



# **PROOFBUDDY**

Acquiring Proof Competence with Friendly Assistance

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# Introduction



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## **Proof Assistants**

#### **Advantages**

provide instant feedback (correctness, completeness)

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- · can help students to write and verify proofs
- often resemble functional programming

#### Disadvantages

- hard to get started
- · lots of (sometimes unintuitive) features to learn
- requires installation



# **Opportunities of a Web Interface**

- no installation
- restrict features for specific learning goals and exercises
- introduce features one by one
- individual feedback for students
- · collect data about the students' behavior/challenges
- exercises tailored to students' learning needs



# **Comparisons to other Approaches**

- Lean: web introduction
- Coq: web interface jsCoq
- Isabelle/HOL:
  - several simple proof assistants available on the web, but none with the full power of Isabelle/HOL

- Clide: but never used for teaching and now defunct
- not aware of any systematic use of behavioral data from a proof assistant



### **PROOFBUDDY**



#### Figure: Screenshot of the interface of a prototype of PROOFBUDDY



# **Teaching Approach**

- MSc course in automated reasoning at DTU, spring 2023
  - testing the tool
  - first-order logic
  - functional programming
- BSc course on proof competence acquisition at TUB, summer 2023
  - back-and-forth transformation between formal and pen-and-paper proofs
  - 1st, propositional and first-order logic
  - 2nd, inductive data structures and more functional programming
- long term: use of behavioral data for didactic research



# **Comparisons to other Approaches**

- Lean: first and second year course at Carnegie Mellon University
- Coq: master course at University of Potsdam
- Isabelle:
  - master course in semantics at TU München
  - Computational Metaphysics at FU Berlin

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## Conclusion

• PROOFBUDDY,

a web interface for the Isabelle proof assistant for teaching

- web interface alleviates some issues for students and opens many new opportunities
- short term plan: test our approach in a MSc and a BSc course
- · long term plan: carry out didactic research