

Project Outline

EMEC-5173: Intelligence Tools for Engineering Applications

Objective:

Develop a neuro-fuzzy (NF) system for engineering design applications. It can be used for system modeling (e.g., system state forecasting), pattern classification (e.g., diagnostics), and intelligent control. Appropriate learning algorithms should be implemented and applied for linear/nonlinear system parameter training.

Requirements:

- 1) PhD students should do individual projects. MSc students can do the work with a group of two.
- 2) The NF system could have **at least THREE inputs**, and each input should have at least two membership functions. One output can be used for programming.
- 3) Programming can be undertaken in MATLAB environment. The fundamental functionalities such as fuzzy reasoning and training should be programmed by yourself instead of using MATLAB toolboxes.
- 4) Hybrid training should be used for parameter optimization: The LSE can be used for linear parameter training and the gradient descent algorithm can be applied for nonlinear system parameter optimization.
- 5) The corresponding ANFIS model in MATLAB can be used for performance comparison in terms of reasoning and training. The ANFIS model should have similar fuzzy reasoning and training algorithms.
- 6) It is recommended to use an error threshold of 10^{-5} and 200 training epochs.

Project report:

- 1) Each group should provide one project report and MATLAB code.
- 2) The report should contain sections such as Introduction, Theory Review, Model Construction, Testing and Result Analysis, Conclusion, and References.
- 3) The project report should use 12 font size, 1.5 line space, and 1 inch page margins.
- 4) Report due: 6:00PM, April 16, 2019.