Student Research Position Quality Predictive Control: Optimal Control of Production Processes using Approximate Dynamic Programming

Project Description:
Achieving optimal product quality is the ultimate goal of all industrial processes. This project focuses on developing control strategies to steer an industrial production system toward this goal. We aim to design an optimal controller based on Dynamic Programming or Reinforcement Learning (RL) methods—specifically using Q-learning and delayed reward mechanisms—to regulate and improve the quality dynamics of the production process.

Responsibilities:

- Implement reinforcement learning algorithms (Q-learning, sparse reward, reward shaping, etc.) for quality control problems.
- Formulate and solve optimal control problems using approximate dynamic programming.
- Simulate and evaluate control policies in Python (using PyTorch when applicable)
- Run experiments on high-performance computing clusters.

Requirements:

- Familiarity with Reinforcement Learning (RL) and Optimal / Dynamic Programming.
- Python programming skills (Optionally experience with PyTorch.)
- Interest in control systems, optimization, or intelligent manufacturing.

For more information or to apply, please contact:
[Negar Arabizadeh]
[negar.arabizadeh@kit.edu]