This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under Marie-Sklodowska Curie grant agreement No 101034285

UNIVERSITY: Public University of Navarre (UPNA)

WIT AREA:

☐**Automotive, Mechatronics and Advance Manufacture**

☐**Health**

☐**Energy**

☒**IA**

WIT PROGRAMME´S RESEARCH LINE NAME: Other applications of Artificial Intelligence as a service in health, energy, etc…)

New developments in efficient multimodal lifelong 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

Among Artificial Intelligence techniques, Machine Learning and more precisely, deep learning, has proven to be one of the most popular and successful due to its applicability to many real-life problems, such as healthcare (clinical decision making or diagnosis), geoscience and remote sensing (automatic classification of remotely sensed imagery) and manufacturing (fault detection or predictive maintenance). However, there exist many topics related to the application of machine learning techniques that needs to be further investigated, such as

This project has received funding
from the *European Union's Horizon 2020*
research and innovation programme
under Marie-Sklodowska Curie
grant agreement No 101034285

continual or incremental learning, where new tasks have to be learned without forgetting previous unavailable data; or multimodal learning, where models learn from very different type of data, such as images or videos, text or audio. The objective of this proposal is to explore these ideas having in mind their potential applicability (in terms of accuracy but also in efficiency) in real world problems.

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
- Department: Statistics, Computer Sciences and Mathematics
- Email: bustince@unavarra.es
- Telephone number: +34 948 16 9254

MEMBERS OF THE LINE RESEARCH:

Mikel Galar (Tutor)

Daniel Paternain

José Antonio Sanz

Aránzazu Jurío

Mikel Sesma

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under Marie-Sklodowska Curie grant agreement No 101034285

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 Elkano

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

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under Marie-Sklodowska Curie grant agreement No 101034285

- 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 Plataform" 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

This project has received funding from the *European Union's Horizon 2020 research and innovation programme* under Marie-Sklodowska Curie grant agreement No 101034285

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