Thesis proposals
Who we are?

“We are a young company, focused on the development and application of mathematical models and advanced scientific software for the optimal solution of engineering problems.”

“We combine Engineering, Math and Computer Science to solve the most challenging problems around.”
What we do?

• Numerical Simulation
• Scientific Software development
• Model & Algorithm development
• Numerics & HPC
• Data Analysis & Machine Learning
Computer Vision for Civil Protection

n.spiezia@m3eweb.it

Objectives:
The aim of the Thesis is to develop an algorithm able to reconstruct the 3D scene, using mainly stereophotogrammetrical techniques, and subsequently compute the displacements between sequences of images, defining thresholds in order to assess the risk of failure.

Introduction
M3E has been selected for the POR FESR project “Computer Vision for Civil Protection”, a R&D project supported by EU & Regione del Veneto to develop Computer Vision based algorithms to detect the inception of Landslides, and help to reduce the Hydrogeological risk.

During the project, real time images will be acquired by two cameras located in the so called ‘Frana Fantoni’ (VI - Italy), in order to monitor the evolution of the landslides thanks to the acquired images.

Project partners:
M3E, Dalla Gassa, EPC Consulting, University of Padua.

You will learn to:
- Develop algorithms for stereo images process
- Use Python & C++ for image processing
- Collaborate with a team of technicians
- Prepare Project Reports and Slide Deck in English

Requirements:
- Basic knowledge of Python and C++

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Deep Learning for Predictive Manufacturing

n.spiezia@m3eweb.it

**Introduction**

M3E has been selected as member of ImproveNet, an Innovation Network involving top firms from industry, such as Electrolux, Santex Rimar, Galdi, etc. and has been involved in PreMani project, a collaborative research initiative to develop predictive models based on Machine Learning for increase product quality and reduce failures, in the spirit of Industry 4.0.

During the project, several real time data will be collected from machineries, and the data will be used to create data driven models, able to identify anomalous conditions in the production plant.

**Objectives:**
The aim of the Thesis is to develop algorithms able to forecast time series, using Deep Neural Networks endowed for example with LSTM and GRU layers, and use the algorithms to identify anomalous pattern in the time series.

**Project partners:**
ImproveNet – Innovation Network

**You will learn to:**
• Develop Machine Learning & Deep Learning algorithms for time series predictions.
• Collaborate with a team of technicians.
• Prepare Project Reports and Slide Deck in English.

**Requirements:**
Basic knowledge of Data Science and Python

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**Objectives:**
Develop and implement algorithm and software for Digital Twin solution in the offshore industry.

**Requirements:**
Basic knowledge of Data Science and Python

**Project partners:**
Saipem

**You will learn to:**
- Develop Machine Learning & Deep Learning algorithms for time series predictions.
- Collaborate with a team of technicians.
- Prepare Project Reports and Slide Deck in English.

**Introduction**
A Digital Twin is an integrated multiphysics, multiscale, probabilistic simulation of an as-built system that uses the best available models and sensor input data to mirror and predict activities/performance over the life of its corresponding Physical Twin.

The key idea of Digital Twin is that, instead of creating a numerical model only for design purposes, the model is continuously updated with real time data collected from sensors. This technology is crucial for many application field, but in particular in the off-shore industry, where environmental condition may be severe.

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Objectives:
The aim of the Thesis is to develop and test highly efficient sparse linear algebra kernels as building blocks of a software library for the solution of very large and sparse linear systems of equations or eigenproblems.

Introduction
The solution of linear systems of equations or eigenproblems is often the most expensive task, in terms of computational resources, for several simulations in science and engineering. M3E is developing a software library for the solution of large size linear algebra problems on High Performance Computers able to take advantage of the modern manycore architecture. To this aim, it is necessary to develop and test highly specialized kernels to perform basic operations such as sparse matrix by vector or matrix by matrix product specifically designed on the hardware, be this a CPU or a GPU.

You will learn to:
• Develop scientific algorithms for modern hardware
• Code in C++, CUDA and use HPC infrastructures
• Collaborate with a team of technicians
• Prepare Project Reports and Slide Deck in English

Requirements:
• Basic knowledge of C++ and good programming skills

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More Info?

Please shot us an e-mail, we will be honored to invite you for a coffee!

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