LERU STudent REseArch Mobility Programme (STREAM)
Project proposal

Host University:
Università degli studi di Milano

Field:
Information and Communication Technologies

Specified field, subject:
Computational intelligence

Research project title:
Artificial Intelligence for industrial, environmental, biometric, health care, and automotive applications

Possible starting month(s):

Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
X	X	X	X	X	X	X	X	X	X	X	

Possible duration in months:

1	2	3	4	5	6
				x	x

Suitable for students in:
2nd cycle (Master students)

Prerequisites:
For first project aspect: computer programming, basic in operations research and optimization.
For second project aspect: computer programming. Additional desirable prerequisites for the second project aspect: MATLAB, neural networks, fuzzy systems, foundations of continuous mathematics.
For third project aspect: background knowledge in cryptography or algebra. Additional desirable prerequisites: C programming.

Restrictions:
none

Description:
The project studies the use of computational intelligence and optimization techniques for intelligent systems a variety of applications (e.g., industrial manufacturing, biometric identification, environmental protection, health care, automotive, smart cities, smart communities).
This project addresses the following three areas, among which the student can choose his/her preferred topic:
Artificial intelligence (in particular, neural networks, deep learning networks, and fuzzy systems) are fundamental technologies for building intelligent

systems. This project will specifically focus on intelligent signal and image processing for industrial manufacturing, health care, biometric identification, automotive, and environmental protection.

The literature analysis in the prospective application area will provide an understanding of the specific application case. One of the following three application areas will be chosen in agreement with the student: in industrial applications, the monitoring and control of wood production processes will be studied; in environmental applications, the prediction of solar illumination for solar panel production will be considered; in biometric applications, gesture or emotion recognition will be addressed; in health care applications, signal and image analysis for various physiological signals and biological images will be studied; for automotive, signal and images for scenario understanding and person/object detection as well as for driver attention analysis will be considered.

The study of signal and image processing techniques for pre-processing and feature extraction will be studied and simulated in Matlab. A deep and broad mathematical background are not necessary since the required essential foundations will be briefly reviewed during the stage.

Artificial intelligence will be studied to implement high-level processing of the application features. In particular, classification, clustering, and prediction will be considered, also by exploiting machine learning and deep learning approaches. If interested, the student will deepen the analysis and the implementation (also in C language) of online and real-time solutions for these advanced processing techniques.

According to the topic of interest to the student, the specific supervisor will be prof. Vincenzo Piuri (vincenzo.piuri@unimi.it), prof. Stefano Ferrari (stefano.ferrari@unimi.it), prof. Fabio Scotti (fabio.scotti@unimi.it), dr. Ruggero Donida Labati (ruggero.donida@unimi.it), or dr. Angelo Genovese (angelo.genovese@unimi.it).

For the above aspects, it is worth noting that:
- the details of the project will be defined in agreement with the student, to take into account his/her specific aspirations, interests and competences;
- the student will not work alone on the selected project, but will work with the supervisor and his research team with their continuous assistance and guidance;
- the experimental cases are simplified versions derived from real cases which have been studied by the research team in national and European industrial projects. **Blended mobility (i.e. a combination of physical and virtual mobility) is an option to be agreed with the Tutor.**

Faculty or Department:
Department of Computer Science

Contact person: International relations office, University of Milan

Contact email: stream@unimi.it