TU WIEN
TECHNISCHE UNIVERSITÄT WIEN

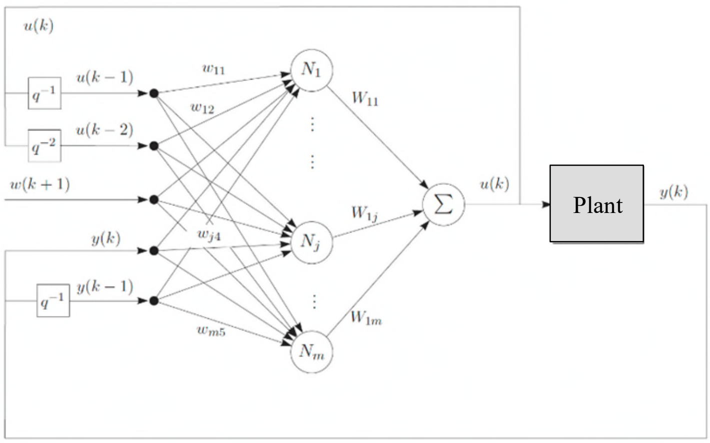
INSTITUT FÜR MECHANIK UND MECHATRONIK
Mechanics & Mechatronics

Announcement BA / PROJ / SEM

Teaching and Demonstration Material on AI-Based Control Methods

Content

This project aims to develop comprehensive lecture and exercise materials for a new course on AI-based control methods. The student will prepare well-structured, illustrated, and pedagogically sound content in LaTeX, covering both theoretical and practical aspects. Core topics include modeling approaches (perceptrons, linear model networks, radial-basis function networks, deep and convolutional neural networks), learning methods such as clustering and autoencoder concepts, and control strategies including optimal control via dynamic programming and Pontryagin's principle, neural-network-based MPC, reinforcement learning, adaptive control, and feed-forward control via model inversion. The work involves creating clear MATLAB and/or Python examples, iteratively re-fining the material in colla-boration with the supervising lecturer.



Tasks

1. **Topic and Example Definition:** Clarify the specific focus, example problem(s), and scope of the project in consultation with the supervising lecturer.
2. **Literature Review:** Conduct a focused review of relevant literature on AI-based modeling and control methods to identify key concepts, algorithms, and representative applications.
3. **Example Development:** Implement illustrative MATLAB and/or Python examples demonstrating selected AI-based modeling and control techniques.
4. **Material Preparation:** Prepare structured and visually clear lecture and exercise materials in LaTeX, including figures, explanations, and code snippets.
5. **Documentation and Code Polishing:** Ensure code readability, reproducibility, and alignment with didactic goals.
6. **Iterative Review and Refinement:** Engage in feedback cycles with the supervising lecturer to refine both content and presentation quality.

Requirements / Prior Knowledge

The work will be written in English.

- Solid understanding of **control theory fundamentals** (e.g., state-space modeling, feedback design, and stability concepts).
- Proficiency in **MATLAB and/or Python** for simulation, data processing, and control implementation.
- Experience with **LaTeX** for scientific documentation (or willingness to learn it quickly).
- Any **prior exposure to AI or machine learning methods** (e.g., neural networks, reinforcement learning) is advantageous but not mandatory.

If you are interested or have questions, please do not hesitate to contact us.

Contact

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