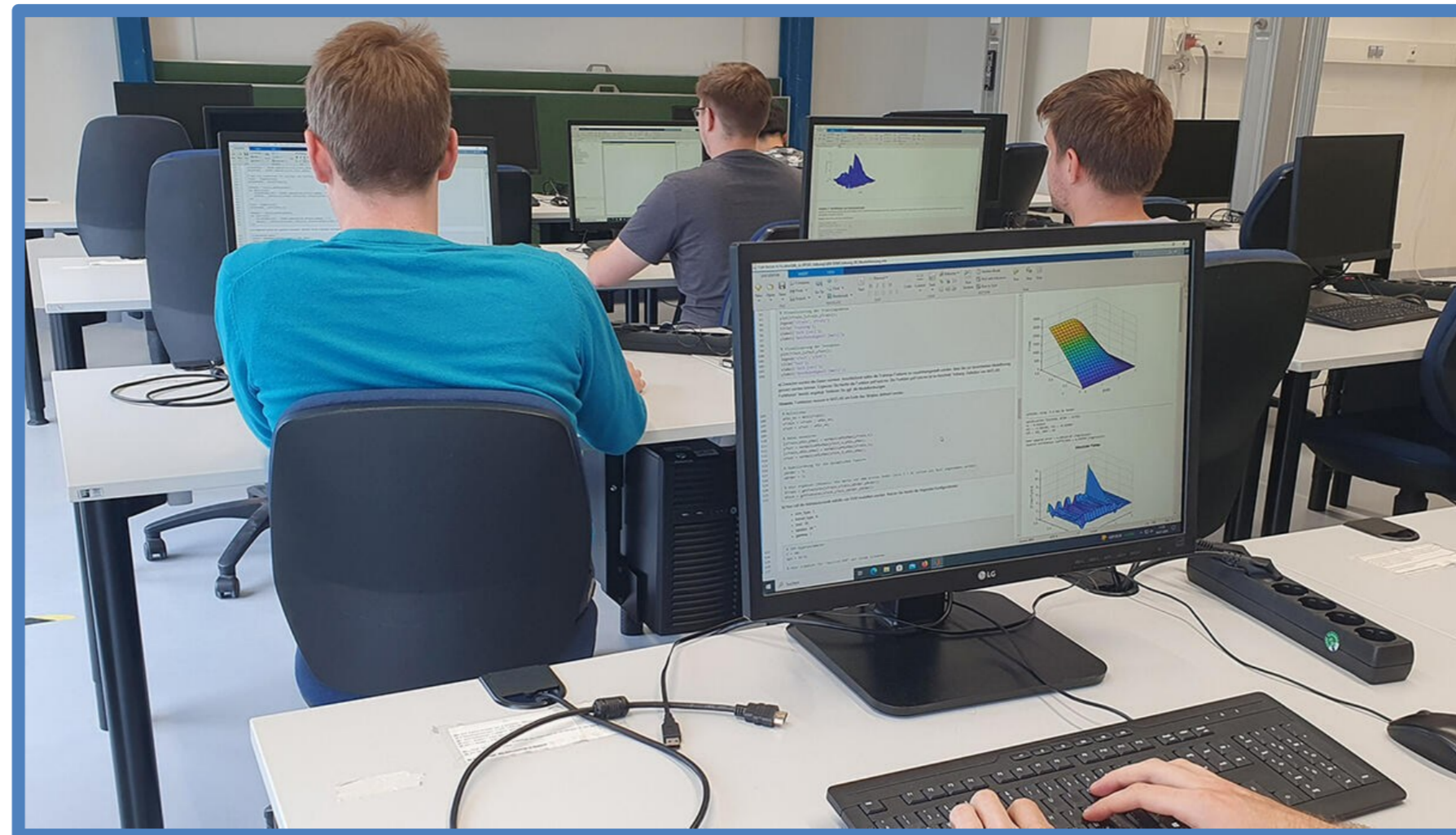


# AI Tutor for Programming Exercises

## Combining Results- and Code-Based Feedback

### Challenges

- Many ways to solve code-based engineering tasks
- Shortage of tutors
- Tutors only available during exercise sessions



Dr.-Ing.  
Sebastian  
Stemmler



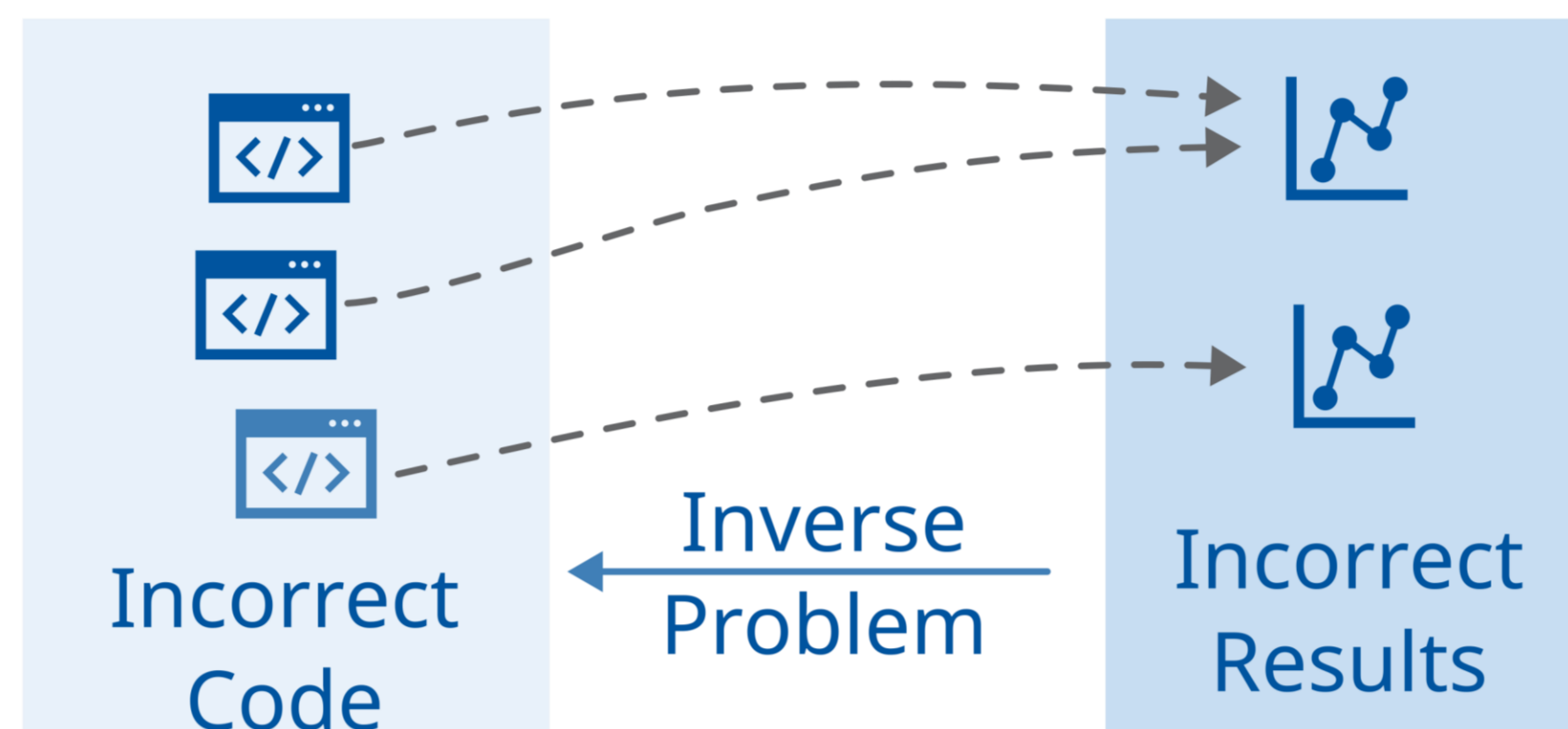
Jens  
Ahlers



Robert  
Göllinger

### Results-based Feedback

- + Validates correct solutions beyond predefined templates
- Error diagnosis becomes an **inverse problem**

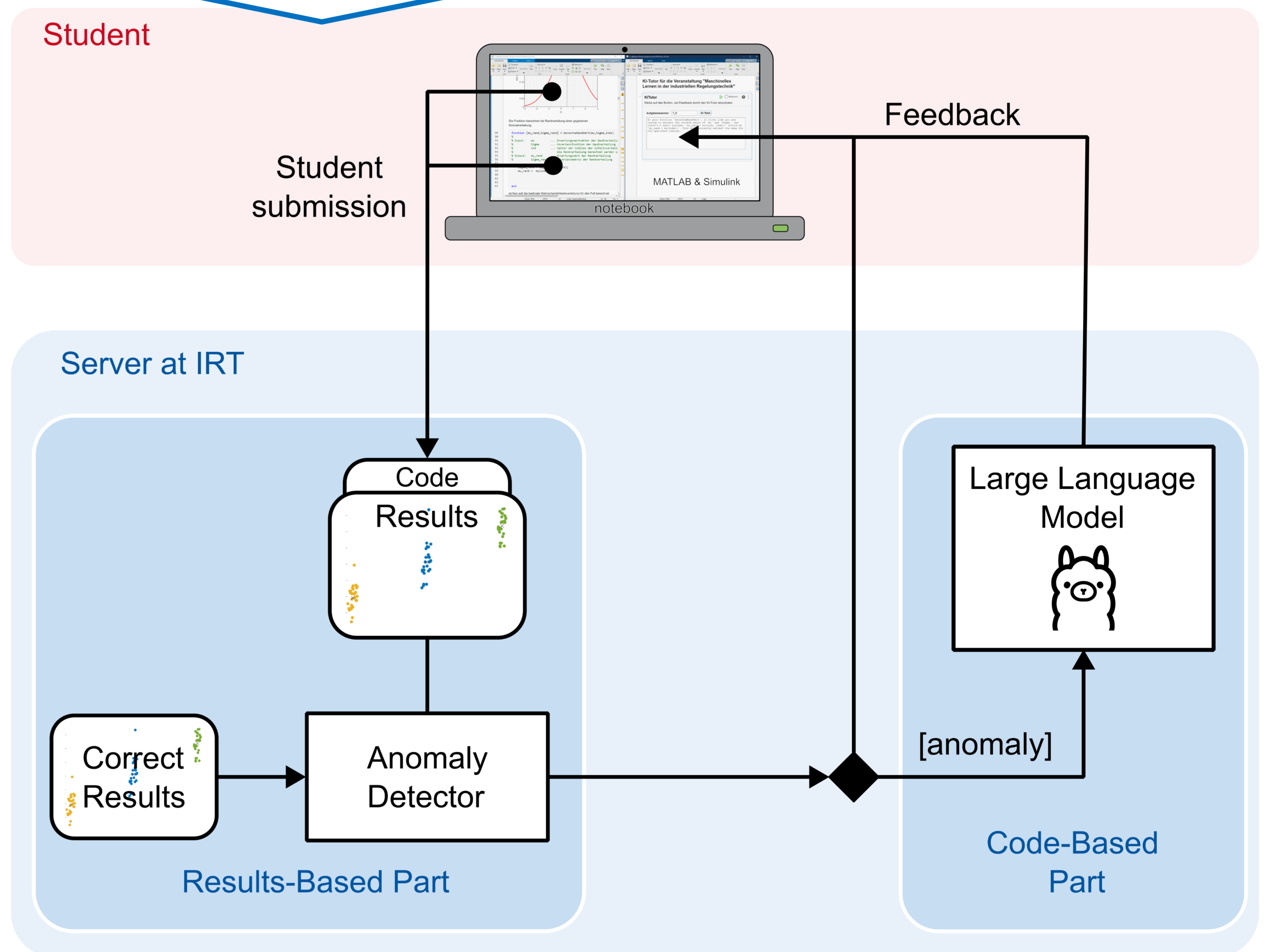


### Code-based Feedback

- + Forward problem
- Favors known solution patterns
- Not applicable to graphical programming (e.g. Simulink)

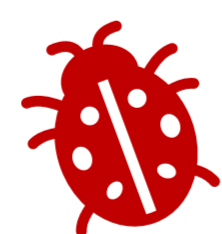
### Approach

- Adaptive feedback by tracking the number of attempts
- Anomaly Detection applied to student solutions
- Anomalous student solutions forwarded to an LLM for error diagnosis
- Student solutions and system responses stored anonymously for system improvement inside a data base
- Multiple solution paths are accepted as correct when they produce valid results.
- Students encountering difficulties are guided toward the reference solution.



### Further Steps

- **Course trial:** *Machine Learning in Industrial Control Engineering*
- **Refining** the feedback algorithm with the gathered feedback and stored data



### Future Vision

- Expanding to more programming courses



### Further Information and Contact

01.04.2024 → 31.03.2026

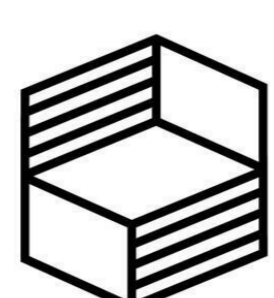


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