Finance.

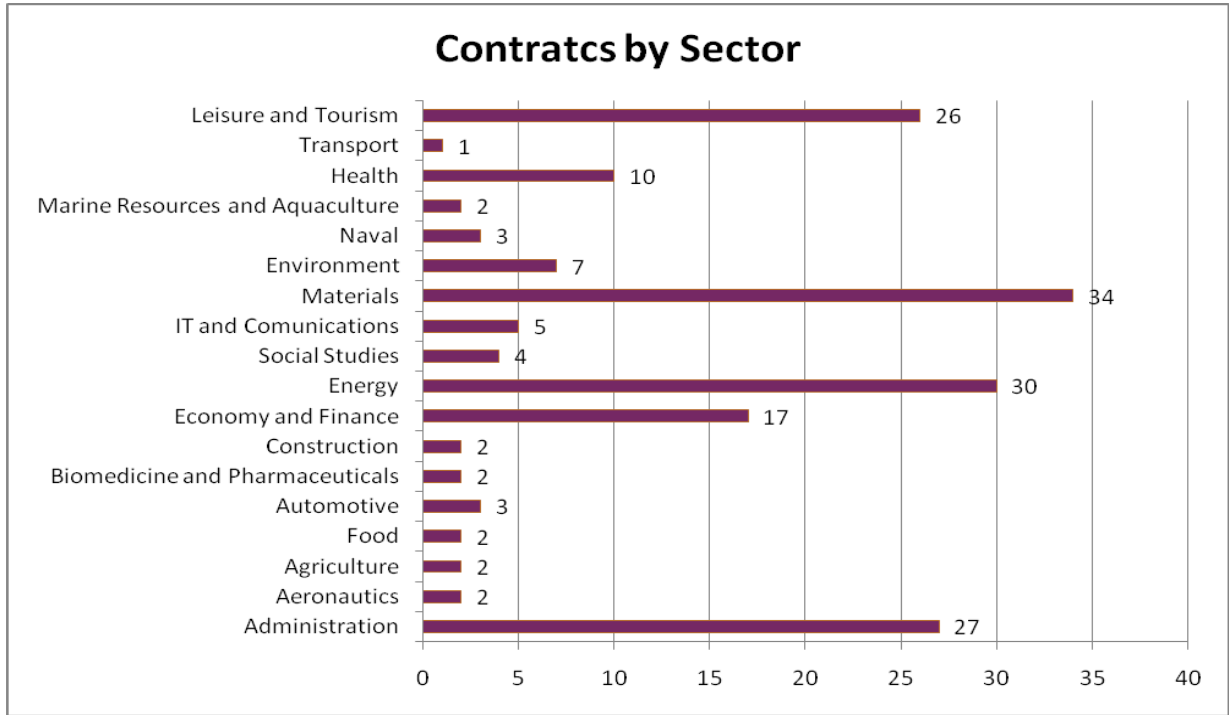
- ST/OR: Statistical and Operations Research tools, such as data analysis techniques or decision-making support techniques. These techniques can be applied to the following fields:

- Quality control.
- Stock: control and optimization of stock.
- Production processes: control and optimization of production processes.
- Risk & financial analysis: analysis of risk, analysis of financial products.
- Strategy, logistics & planning: strategy, decision-making, logistics, planning.
- Customer/market/product studies: customer analysis, market studies, and product studies.
- Exploitation of internal information: data mining, business intelligence.
- Other: e.g. experimental design, clinical analysis, clinical trials.

INNOVATIVE ASPECTS

Mathematics provides a fundamental toolkit and a universal framework for innovation. The cross-cutting nature of mathematical and statistical techniques has favoured to ITMATI for interaction with a large number of industrial sectors. ITMATI has an extensive experience in knowledge transfer broken down by sector of economic. The ITMATI objective is to provide mathematical solutions for innovative companies, by transferring technology, and to contribute decisively to the creation of economic value in many industrial sectors of the society.

ITMATI has interacted and established partnerships with industrial organizations for transferring knowledge or technology to all reference sectors. Its priority areas of action: Agriculture; Marine Resources; Aquaculture; Food; Construction; Materials; Transport; Aeronautics; Automotive; Naval; IT & Communications; Tourism; Leisure; Services; Energy; Environment; Biomedicine and Pharmaceuticals; Health; Social Studies; Administration; Economy and Finance.



■ Number of contracts with companies by sector (1998-2011).

INNOVATIVE SOLUTIONS

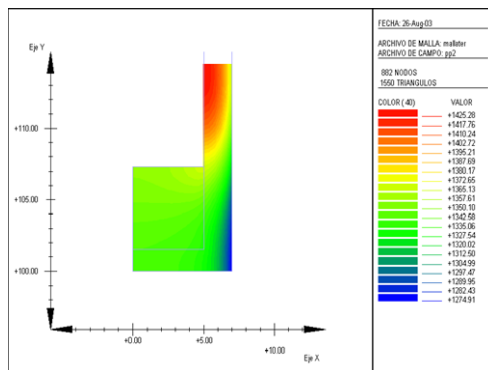
ITMATI offers multiple services for industry and business world, our innovative solutions from mathematical technology are:

- Product development / Solutions
- Technology consulting
- Collaboration in projects / Contracts for R & D + i.
- Software development
- High level scientific advisory.
- Specific training courses on customer demand (software and mathematical techniques) to problem definition and interpretation of results.

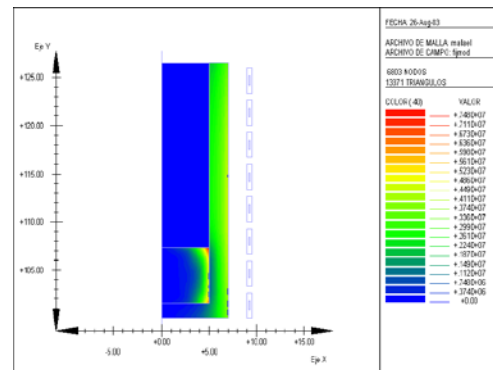
SUCCESS STORIES

Design and operation of induction furnaces

- The metallurgical company Ferroatlántica R & D needed to melt silicon in order to find out the behaviour of induction furnaces.
- The mat+i research group developed a software tool that improves the design and operation of induction furnaces.
- To conduct trials is too expensive, therefore numerical simulation allowed to study the problem even before buying the rig.



- Temperature distribution in a section of crucible-silicon assembly.



- Current density distribution in the crucible-silicon assembly.

Accidents prediction during a period time

- The insurance section of INDITEX needed an accidents prediction method that would facilitate making decisions regarding its insurance policy.
- The MODES research group developed a specific software for this need.
- The tool allows to obtain statistical information on the total cost of claims occurring in a period of time, based on information from past claims.

Treatment of epidemiological data

- Epidemiology Service, Department of Innovation and Public Health Management, Xunta de Galicia.
- Collaboration from 1992 to 2010 with the MODESTYA biostatistics group for prediction and control of factors related to health and disease incidents.
- Development of EPIDAT (free software) supported by the Pan American Health Organization.
- The research allows multiple applications, such as development of indicators to assess the efficiency of a diagnostic test or association studies exposure and disease risk factor.



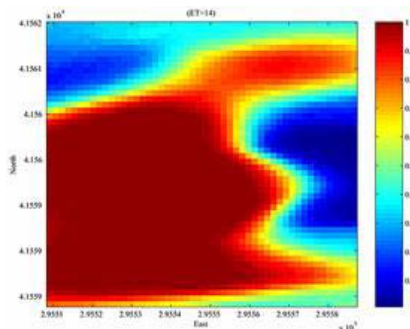
- EPIDAT software for prediction and control of factors related to health and disease incidence. modestya Group.

MATHEMATICAL SOLUTIONS (“*Mathematics Answer*”)

Agriculture

- Weed Science. Detection of weeds in crops.

How could you detect weeds in crops?



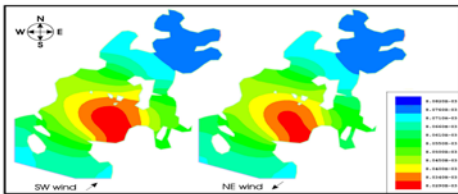
Food

Environment

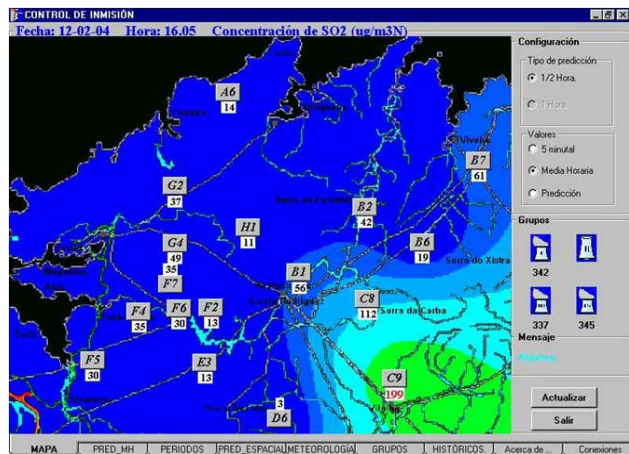
How do we affect ourselves the industries pollution?, pollutant emission and propagation.

Energy

- Pollution levels in the environment of a power plant (SO₂ and NO_x).



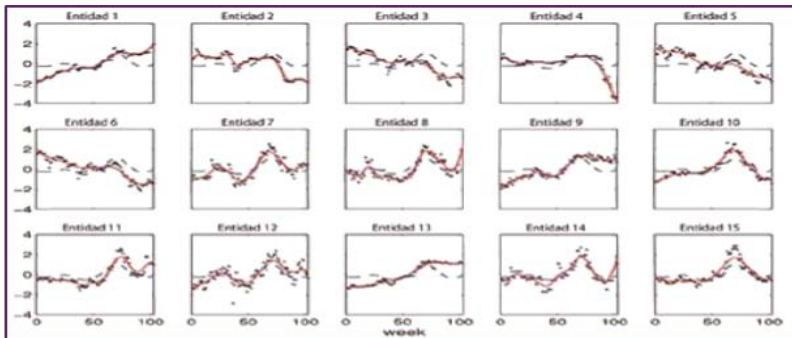
- Pollution from industries. Concentrations of pollutants in an estuary.



Economy and Finances

Which are the best investment options in the stock market?

How much money a bank loses when we do not pay our credits?
Credit Risk.

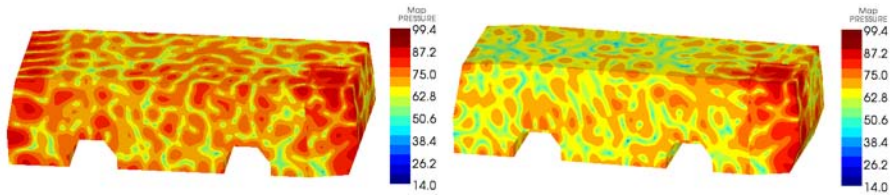


- Financial Risk Analysis in 15 Spanish banks.

Control Industrial Process

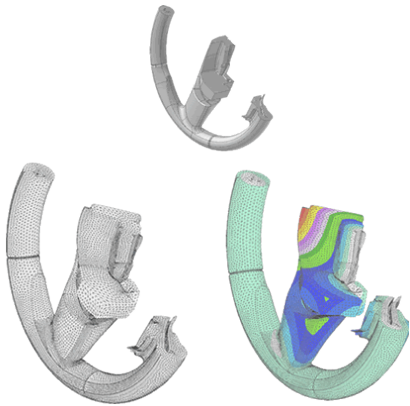
Are transport vehicles well soundproofed?

■ Simulation of sound pressure on a bus



Automotive

Are you comfortable with your driving wheel?



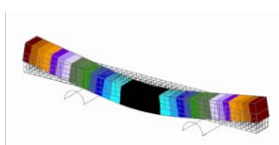
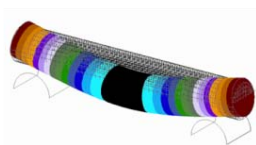
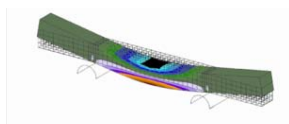
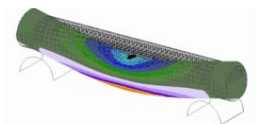
■ Design of foam injection molds for steering wheels.

Construction

Are our homes ready to support inclement weather, floods and earthquakes?

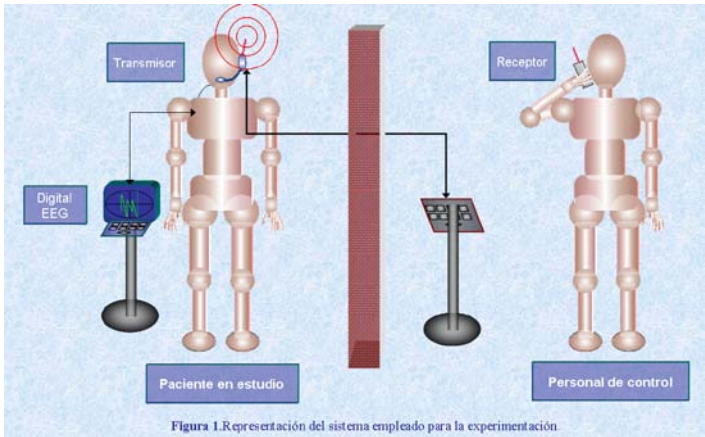
How do we know wear resistance of materials?

■ Tensions and Temperature in cylindrical and rectangular beams.



Health

How does mobile telephony affect to patients with epilepsy?

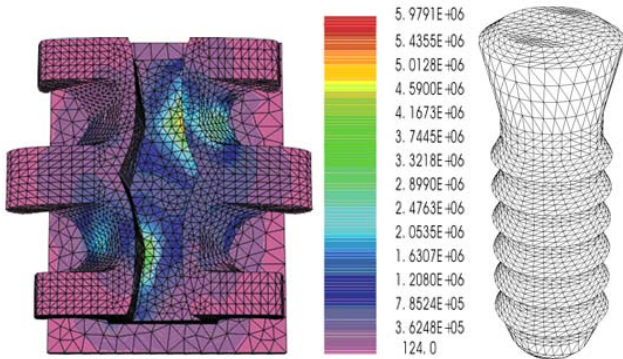


- Representation of the system used for the test. "electroencephalographic spectrum of epileptic patients".

Pharmaceutical

Biomedicine

How do the devices work used in surgery and orthodontics?



- Analysis and design of brackets and dental implants. Biomechanics and orthodontics.



Technological Institute for Industrial Mathematics

REQUIREMENTS FOR POTENTIAL PARTNER

ITMATI is looking for potential partners interested in solving industrial and business needs. The majority of applications are for industrial and business implementation.



Technological Institute for Industrial Mathematics

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