



Intelligence for Embedded Systems: the projects

Ph. D. and Master Course

Manuel Roveri

Politecnico di Milano, DEIB, Italy



- **Project/Thesis**

- a) Analysis of the literature

- b) Design of a solution

- c) Development of the designed solution

- d) Experimental Analysis

- Different combinations for a, b, c, d but $a+b+c+d=100\%$

- Different workloads for Ph.D. and Master Students

- Up to two people

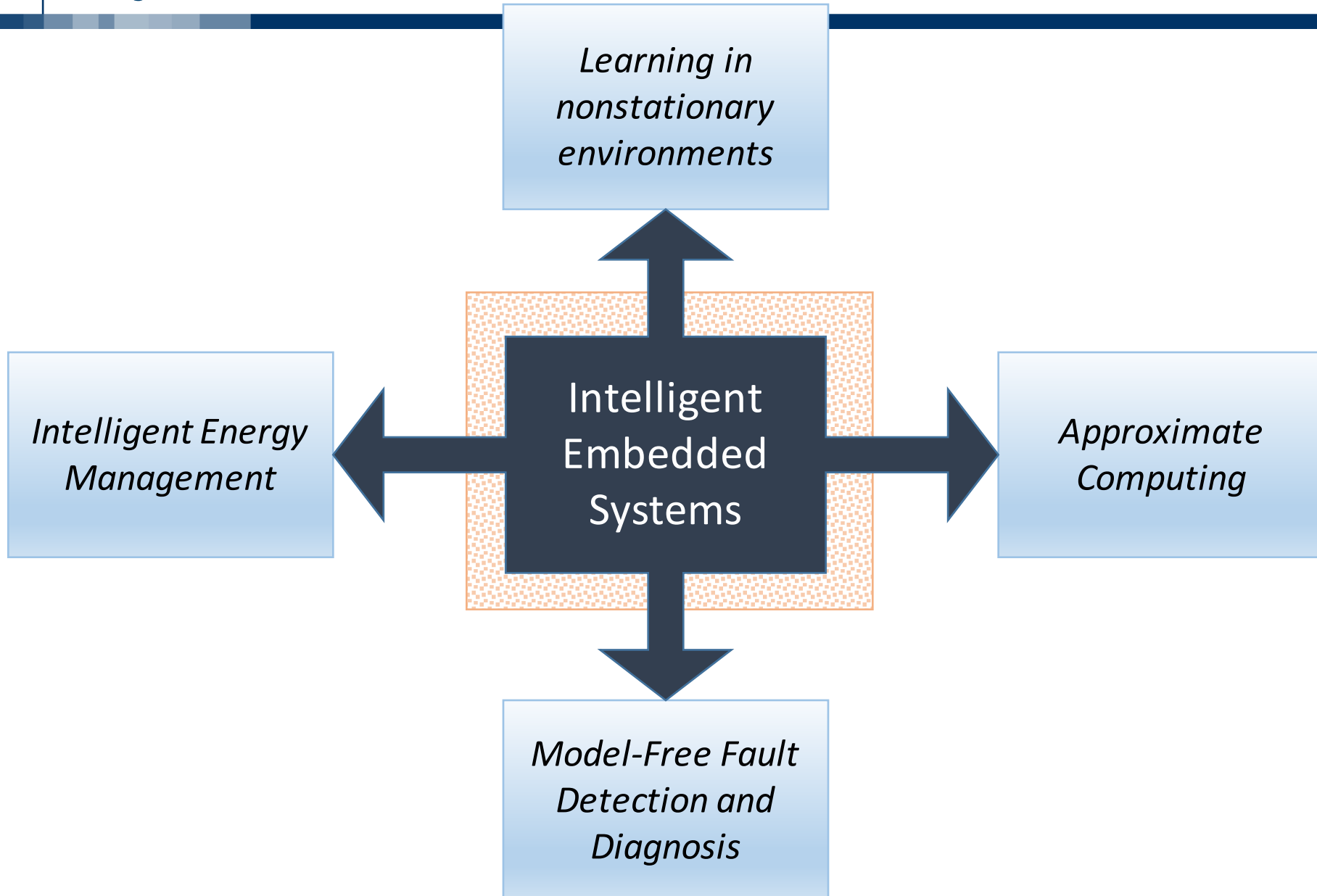
- ***Project Deadline (tentative): June, 30***



Project Topics



Project Research Areas





Project Contents

- The students can select the layer they want to operate in:
 - Embedded System
 - Matlab (Simulation)
- For the Embedded System:
 - Pick up one topic
- For the Matlab (Simulation)
 - Pick up two topics
- **Quality and not quantity**



“Ready-to-go” projects: Embedded Systems

- Design and development of **Intelligent Mechanisms for embedded systems**
 - Recurrent Neural Networks for datastream learning
 - Correlation analysis based on single/multiple units
 - Adaptive sampling for energy conservation
 - Change detection and learning mechanisms on networked embedded systems (e.g., graph analysis)



“Ready-to-go” projects: Matlab

- **Analysis of a model** (e.g., FFNNs) from one of the following points of view:
 - Accuracy-Complexity
 - Accuracy-Memory
 - Accuracy-Energy consumption
- **Learning models with technological constraints** (survey)
- **Combining learning in non-stationary environment** with
 - Fault detection
 - Energy management
- **Combining fault detection with energy management**



Learning in Nonstationary Environments (Matlab)

- **Change detection** mechanisms for multivariate and big data
 - Multivariate CPM-based change detection
 - Analysis of performance in big data scenarios
 - Qualitative datastreams
- **Application scenarios**
 - Textual information, user preferences, sentiment analysis, etc..
- **CDT demos on datastreams/residual**



Learning in Nonstationary Environments (2)

- **Learning** for multivariate and big data
 - Analysis of performance in imbalance datasets
 - Dynamic knowledge base management
 - Adaptive and ensemble classifiers
- **DEMOS on prediction/classification:**
 - Active solutions
 - Passive solutions
- **Application scenarios**
 - Textual information, user preferences, sentiment analysis, activity recognition, etc..



Probabilistic Computation in Embedded Systems

- *From a determinist to a probabilistic framework in embedded systems*
- **Topics:**
 - Randomized Algorithms
 - Robustness Analysis
 - Performance estimation and Probably Approximately Correct Computation