



UNIVERSITY: Public University of Navarre (UPNA)

WIT AREA:

- Automotive, Mechatronics and Advance Manufacture
- Health
- Energy
- IA

WIT PROGRAMME'S RESEARCH LINE NAME: Artificial Intelligence applied to real-time data processing .

New developments in information fusion techniques using interval and multidimensional data with applications in computer vision and machine learning

DOCTORAL PROGRAMME:

Doctorate in Science and Industrial Technologies

<https://www.unavarra.es/escuela-doctorado/doctorate-programs/current-plan/science/doctorate-in-science-and-industrial-technologies?languageId=1>

COMPLETE DESCRIPTION OF THE LINE

Information fusion consists in combining many pieces of information into a single representative piece that best represents the original data. When the information to be fused is numerical (for example, coming from different sensors), mathematical aggregation functions are the most used and studied



ones. However, as information systems become more complex, the need to aggregate or fuse more complex data arises. This is the case, for example, of aggregating interval or multi-dimensional data. In these cases, the problem is not trivial, and many problems appear, such as the ordering of datum.

In this sense, we propose to study which are the trends in the literature to deal with the fusion of interval and multi-dimensional data and to explore new possibilities proposing new ways of aggregation. Moreover, new developments can be applied to many machine learning problems with the aim, for example, of improving accuracy of learned models.

RESEARCH GROUP NAME: Approximate Reasoning and Artificial Intelligence

COORDINATOR:

- Last and first name; link to the “Portal of scientific production”: Bustince, Humberto.
https://academicos.unavarra.es/CawDOS//jsf/seleccionActividades/seleccionActividades.jsf?id_pers=278&idioma=es&elmeucv=N
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MEMBERS OF THE LINE RESEARCH:

Daniel Paternain (Tutor)

Mikel Galar

José Antonio Sanz

Aránzazu Jurío



Mikel Sesma

ANOTHER RESEARCH LINES OF THE GROUP:

- Information Fusion and aggregation techniques
- Decision making
- Computer vision
- Machine learning
- Data Mining
- Deep learning

- Entities involved in research lines and contact person:

- ✓ Academic entities:

Universidade de Tras-os-montes e Alto Douro, Vila Real (Portugal): Pedro Melo-Pinto

Slovak University of Technology, Bratislava (Slovakia): Radko Mesiar

University of Ostrava, Ostrava (Czech Republic): Irina Perfilieva

University of Nottingham, Nottingham (United Kingdom): Isaac Triguero

Ghent University, Ghent (Belgium): Daniel Peralta

Wroclaw University, Ghent (Belgium): Michael Wozniak

Virginia Commonwealth University, Richmond (United States of America): Bartosz Krawczyk and Alberto Cano

University of Granada, Granada (Spain): Alberto Fernández

- ✓ Industrial entities:



Neuraptic AI (<https://www.neuraptic.ai/>): Mikel Elcano

Tracasa Instrumental (<https://itracasa.es>): Carlos Aranda

- Joint supervision of doctoral thesis with international universities or non-academic institutions:

“Behavioral analysis in Cybersecurity using Machine Learning. A study based on graph representation, class imbalance and temporal dissection” by Francesco Zola (Vicomtech)

“Aggregation and pre-aggregation functions in fuzzy rule-based classification systems” by Giancarlo Lucca (Universidade Federal do Rio Grande, Brazil)

“Admissible interval-valued overlap functions in fuzzy rule-based classification systems” under development by Tiago Da Cruz Asmus (Universidade Federal do Rio Grande, Brazil)

Currently in process:

“Deep Learning for Earth Observation” by Christian Ayala (Tracasa Instrumental)

“Continual Learning for ENAIA Machine Learning Plataforma” by Enrique Hernández (Neuraptic AI)

“Development of intelligent technologies in Industry 4.0: Automatic Quality Assessment and Maintenance” by Luis Iñiguez (KWD Automotive)

“Development of Machine Learning models for improving Indoor Air Quality (IAQ)” by Peio Garcia (InBiot)



- Brief group overview

The Artificial Intelligence and Approximate Reasoning Research Group (GIARA) began its trajectory focusing on mathematical modelling, especially in the context of Fuzzy Set Theory. The experience accumulated in this line generated different theoretical-practical research, mostly based on machine learning and/or computer vision. This research has led to advances in areas as varied as automatic control, food safety, geospatial data processing, health, big data or convolutional/deep neural networks. Beyond the academic impact, the ability to connect mathematical theory with advanced technical tools has led to applied developments in industrial, agrobiotechnology and medical environments. To date, GIARA has generated more than 400 indexed articles, collaborating with more than 200 different authors, and maintains active projects with researchers from 4 continents.

- Link of the group to the “Portal of scientific production”

https://academicos.unavarra.es/CawDOS//jsf/seleccionActividades/seleccionActividades.jsf?id_pers=7828&idioma=es&elmeucv=N

- Pictures, links... to academic or industrial partners (if any)

<https://itracasa.es/investigacion-desarrollo-innovacion/>

<https://www.neuraptic.ai/>

ACADEMIC REQUIREMENTS: Computer Science



ADDITIONAL REQUIREMENTS: Knowledge in image processing, computer vision and machine learning