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Already renowned for its excellence in teaching, the University of Namur (UNamur) is increasingly recognized for the quality of its research. Many research units, from within six faculties, gather academic, scientific, administrative and technical staff, all sharing a common passion for research. The University of Namur belongs to and partakes in several, often interdisciplinary, research networks at the local, regional, federal, european, and international level.
With units specialized in materials (PMR and CES), modeling, optimization and space dynamics (naXys), as well as software engineering (PReCISE), the expertise gathered by the University of Namur covers a large part of the Skywin strategic axes.

Research Center in Physics of Matter and Radiation (PMR)

Laboratories from PMR draw on powerful and modern instrumentation to develop materials, processes, devices and modeling thereof.
It includes the development and applications of many spectroscopic techniques, the quest for new materials, the study of thin films, nanostructures and hybrid (nano)-systems. A selection of examples includes research on self-cleaning surfaces, photovoltaic cells, organic light emitting diodes and new transparent conducting oxide layers.
The research is focused on the study of materials, radiations and their interactions. LISE and LARN laboratories investigate surface deposition and/or modification of materials by ion implantation, physical deposition or RF plasmas. The surfaces and interfaces of those innovative solid materials are investigated by up-to-date optical, electron and ion spectroscopies. Quantum chemical calculations are also performed (***pmr.unamur.be/fr***).

Laboratory of Chemistry and Electrochemistry of Surfaces (CES)

Research objectives of the CES are the design and elaboration of surface and interfacial materials (thin and ultra-thin organic and inorganic films on metal, oxide and polymer substrates) by chemistry processes (electrochemistry, self-assembly, sol-gel film deposition...) The goal is to obtain structured surface materials with new and/or improved properties resorting to the bottom-up approach which depends on the control of processes and interactions at the molecular level.

Molecular self-assembly on active metals

The objectives are to chemically graft organic mono- or multilayers on various substrates - noble metal (Au, Ag, Pt...) and (re)active metals (Ni, Cu, Zn, Al, Ti, Ta...) - by bifunctional molecular connectors (X-spacer-Y) -X being a group (-SH, -SeH, -S-S-, -SiR3, -PO(OH)2...) selected to preferentially react with the surface substrate. The group -Y is chosen to impart either specific end-properties to the modified substrate (lubrication, anti-wear, corrosion resistance, anti-fouling, controlled wetting...) and/or (re)activity for additional surface processes (chemical anchoring and/or induced growth of one or more additional layers).

Others

Additional topics are related to carbon nanotubes functionalisation for composites elaboration (polymers/CNTs, metal or metal oxides/CNTs), surface modification for biomaterials applications, electrodeposition in ionic liquids...
(***www.unamur.be/sciences/chimie/cesa/***)

Namur Center for Complex Systems (naXys)

From the space debris to the whole universe, in the solar and extrasolar systems, the center naXys of UNamur is renowned for its numerical and analytical approaches of space dynamics.

The center naXYs (Namur Complex Systems) has a strong research component in orbital motions, space geodesy and physical cosmology. The researchers are partners of several space missions (BepiColombo, Euclid, Juice, Cheops) where their theoretical approaches are appreciated in the mission analysis and preparation phases; they contribute to the modeling of the dynamical problems and observables, as well as to the building and refining of suitable numerical software and tools (frequency analysis, efficient algorithms, statistical forecasts, chaos detection, stability criteria).

In many industrial and research projects, one attempts to improve a system by modifying its decision variables subject to constraints: this is optimization.

The research group focusses on the numerical solution of such problems that is the effective calculation of the best values for the decision variables.

We focus in particular on nonconvex and large scale instances. Both theoretical questions, such as design and convergence properties of the algorithms, and associated software issues are studied (***www.unamur.be/sciences/naxys***).

PReCISE

The PReCISE research center is dedicated to all areas of software engineering, from requirement engineering to testing, using modeling techniques to reason and design complex software systems both from functional and data-oriented perspectives.

Quality and Measurement

Assessing software quality through quantitative and reliable information has always been a major concern of software engineering. However, as the field evolved, software has become a complex product involving interrelated models with different abstraction levels targeting different stakeholders. During the past few years, the PReCISE center has developed innovative techniques, methodologies and tools dedicated to the quality modeling of complex software systems. Relying on software measurement and taking into account the complex relationships between software products (from requirements and design documents to tests and documentation), these techniques offer a more efficient understanding of software quality that benefits to all stakeholders (from customers to developers).

Model-based Engineering and Quality Assurance for Variability-Intensive Systems

For more than 10 years, the PReCISE center has developed techniques to specify, analyze, verify and test variability-intensive systems, a large class of systems regrouping software product lines and highly configurable software challenging current engineering techniques by the combinatorial explosion such configurability induces. Efficient quality assurance techniques and formal definition of variability-aware domain–specific languages are the keys to such challenges. Additionally PReCISE is concerned by the definition of generative approaches to systematically build such variability-intensive systems. Some of these innovations are currently being transferred in industry through a spin-off company dedicated to configuration software (***www.unamur.be/en/precise/***).