List of available projects for the JAE Intro ICU 2022 at the Unidad de Excelencia María de Maeztu IFCA

The IFCA MdM Unit of Excellence is offering several scholarships for introduction to research and to follow the Master's Degree in Data Science of the Universidad Internacional Menéndez Pelayo (UIMP) and Universidad de Cantabria (UC) in the 2022-2023 course. As part of the scholarship, the student will join one of the international research groups at IFCA carrying out a research project in a topic to be chosen from the list below. The student can choose up to three different projects in order of priority. For general enquiries about the scholarships, please send an e-mail to info-masterdatascience@listas.csic.es indicating in the subject "JAE Intro". For specific questions about the proposed projects, please e-mail the corresponding supervisor.

Data Science to analyse open and remote sensing data

Supervisor: Fernando Aguilar (aguilarf@ifca.unican.es)

Remote sensing from satellites has been one of the most effectives ways to monitor the Earth as a system since the 1970's. Recently, drones and airbones have contributed to increase the available data source. Although there are traditional statistics and analysis techniques that support the analysis of remote sensing data, recent advances in computing and data science can contribute to improving the quality of the results. However, there is still a gap between the experts in a particular field (geology, environmental sciences, biodiversity) that requires a "person in the middle" to adapt the data science methods to a particular discipline. This proposed project aims to bring closer modern techniques to traditional sciences like geology. The student will act as a bridge between this particular discipline and data science, adapting traditional methods used in teledetection to those learnt during the master.

Optimising the energy consumption in the steel rolling process using artificial intelligence

Supervisor: Lara Lloret (lloret@ifca.unican.es)

Steel rolling is an extremely complex industrial process characterised by the number and diversity of subsystems involved and the complex interactions between them. This is why there is a need for intelligent control systems that are able to monitor the rolling process and discover the failures that may occur, manage incidents in an automated way and diagnose and anticipate maintenance plans, thus supporting the human task of controlling, monitoring and optimising its operation and consumption.

One of the key elements during the rolling process is the induction furnace which is used to reheat the billets that have cooled during the grinding stage to reach an adequate rolling temperature. The induction furnace records the billet temperature by means of an inlet and outlet pyrometer. Based on the inlet temperature and the outlet target temperature, the furnace regulates the power supplied by each of the inductors; however, in practice, the set target temperature is not always reached and, for this reason, the operator in charge has to modify the target temperature manually. On the other hand, among the possible inductor management strategies, it is necessary to identify the one that minimises energy consumption.

In short, the scope of this study is to develop a procedure to optimise energy consumption subjected to the operating conditions required by the billet rolling process. For this, the student will have to explore different artificial intelligence tools such as recurrent Neural Networks in order to predict the power consumption and setting in place a tool allowing to optimise the process.

Applications of Data Science technologies to climate services

Supervisor: Antonio S. Cofiño (antonio.cofino@unican.es)

Data Science is the fourth paradigm of Science (science based on empirical, theoretical, computational and data models), since today the way of doing science has changed, due to the impact of new information and communication technologies (ICT). Data Science is an interdisciplinary field, which involves extracting knowledge (intelligent systems), from structured and unstructured data, using techniques from the fields of statistics, data mining, machine learning and artificial intelligence.
The scope of this project is to develop and deploy services, based on Data Science tools and applications, over a Data Common platform, based on computational and storage resources distributed globally, for use by the climate scientific community.