Multi-Agent AI Toolbox for Physics-Informed Equation Discovery

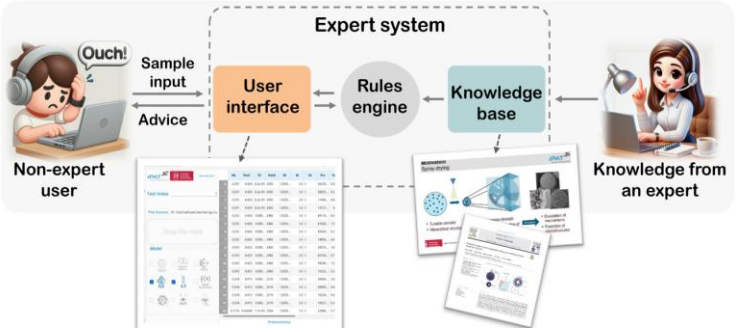
iPAT
Institut für Partikeltechnik

Bachelor's – Master's Thesis / Student Project

Large language models and multi-agent AI systems can help researchers discover interpretable, physically meaningful equations from engineering data. In this project, an existing LLM-driven symbolic regression framework will be extended into a multi-agent AI toolbox that integrates modeling modules such as dimensional analysis, symbolic regression, physics-aware equation scoring, feature engineering, and knowledge-based reasoning. The goal is to build a modular workflow where specialized AI agents and scientific tools work together to guide equation discovery toward models that are accurate, interpretable, dimensionally valid, and useful for process engineering applications.

Your Tasks:

- Test and improve the existing LLM-agent symbolic regression framework
- Explore how different modules can be connected as tools for an AI agent
- Design a simple multi-agent workflow for physics-informed equation discovery
- Use agents for tasks such as variable analysis, dimensional checking, PySR configuration, equation evaluation, and result interpretation
- Optionally contribute to a prototype interface for using the toolbox on engineering datasets



Methods:

- LLMs and multi-agent AI systems
- Physics-aware equation evaluation
- Python programming
- Streamlit or web-app prototyping

Requirements:

- Interest in AI, scientific modeling, and interpretable equations
- Basic Python skills
- Motivation to work with engineering data
- Structured and independent working style
- Background in engineering, data science, or ML is helpful

Start:

Immediately, or by arrangement

- The duration and focus will be adjusted to the requirements of each kind of thesis.
- We can arrange a personal conversation at any time and discuss this or other topics without obligation.

Kontakt:

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