



UNIVERSITY: Public University of Navarre (UPNA)

WIT PROGRAMME'S RESEARCH LINE NAME: Machine learning-based prediction of adverse effects in colonoscopy biopsies

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

The Complejo Hospitalario de Navarra (CHN) has added to its catalog of services the Endoscopic Mucosal Resection (EMR), a new colonoscopy technique optimized by Dr. Albéniz. This colonoscopic technique is an effective and safe alternative to conventional surgical treatments, but it does not avoid all their risks. Specifically, there are certain risks of post-polypectomy syndrome, perforation, or delayed bleeding. These adverse effects can be significant, as long as they can manifest themselves days after the intervention, forcing new admissions and treatment of the patients.

Along these lines, we propose an intelligent system for learning and predicting risks based on (a) the patient's clinical history and (b) colonoscopic videos of the intervention. This system should help experts to preview possible adverse events, but also to personalize the intervention according to both the risks and the factors that increase them.

RESEARCH GROUP NAME:

Grupo de Investigación en Inteligencia Artificial y Razonamiento Aproximado (GIARA).



COORDINATOR:

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- Humberto Bustince (UPNA & NavarraBiomed, Tutor)
- Roberto Tagliaferri (University of Salerno)
- Carlos López Molina (UPNA & NavarraBiomed)
- David Carbone (Medtronic)
- Irma Fernandez (Medtronic)

ANOTHER RESEARCH LINES OF THE GROUP: short description of each of them

- Fuzzy Set Theory and Approximate Reasoning
- Information aggregation and fusion operators
- Machine Learning, Neural Networks and Deep Learning
- Industrial, agronomic and medical image processing
- Medical and biotech data analysis
- Clustering and classification based on fuzzy rules



- Entities involved in research lines and contact person:

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 - Vicomtech (R. Orduna, rorduna@vicomtech.org)
- Joint supervision of doctoral thesis with international universities or non academic institutions:



- Sesma-Sara, Mikel, *Generalized forms of monotonicity in the data aggregation framework*, H. Bustince (UPNA), R. Mesiar (Slovak Technical University) Universidad Pública de Navarra 2019.
- De Miguel Turullols, Laura, *Computing with uncertainly truth degrees: a convolution-based degrees*. H. Bustince (UPNA), B. De Baets (Ghent University), 2017.
- Paternain Dallo, Daniel *Optimization of image reduction and restoration algorithms based on penalty functions and aggregation techniques*, H. Bustince (UPNA), F.J Fernández (UPNA), G. Beliakov (Deakin University), 2013.
- Lopez Molina, Carlos, *The Breakdown structure of edge detection: Analysis of individual components and revisit of the overall structure*. H. Bustince (UPNA), B. De Baets (Ghent University), 2012.

- Group review

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

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

<https://academicos.unavarra.es/CawDOS/?id=1adf33dba1eb5382&idioma=es&tipo=actGrupo>



- Pictures, links... to academic or industrial partners (if any)
 - UPNA: www.unavarra.es
 - NavarraBiomed: www.navarrabiomed.es
 - CHN: www.idisna.es/conocenos/instituciones/complejo-hospitalario-de-navarra
 - Medtronic: www.medtronic.com
 - University of Salerno: www.unisa.it

CANDIDATE REQUISITES

Degree in Computer Sciences or Mathematics

The candidate shall ideally have some experience in bio-related projects and/or developments. Also, needs to be open to integration in a multidisciplinary team involving different experts in the field.