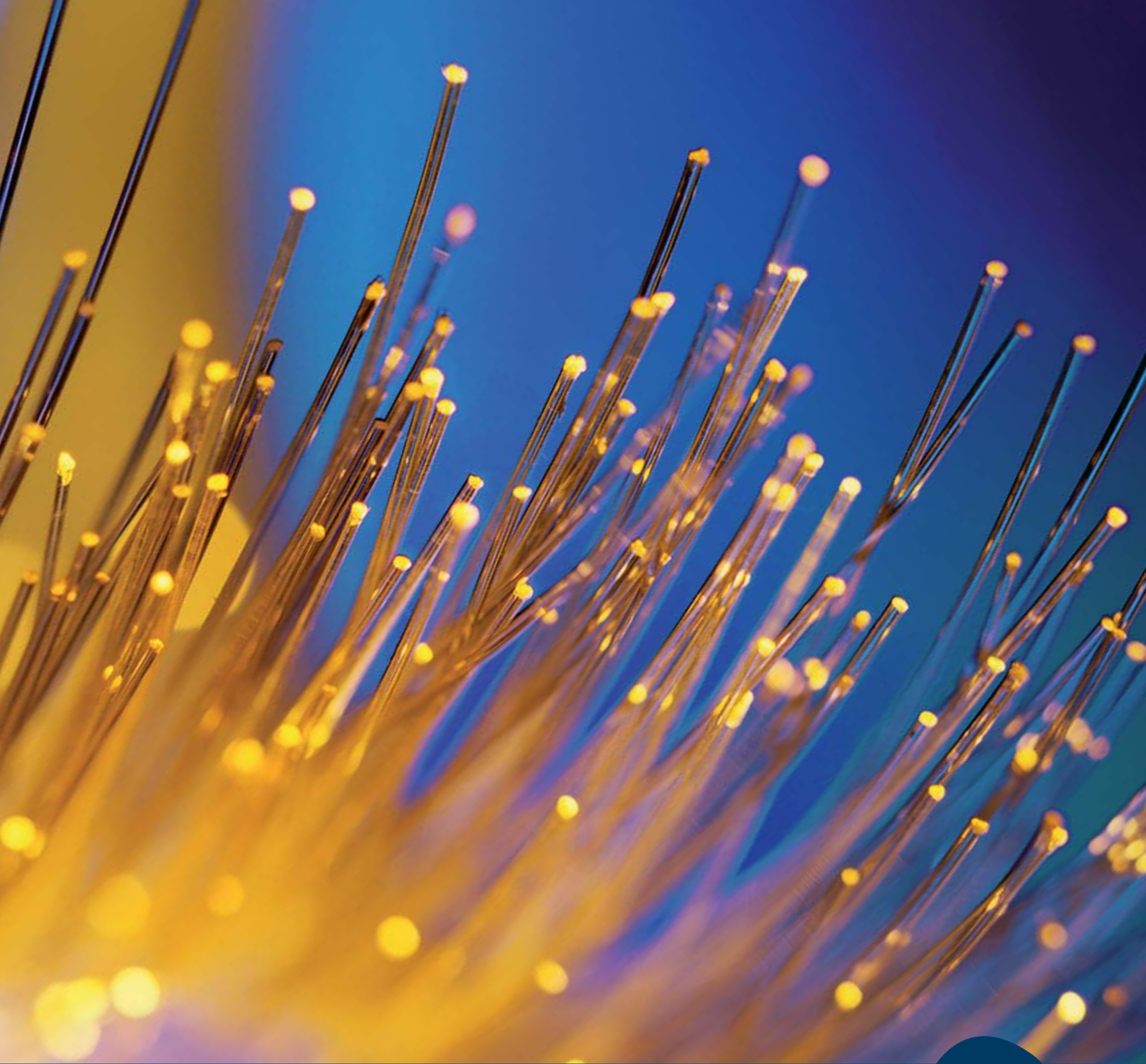


THE CHARLES DELAUNAY INSTITUTE

UMR CNRS 6281

UTT research driving innovation

utt
université de technologie
Troyes

COMUE université de Champagne

The Charles Delaunay Institute

CNRS Mixed Research Unit 6281

The Charles Delaunay Institute (ICD) brings together all of the research teams within UTT (more than 120 researchers) representing the main disciplines in engineering, information sciences & technologies and human & social sciences. Assisted in their research activities by technical staff, and using state-of-the-art equipment, they bring their scientific expertise to bear in support of the overall objectives of the Institute and its institutional and industrial partners.

A network of cooperation

The Institute's researchers carry out high-level scientific work within their areas of specialisation, often in partnership with other institutions and research centres — including CNRS (French National Scientific Research Centre), INRIA (French National Institute for Research in Computer Science and Control), and CEA (French Atomic Energy and Alternative Energies Commission) — as well as with a range of other stakeholders in the economy and society at large. The Institute also aims to enhance and leverage synergies among disciplines by promoting cooperation between its project teams.

Competitive research

The Institute's technical equipment and experimentation platforms are key assets in forging scientific and industrial partnerships. More than 80% of funding, excluding in-house researchers' salaries, comes from research contracts, more than a quarter of which are signed with companies.

International ambition

The Institute has built up an extensive network of collaborations over the years, enabling it to recruit doctoral and post-doctoral students from outside France. Together with UTT's doctoral school and International Relations Office, the Institute supports in particular the transnational recruitment programmes for foreign doctoral students as well as joint doctoral ("cotutelle") programmes (working with the China Scholarship Council, Nanyang Technological University in Singapore, the Lebanese University and the National Technological University of Argentina).

To meet current national and international research challenges, the Institute needs to boost its human resources in order to enhance its profile in an increasingly competitive environment. As a result, researchers from the EPF engineering school and the ESC Troyes business school can, if they wish, join the Institute's existing research teams.

Areas of **excellence**

The project teams are responsible for ensuring a high profile for the research conducted within the different areas of expertise. This is achieved through high-level publications, extensive involvement in major national and European projects, successful technology transfer, and wide-ranging international exchanges — all of which bear witness to the quality of the research carried out at the Institute.

The Institute currently has **eight research teams** working across its research programme:

- Centre for Research and Interdisciplinary Studies on Sustainable Development (CREIDD)
- Autonomic Networking Environment (ERA)
- Advanced Automatic Mesh Generation Techniques (GAMMA 3, a joint UTT-INRIA project team)
- Mechanical Systems and Concurrent Engineering (LASMIS, in partnership with the CEA)
- Nanotechnologies and Optical Instrumentation Laboratory (LNIO)
- Systems Modelling and Dependability (LM2S)
- Industrial Systems Optimisation Laboratory (LOSI)
- Cooperative technologies for collective interaction and knowledge (Tech-CICO)

A **cross-cutting societal research topic, STMR (Science and Technologies for Risk Control)**, provides a framework for interdisciplinary research by the Institute's teams. The research is structured around five Scientific and Technological Programmes (PST):

- Resilience and Crisis Management
- Monitoring, Dependability and Security of Large Systems
- e-health
- Cybersecurity
- Eco-design

KEY FIGURES

2 joint research labs with CEA

1 INRIA project team

360 staff, including

117 teachers/researchers & **184** doctoral students

8 disciplinary research teams

1 interdisciplinary research topic

7 science and technology platforms

Equipment worth a total of **€14 million**

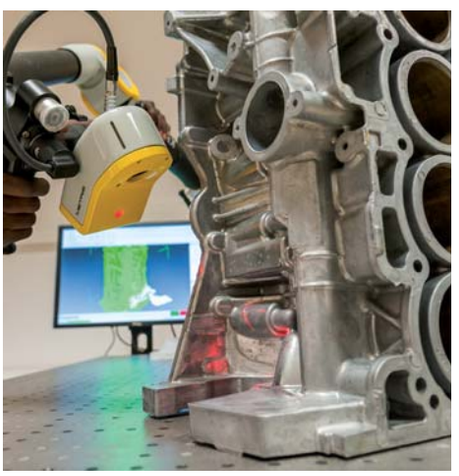
38 theses presented in 2015

Over **70** international collaborations

More than **400** articles and
national / international conferences in 2014

Contracted research worth almost **€6 million**
in 2014

SOCIO-ECONOMIC CHALLENGES
HEALTH QUALITY OF LIFE
NATURAL RESOURCES
RISKS UNFORESEEN EVENTS SECURITY
MULTIDISCIPLINARY
INNOVATIVE SCIENCES & TECHNOLOGIES
MATTER MATERIALS DIGITAL
HIGH-PERFORMANCE COMPUTING
MATHEMATICS HUMAN & SOCIAL SCIENCES



Science and technology platforms

Supporting research and commercialisation

Seven hardware and software platforms, run by research departments and teams, support the Institute's research and commercialisation activities, and can respond to specific requests from industry partners.

Nano'Mat

Nanocharacterisation and NANOmanufacturing of Materials for Mechanical, Optical, Biological and Agri-Resources Applications

Nano'mat is a dual-site platform, with locations in Troyes and Reims, dedicated to nanocharacterisation and nanomanufacturing activities for a range of applications. It boasts state-of-the-art equipment and draws on skills developed in partner nanotechnology labs. Nano'mat acts as a specific platform within the french RENATECH network, supporting the research and development work of academic and industrial partners. In Troyes, Nano'mat draws on the skills and expertise developed at the LNIO and LASMIS teams.

Find out more at **www.nanomat.eu**

CapSec

Security Sensors platform

Managed by the LM2S team, CapSec is an embedded wireless sensor network platform. Its primary objective is to provide a key resource for industry partners and academic laboratories to trial and validate their technological solutions based on networks of wireless sensors.

EcoCloud

EcoCloud is an environmental impact analysis and evaluation platform, supported by the CREIDD team. It offers skills, methods and tools in eco-design and industrial ecology, enabling evaluation of deployment scenarios for sustainable development strategies to support the development of industries and territories.

CyberSec

Cybersecurity platform

The CyberSec platform is supported by the cybersecurity research programme. It provides an environment for the development, testing and qualification of information system security and anti-cybercrime solutions. It is also aimed at fostering partnerships with universities and industry in the cybersecurity field.

Living Lab ActivAgeing

Living Lab ActivAgeing (a member of the European Network of Living Labs – ENoLL) provides an innovative framework for the design and evaluation of technological solutions to autonomy issues for elderly people, based around a participative, user-centred design approach. Equipment includes a real-time video analysis system with eye tracking and 3D movement analysis capabilities. Living Lab ActivAgeing is supported by UTT's Tech-CICO and LM2S teams.

Find out more at **www.activageing.fr**

Num3D

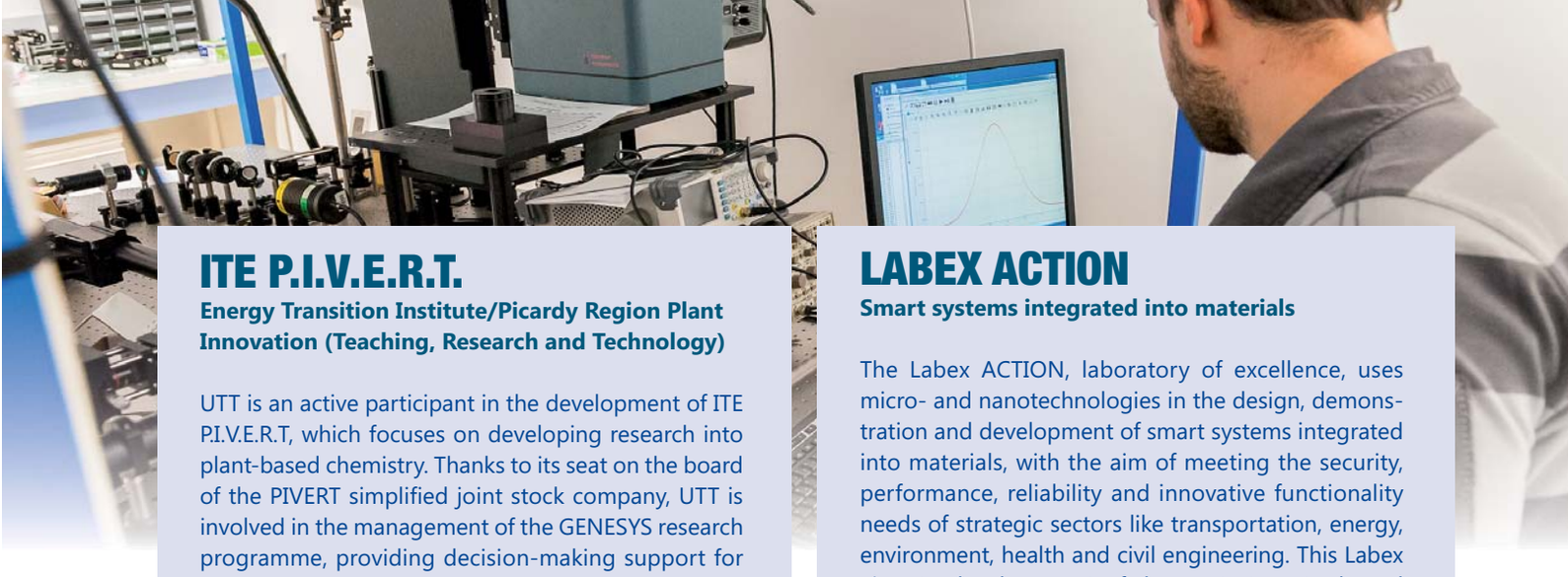
3D digitisation and virtual engineering

Num3D is a regional multi-site platform managed by the LASMIS team. It brings together hardware and software capabilities to support the development of advanced methods related to virtual engineering such as retro-design, immersive display, digital simulation, virtual forming of mechanical components, and advanced product lifecycle management (PLM).

Find out more at **www.num3d.fr**

Adhere

The ADHERE platform groups capabilities in production/characterisation of deposits and functionalisation of surfaces, as well as regional skills in surface treatment. ADHERE also strengthens the partnership between the LASMIS team and the CEA (French Alternative Energies & Atomic Energy Commission) in the field of surface engineering.



ITE P.I.V.E.R.T.

Energy Transition Institute/Picardy Region Plant Innovation (Teaching, Research and Technology)

UTT is an active participant in the development of ITE P.I.V.E.R.T, which focuses on developing research into plant-based chemistry. Thanks to its seat on the board of the PIVERT simplified joint stock company, UTT is involved in the management of the GENESYS research programme, providing decision-making support for the design of a territorialised bio-refinery, the aim being to help anticipate industrial risks as well as risks and opportunities in terms of social, economic and environmental impact.
The Institute's researchers also collaborate in projects funded under the GENESYS programme relating to supply logistics for bio-refineries, industrial ecology and environmental impact assessment.

Find out more at **www.picardie.fr/pivert**

LABEX ACTION

Smart systems integrated into materials

The Labex ACTION, laboratory of excellence, uses micro- and nanotechnologies in the design, demonstration and development of smart systems integrated into materials, with the aim of meeting the security, performance, reliability and innovative functionality needs of strategic sectors like transportation, energy, environment, health and civil engineering. This Labex aims to develop a set of demonstrators, tools and methods with the participation of UTT. The LNIO team is leading the "smart nanosensors integrated into materials" demonstrator.

Find out more at **www.labex-action.fr/fr**

Investments for the future

IRT M2P

Institute for Technological Research in Materials, Metallurgy and Processes

One of eight institutes of its kind created in France, and a Foundation for Scientific Cooperation, IRT M2P is supported by academic institutions across Eastern France (Universities of Lorraine; Troyes and Belfort-Montbéliard Universities of Technology; CNRS, etc.) as well as by various industrial groups (SAFRAN, PSA, Renault, ARCELOR MITTAL, EDF, AREVA, etc.).
Its activities encompass the entire production chain of materials, principally metals, with a focus on production processes in the context of sustainable development. UTT contributes to the development strategy of IRT M2P, and is involved in several research projects.

Find out more at **www.irt-m2p.eu/fr**

UTT is involved in a number of entities qualified within the scope of the various calls for projects launched in 2010 and 2011 as part of France's "Grand Emprunt" economic stimulus package.

SATT Grand-Est

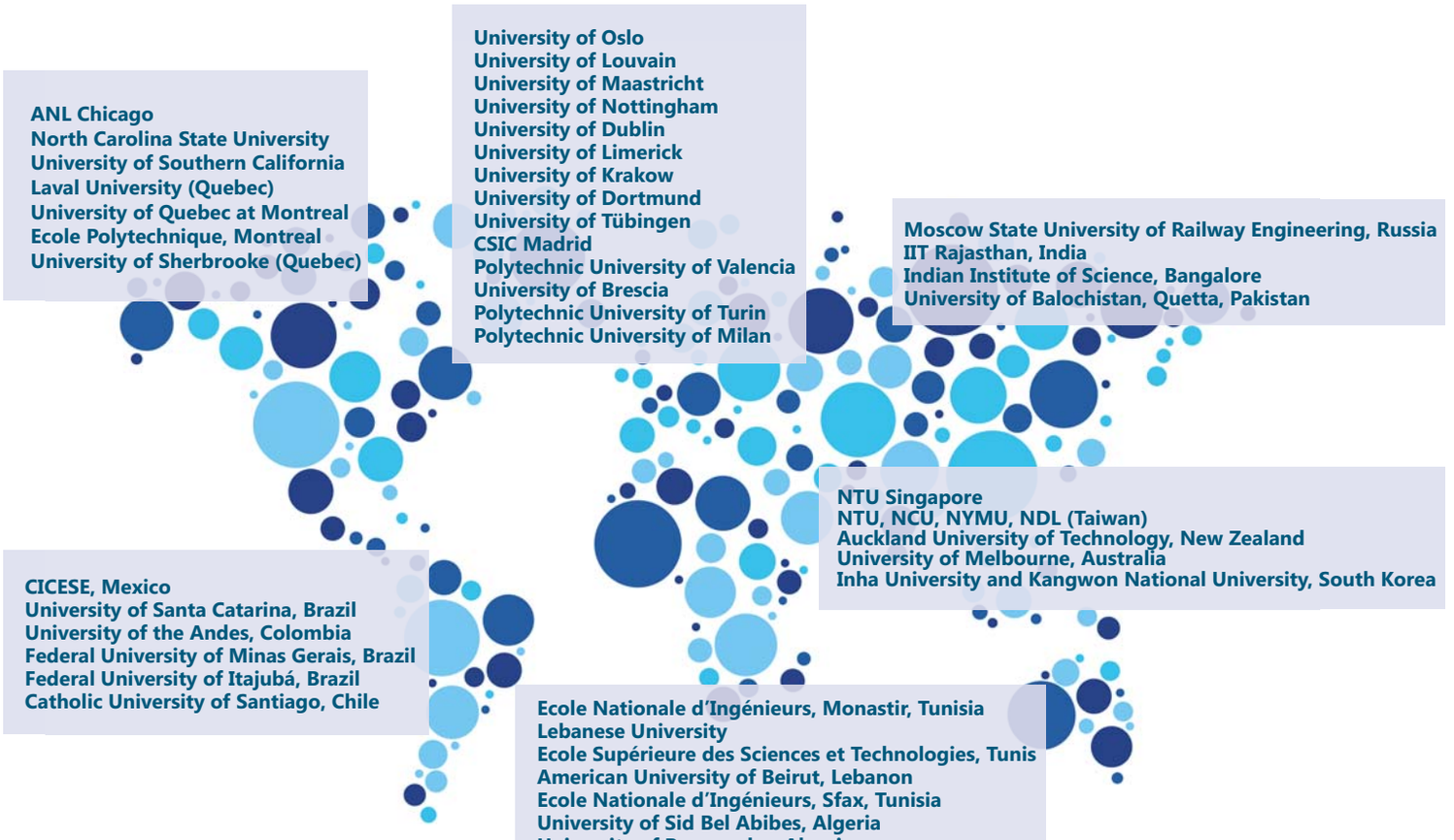
Eastern France technology transfer accelerator company

SATT Grand-Est is the eleventh simplified joint stock company to be set up under a French initiative aimed at providing an effective interface between businesses and public research institutions. Its objectives are to invest in maturation projects (in R&D, market studies and intellectual property), to provide proof of concept for projects with strong economic potential, and to offer services in technology transfer, notably by identifying projects at research laboratories. It provides a simplified, professional and collaborative means of leveraging R&D efforts for commercial development.

SATT Grand-Est offers an additional pathway for researchers to commercialise their discoveries. It broadens the scope of possibilities for commercialisation and industrial partnerships already available via UTT's own specialised unit.

Find out more at **www.satt.fr**

The Charles Delaunay Institute's international collaboration



ANL Chicago
North Carolina State University
University of Southern California
Laval University (Quebec)
University of Quebec at Montreal
Ecole Polytechnique, Montreal
University of Sherbrooke (Quebec)

University of Oslo
University of Louvain
University of Maastricht
University of Nottingham
University of Dublin
University of Limerick
University of Krakow
University of Dortmund
University of Tübingen
CSIC Madrid
Polytechnic University of Valencia
University of Brescia
Polytechnic University of Turin
Polytechnic University of Milan

Moscow State University of Railway Engineering, Russia
IIT Rajasthan, India
Indian Institute of Science, Bangalore
University of Balochistan, Quetta, Pakistan

NTU Singapore
NTU, NCU, NYMU, NDL (Taiwan)
Auckland University of Technology, New Zealand
University of Melbourne, Australia
Inha University and Kangwon National University, South Korea

CICESE, Mexico
University of Santa Catarina, Brazil
University of the Andes, Colombia
Federal University of Minas Gerais, Brazil
Federal University of Itajubá, Brazil
Catholic University of Santiago, Chile

Ecole Nationale d'Ingénieurs, Monastir, Tunisia
Lebanese University
Ecole Supérieure des Sciences et Technologies, Tunis
American University of Beirut, Lebanon
Ecole Nationale d'Ingénieurs, Sfax, Tunisia
University of Sid Bel Abibes, Algeria
University of Boumerdes, Algeria

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UTT is a member of several international higher education and research networks, helping raise the profile of CDI's research activities worldwide: • EUA - European University Association • EAIE - European Association for International Education • ESRA - European Safety and Reliability Association • GE3 - Global Engineering Education Exchange • ARFITEC - ARgentina France Ingénieurs en TEChnologie • BRAFITEC - BRAsil France Ingénieurs en TEChnologie

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utt
université de technologie Troyes

COMUE université de Champagne

cnrs
dépasser les frontières

UMR CNRS 6281

A new building housing five research, innovation and technology development platforms

Nano'mat

The Troyes University of Technology (UTT) and the University of Reims Champagne-Ardenne (URCA) have pooled their skills and equipment to set up a new dual-site nanomanufacturing and nanocharacterisation platform dedicated to nanomaterials for mechanical, optical, biological and agri-resources applications.
In the Troyes site, Nano'mat draws on the skills and expertise developed at the LNIO and LASMIS laboratories.

The platform makes nanomanufacturing facilities available to universities and industry partners:

- Electron, optical and 3D optical lithography
- Wet and dry etching (RIE, IBE)
- Thermal evaporation or electron beam deposition (metals, oxides, etc.)
- Cathode sputter deposition (oxides)
- Chemical synthesis of nano-objects
- Nanocrystallisation

Characterisation capabilities include:

- Electron microscopes
- Scanning probe microscopes (AFM, SNOM, etc.)
- Optical microscopy and spectroscopy (fluorescence, time-resolved fluorescence, Raman, etc.)
- Structural characterisation (DRX, etc.)
- Mechanical characterisation (SEM in-situ traction, photomechanical, nanoindentation, etc.)

The Nano'mat platform also offers businesses and research labs the equipment, skills and training they need to conduct their activities effectively.

www.nanomat.eu

Living Lab ActivAgeing

Living Lab ActivAgeing (LL2A), a member of the European Network of Living Labs (ENoLL), provides a framework for the design of prototype solutions to autonomy issues for elderly people.

The Living Lab concept is designed to support the design process for user-centred technologies. The user acts as a key partner in the conception, development, creation and full-scale testing of innovative tools and services as well as new uses that meet the hopes and needs of all. The innovative nature of the Living Lab lies in its power to deliver authentically new products whose value is perceived by the economic players involved. Living Labs help accelerate the emergence of genuinely useful and effective technological solutions that benefit society as a whole.

Living Lab ActivAgeing is supported by the e-health STP (part of the STMR cross-cutting research topic). The platform offers capabilities that encompass all the stages of a participative design cycle. Its array of special equipment includes a real-time video analysis system with eye tracking and 3D movement analysis capabilities.

www.activageing.fr

THE PLATFORMS AT A GLANCE

5 000 square metres of floor space
600 square metres of clean rooms
Total building cost: **€15.5 million**
Cost of scientific equipment: **€12 million**
150 staff
1 apartment-laboratory
1 ideas laboratory
2 videoconferencing systems (one mobile)

Aube en Champagne LE DÉPARTEMENT
RÉGION CHAMPAGNE ARDENNE
Grand Troyes
UNION EUROPÉENNE

Num3D

3D digitisation and virtual engineering

Num3D is a technology platform designed to provide businesses and research laboratories with support in the field of digital engineering. The platform's hardware and software capabilities, housed at the UTT site, enable a variety of areas of focus to be addressed:

- Product design and lifecycle (incorporation of specialist technical knowledge into design, PLM, etc.) thanks to an array of software solutions including Creo3, Catia, Windchill, Enovia, etc.
- Additive manufacturing (incorporating functional studies, etc.) using the Objet30 3D printer.
- 3D digitisation (digitisation, geometric inspection, retro-design, etc.) using an LK 10.7.6 three dimensional measurement machine, an MCAx measuring arm, and an LC60Dx laser scanner, as well as inspection and retro-design software such as Focus, 3D Reshaper, RapidForm, etc.
- Digital simulation and optimisation (mechanical strength, forming, etc.) using computation servers, Abaqus digital simulation software, and modeFRONTIER optimisation software.

www.num3D.fr

CapSec

Security Sensors platform

CapSec is an embedded wireless sensor network platform, managed by LM2S. Its primary objective is to provide a key resource for industry partners and academic laboratories to trial and validate their technological solutions based on networks of wireless sensors
The CapSec platform meets a growing industry need, and fosters links between research laboratories and the regional economy.

CapSec boasts electronic systems and equipment for embedded programming (microcontrollers, ARM processors, FPGA platforms, etc.), various types of off-the-shelf sensors for rapid prototyping, and a range of wireless communication equipment such as networks of Zigbee, Bluetooth, Wi-Fi and ultra-wideband transmitters/receivers.

CapSec will also support the advancement and commercialisation of knowledge in the fields of collaborative, decentralised information processing and communication protocols adapted to the variable topology of distributed nodes. Potential applications targeted by the platform sit at the intersection point between a number of fields (statistical decision-making, digital communications, electronics, and e-health).

CyberSec

Cybersecurity platform

The CyberSec platform is supported by the PST cybersecurity research programme.
It provides an environment for the development, testing and qualification of information system security and anti-cybercrime solutions. It is also aimed at fostering partnerships with universities and industry in these areas. The current platform is structured around three main systems:

- The **DIF (Digital Image Forensics)** system provides access to a database of intact, corrupted or modified digital images and videos, as well as all the parameters required for their characterisation. The database can be used to test solutions developed for the purpose of certifying the integrity of these types of digital media.
- **Dej@Vu** offers data collection and analysis capabilities for the purpose of understanding the lifecycle of event trajectories in interconnected systems.
- **CloudSec** is an experimentation environment based on a datacentre architecture. It is designed to allow reproduction of malicious behaviours, and implementation and assessment of detection solutions and countermeasures for future Internet services and network architectures.

www.cybersec.utt.fr

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