Thematic School on
Artificial Intelligence
for Sensor Data Intelligent Exploitation to Develop Smart Cities

October 4th - 8th 2021
Online • 9 am (Mexico city) • 4 pm (France)

MUFRAMEX
MAISON UNIVERSITAIRE FRANCO-MEXICAINE

Université Fédérale
Toulouse Midi-Pyrénées

Nowadays, the widespread use of sensors allows for the collection of a variety of different data. This data can be directly exploited with the use of classical statistical tools. However, the use of advanced artificial intelligence algorithms makes it possible to take full advantage of the correlation, as well as the detection of underlying structures.

The University of Guadalajara (UdeG, Mexico) and, more specifically, its Smart City Innovation Center (SCIC), has a strong expertise in the field of data collection, storage and visualization while the University of Toulouse (UFTMiP, France), with its 3IA Artificial and Natural Intelligence Toulouse Institute (ANITI), is renowned for its work in data exploitation by AI algorithms.

The objective of this workshop is to bring together the complementary skills available in these countries by using artificial intelligence algorithms on sensor data (IoT). This complementarity could produce an innovative environment where researchers could continue to explore this particular field, providing M.A. and PhD students with a test bed for various studies.

Pro gram

9:00 Mx
16:00 Fr

Opening ceremony

Opening remarks and presentation of the MUFRAMEX
- **Dr Sonia V. Rose**, Director, MUFRAMEX (MESRI/SEP)

Presentation of the researchers and their institution
- **Dr Hervé Luga**, Institut de Recherche en Informatique de Toulouse (IRIT)
- **Dr Victor Manuel Larios**, CUCEA Smart Cities Innovation Center
- **Pr Anne Laurent,** Institut de Science des Données de Montpellier (ISDM)
- **Dr Johan Van Horebeek**, Centro de Investigación en Matemáticas (CIMAT)

Presentation of scientific objectives and schedule
- **Dr Victor Manuel Larios**, CUCEA, University of Guadalajara (UdeG) & **Dr Hervé Luga**, IRIT, University of Toulouse (UFTMiP)

Q & A (10 min)

10:30 Mx
17:30 Fr

Open Data and IADATA in Toulouse: use and reuse
Keynote Speaker
- **Sandrine Mathon**, Head of the Resources Area, Department for digital, Toulouse City Hall, France (30 min)

11:00 Mx
18:00 Fr

Courses
- **Data mining and pattern mining for IoT (1h)**
  Pr Anne Laurent, ISDM, University of Montpellier (UM), France

- **Machine Learning Techniques and Artificial Neuronal Networks (1h)**
  Dr Sylvain Cussat-Blanc, IRIT, Artificial and Natural Intelligence Toulouse Institute (ANITI), France

Day 2 - Tuesday, October 5th

9:00 Mx —— **Industrial challenges**
16:00 Fr   Keynote Speakers

- **Pr Nicolas Viallet**, Operationnal director, ANITI (20 min)
- **Luis Valtierra**, CEO INSIGHT and former IJALTI President (Instituto Jalisciense de Tecnologías de la Información) (20 min)
- **Dr Pablo Salazar**, Enterprise Architect, Member of Academy of Technology, IBM (20 min)
- **Dr Pablo A. Martinez**, Lead Staff Algorythms Engineer, Research and Advanced Engineering, Continental Mexico (20 min)

10:20 Mx —— **Hackathon: presentation (20 min)**
17:20 Fr   Q & A (10 min)

11:00 Mx —— **Courses**
18:00 Fr
- **Modelling and control of dynamic systems (1h)**
  Dr Francisco José Ruiz-Sánchez, Cinvestav Unidad Saltillo, Mexico
- **Knowledge graph for the Internet of Things (1h)**
  Pr Nathalie Hernandez, IRIT, University of Toulouse - Jean Jaurès, France

Day 3 - Wednesday, October 6th

9:00 Mx —— **Virtual poster session** (open to PhD students)
16:00 Fr

9:30 Mx —— **Hackathon : organization (20 min)**
16:30 Fr   Q & A (10 min)

10:00 Mx —— **Courses**
17:00 Fr
- **Deep learning (1h)**
  Dr David Simoncini, IRIT, Toulouse 1 Capitole University, France
- **Data visualization (1h)**
  Dr Johan Van Horebeeck, CIMAT, Mexico

Day 4 - Hackathon - Thursday, October 7th

9:00 Mx —— **Hackathon: project development by blended teams (3 o 4 teams)**
16:00 Fr

11:00 Mx —— **Closing session (2h)**
18:00 Fr   Keynote speaker
- **Pr Bertrand Monthubert,** President, OPenIG, France (10 min)

Day 5 - Friday, October 8th

9:00 Mx —— **Discussions & perspectives (researchers only)**
16:00 Fr

- Courses assessment and discussions on future possibilities

- Discussion on becoming a thematic network within the frame of MUFRAMEX's French-Mexican research network (goals, organization, activities, scope, research focus)

- In connection with the above: discussions on the research project, examination of funding and exchange opportunities for students and professors (including a *Diplomado* in AI)

Dr Victor Manuel Larios Rosillo

Dr Victor Manuel Larios Rosillo received his PhD and a DEA (French version of a MS program) in Computer Science from the Technological University of Compiegne (France) and a BA in Electronics Engineering from the ITESO University in Guadalajara (Mexico). He holds a full-time professor position at the Department of Information Systems in the CUCEA Campus at the University of Guadalajara. Since April 2014, he is the actual Director of the Smart Cities Innovation Center (SCIC). His research interests are related to smart cities, IoT distributed systems, networking, multiagent systems, and data visualization using virtual reality. Dr Larios has published over 70 articles and 1 book on serious game. He is also a IEEE Senior Member for 27 years and the Guadalajara local leader at the IEEE Smart Cities Initiative since 2013.

Dr Hervé Luga

Dr Hervé Luga is full-time professor and Vice Provost at the University of Toulouse. After having received a PhD from Toulouse 3 University, he became associate professor at Toulouse 1 Capitole University. Head of the REVA-IRIT (UMR 5505) research team, he is currently conducting research in the area of artificial life. He is particularly interested in the fundamentals of learning with works concerning the dynamic growth of neural networks as well as in deep neural networks alternatives.

Dr Sylvain Cussat-Blanc

Dr Sylvain Cussat-Blanc is associate professor at Toulouse 1 Capitole University. He is a member of the REVA team at the Institute of Computer Science in Toulouse (IRIT) and head of the Onko3D project-team hosted at the Institute of Advanced Technologies in Life Sciences (ITAV). His work focuses on bio-inspired artificial intelligence (artificial embryogenesis, artificial gene regulatory networks and evolutionary computation) and on applying these concepts to *in silico* modelling of biological processes.

Dr Johan Van Horebeek

Dr Johan Van Horebeek is a researcher at the Computer science Department of CIMAT, a federal funded research centre in Mathematics, Statistics and Computer Science in Guanajuato City (Mexico). He holds a PhD from the University of Leuven (Belgium) in statistics. His research interests are statistical pattern recognition, analysis of complex data and machine learning. He teaches at CIMAT and at the University of Guanajuato and participates regularly in consultancy projects (INEGI, Central Bank of Mexico, etc).

Pr Anne Laurent

Pr Anne Laurent is full-professor at the University of Montpellier. As a member of the FADO Research group (LIRMM lab), she works on open data, semantic web and data mining. She is particularly interested in the study of the use of fuzzy logic to provide more valuable results, while remaining scalable. Pr Laurent is currently Vice Provost at the University of Montpellier delegated to open science and research data. She also heads the Montpellier Data Science Institute (ISDM) and the high-performance computing center (MESO@LR).

Dr David Simoncini

Dr David Simoncini is associate professor at Toulouse Capitole University. He is a member of the REVA team at the Institute of Computer Science in Toulouse (IRIT) and associate to the «Design using intuition and logic» chair from the Artificial and Nature Intelligence Toulouse Institute (ANITI). He is interested in applied interdisciplinary research combining AI methods and biology for health and environment. His expertise focuses on solving combinatorial optimization problems with constraint programming and evolutionary algorithms.

Dr Francisco José Ruiz-Sanchez

Dr Francisco José Ruiz-Sanchez obtained his PhD in Control Systems from the Technological University of Compiegne (France). In 1998, he joined the Center for Research and Advanced Studies of the National Polytechnic Institute of Mexico (Cinvestav – IPN for its acronym in Spanish - Mexico). He is currently associate professor within the Group of Robotics and Advanced Manufactured (Cinvestav, campus Saltillo). His research includes attention to modelling and control of dynamic systems, cognitive approaches for autonomous systems and man-machine interfaces and their application to assisted rehabilitation.

Pr Nathalie Hernandez

Pr Nathalie Hernandez is full-time professor at Toulouse Jean Jaurès University. In December 2019, she received her «Habilitation à diriger des recherches» (accreditation to supervise research) with the thesis entitled «Centrality of ontologies: from the Semantic Web of users to the Semantic Web of objects» at Toulouse Jean Jaurès University. Since 2001, her research laboratory has been IRIT (Toulouse, France). Within the field of artificial intelligence, her research focuses on knowledge engineering and the semantic web.

The University of Guadalajara (UdeG)

The UdeG is the second largest educational institution in Mexico. It is a network of 16 campuses located all across the state of Jalisco, including one virtual campus. The Smart Cities Innovation Center (SCIC) is a unique structure in Mexico, with its compact but very efficient team of information technologies researchers. The Center promotes ways to shape and transform Latin American cities so they may have an improved and better accessible urban future. Based in Guadalajara City (Mexican Silicon Valley), it is located in the Business and Economics Campus (CUCEA) at the Department of Information Technologies (UdeG). It has a track record of successful projects with high technology companies such as IBM, Intel, HPE, as well as active collaboration with municipalities and state authorities.

The University of Toulouse (Université Fédérale Toulouse Midi-Pyrénées - UFTMiP)

The University of Toulouse is an institution which aims to bring together the main higher education and research bodies in Toulouse and its region (23 higher education institutions, 1 university hospital and 7 research institutions). It aims at placing them at the highest international level from the academic and scientific point of view. It hosts the Artificial and Natural Intelligence Toulouse Institute (ANITI) which aims to develop a new generation of artificial intelligence called hybrid AI, by integrating data-driven learning techniques and symbolic or mathematical models which permit the expression of constraints and carry out logical reasoning.

CINVESTAV (Center for Research and Advanced Studies), Unidad Saltillo

The Cinvestav is a Mexican non-governmental scientific research institution affiliated to the National Polytechnic Institute (IPN). It is divided into 10 research centers; 3 of these are in Mexico City, while the others are dispersed across the country. The Unity of Saltillo, located in the city of Saltillo, focuses on four areas of research : metallurgical engineering, ceramic engineering, robotics and advanced manufacturing and natural resources and energy.

The University of Montpellier

With 16 schools and institutes, and 78 research structures, the University of Montpellier is a research-intensive university which brings together many areas of knowledge ranging from science, technology, medicine, pharmacy, to law, political science and economics. Within the UM, ISDM (Institut de Science des Données de Montpellier, for its acronym in French) seeks to promote and support responsible data management as well as to boost and foster an open science policy.

CIMAT (Centro de Investigación en Matemáticas)

Located in the city of Guanajuato, CIMAT is a publicly-funded research centre fully integrated within the Public Centres System overseen by Mexico's National Council for Science and Technology (CONACYT). CIMAT focuses on the creation, transmission and application of specialist knowledge in the fields of mathematics, statistics and computer science. It is recognized both at national and international level for its tradition of educational excellence and progressive scientific development, its areas of advanced mathematical specialization and its power to attract students from all over the world.

Over 4 half days, the thematic school's aims are:

. **To assemble relevant stakeholders** to develop a deeper understanding of the exploitation of sensor data using artificial intelligence;

. **To bring together researchers and students** and share knowledge and expertise;

. **To offer research-oriented teaching** by leading experts in their fields from top institutions;

. **To promote networking opportunities** in order to facilitate new partnerships between M.A. and PhD students and researchers from Mexican and French higher education institutions.

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