

DIGIN

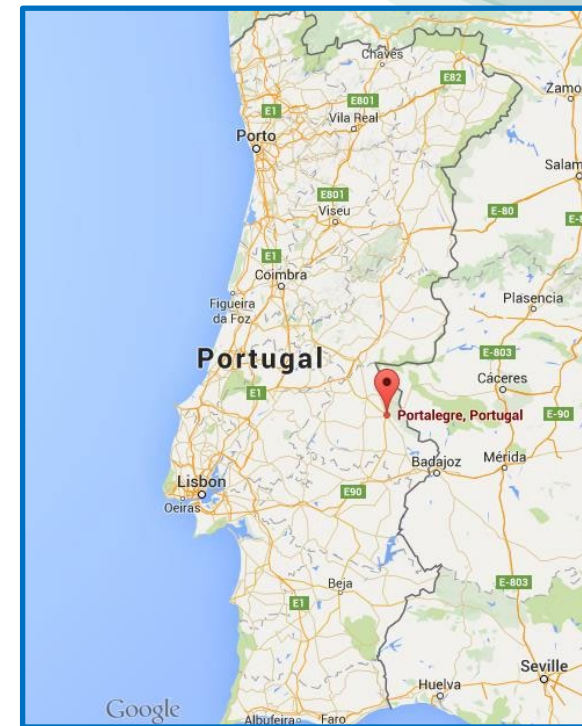
Digital Inclusion in the Information Society

Mathematics and Critical Thinking in the AI Era: Rethinking Classroom Practices

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AI-Enable

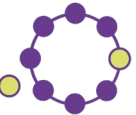


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AI-Enable

Welcome to

AI-Enable

ERASMUS+ project

**“Enhancing Inclusive Education
in Higher Education Institutions
with Artificial Intelligence”**



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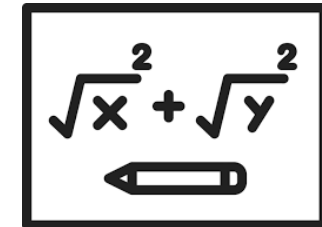
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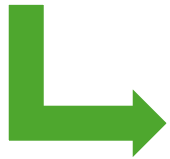
□ Motivation

- ✓ AI is increasingly present in education. Students are using it. Aren't you?
- ✓ Mathematics plays a strategic role in developing **critical thinking**
- ✓ Challenge: Moving beyond formula-based, mechanical approaches

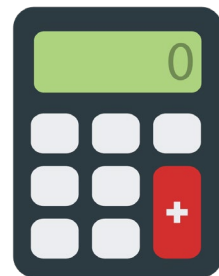


❑ Where are we? What are the Challenges

Students highly rely on LLM



LLM are considered a ground truth



$$4 \times 4 = 16$$



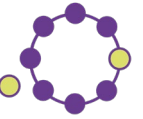
❑ Where are we? What are the Challenges

Students were trained to rely on machinery
and to reasoning from this point



Students need to question
the machine!





□ Where are we? What are the Challenges

Do machines think?

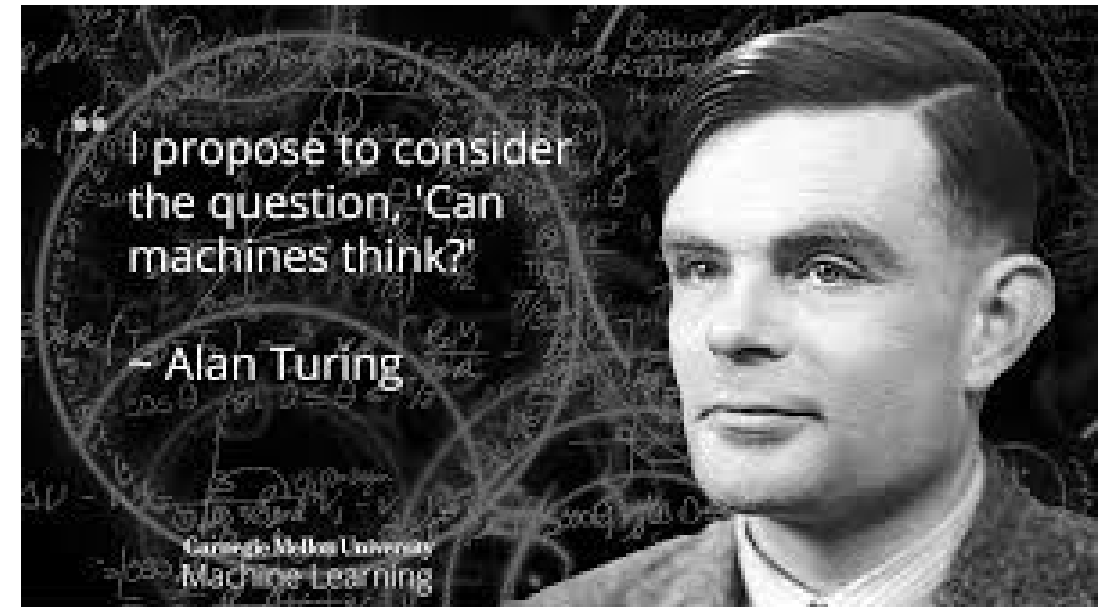


What is intelligence?



https://en.wikipedia.org/wiki/Enigma_machine

<https://medium.com/@jetnew/a-summary-of-alan-m-turings-computing-machinery-and-intelligence-fd714d187c0b>

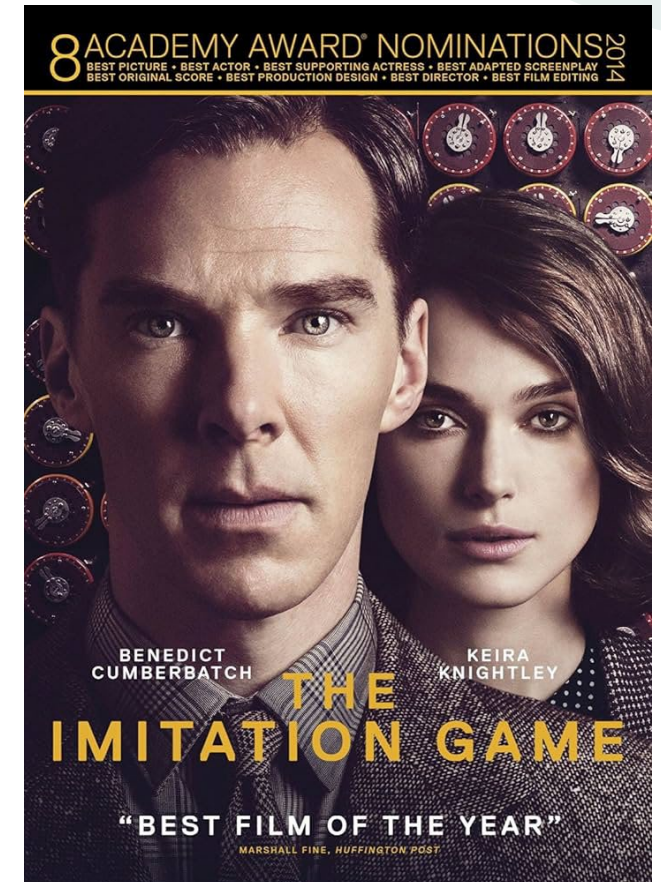


□ Where are we? What are the Challenges

***Turing Test** - originally called the imitation game by Alan Turing in 1950, is a deceptively simple method of determining whether a machine can demonstrate human intelligence.*

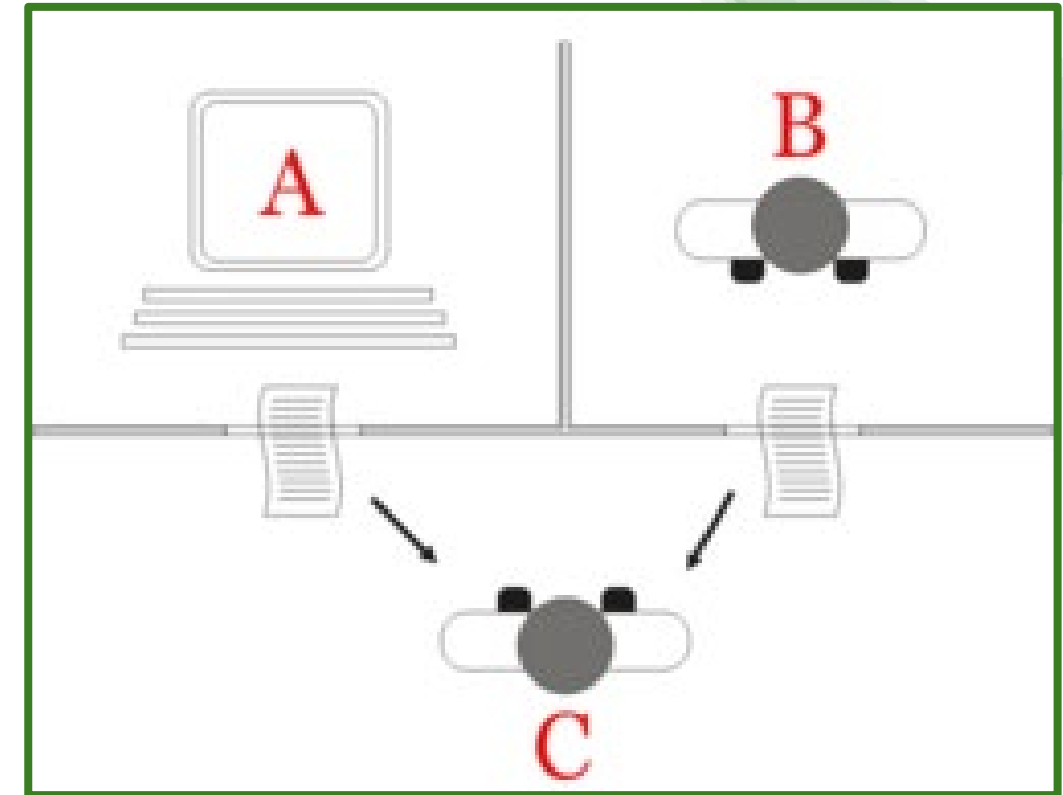
If a machine can engage in a conversation with a human without being detected as a machine, it has demonstrated human intelligence.

Try to watch the film: [The Imitation Game \(2014\)](#)



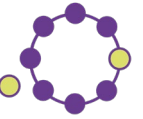
□ The Imitation Game

The "standard interpretation" of the Turing test, in which player C, the interrogator, is given the task of trying to determine which player – A or B – is a computer and which is a human. The interrogator is limited to using the responses to written questions to make the determination.



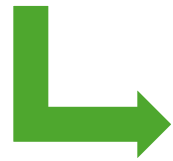
https://en.wikipedia.org/wiki/Turing_test

- **ChatGPT** (GPT-4.5) passed the Turing Test. The AI fooled 73% of people into thinking it was human, raising new questions about machine intelligence.
- **Google** has both been the subject of claims about its AI passing the Turing Test, particularly with the Google Duplex AI in 2018 and the LaMDA AI in 2022.

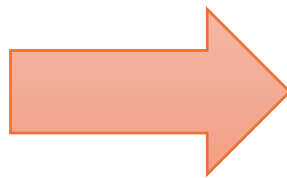


❑ Where are we? What are the Challenges

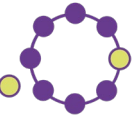
Do machines **DO NOT** think?



Machines **INTERPRET** questions
and search for the best possible
answer!

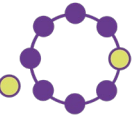


Prompt Engineering



□ Where are we? What are the Challenges

It is essential to **train** our students to **question the models adequately** and to **interpret** the results, not as a ground truth, but as something to further **analyze**, **question**, and **develop**.



□ Research Objectives

01

Integrate AI tools
(ChatGPT, Copilot) in
statistics teaching

02

Promote **autonomy,**
critical thinking, and
collaboration

03

Evaluate students'
ability to formulate
hypotheses and solve
problems with AI
support

□ Theoretical Framework

Risks of AI

- Over-reliance
- Shallow reasoning
- Misinformation

Opportunities

- ✓ Personalized learning
- ✓ Cognitive mediation
- ✓ Immediate feedback

The key is to train students in AI literacy so they use these tools **critically** and **ethically**.

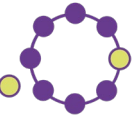
❑ Methodology

Qualitative, Exploratory Design

➤ 2 sessions (120 minutes each), 15 Bachelor education students

❑ **Session 1:** Guided Exploration of AI → Focus on asking questions & interpreting responses

❑ **Session 2:** Group problem-solving with AI support



□ Problem-Solving Tasks

✓ Problem 1

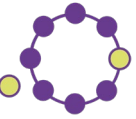
Do students sleep < 7 hours? $\rightarrow$ *t-test for one mean*

✓ Problem 2

Are $>60\%$ of users satisfied with an AI app? $\rightarrow$ *z-test for proportion*

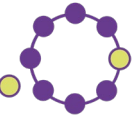
✓ Problem 3

Difference between two groups (textbooks vs. AI-assisted) $\rightarrow$ *t-test for two means*



□ Assessment Criteria

Criterion	Beginner (□)	Intermediate (△)	Advanced (□)
Hypothesis Formulation	Struggles with H_0/H_1	Correct H_0/H_1 in simple cases	Accurate H_0/H_1 , correct test
Interpretation of Results	Misinterprets p-value	Usually interprets p-value	Understands p-value & errors
Use of AI	Copies AI answers	Uses AI functionally	Critically evaluates AI
Collaboration	Minimal participation	Contributes to discussions	Active collaboration



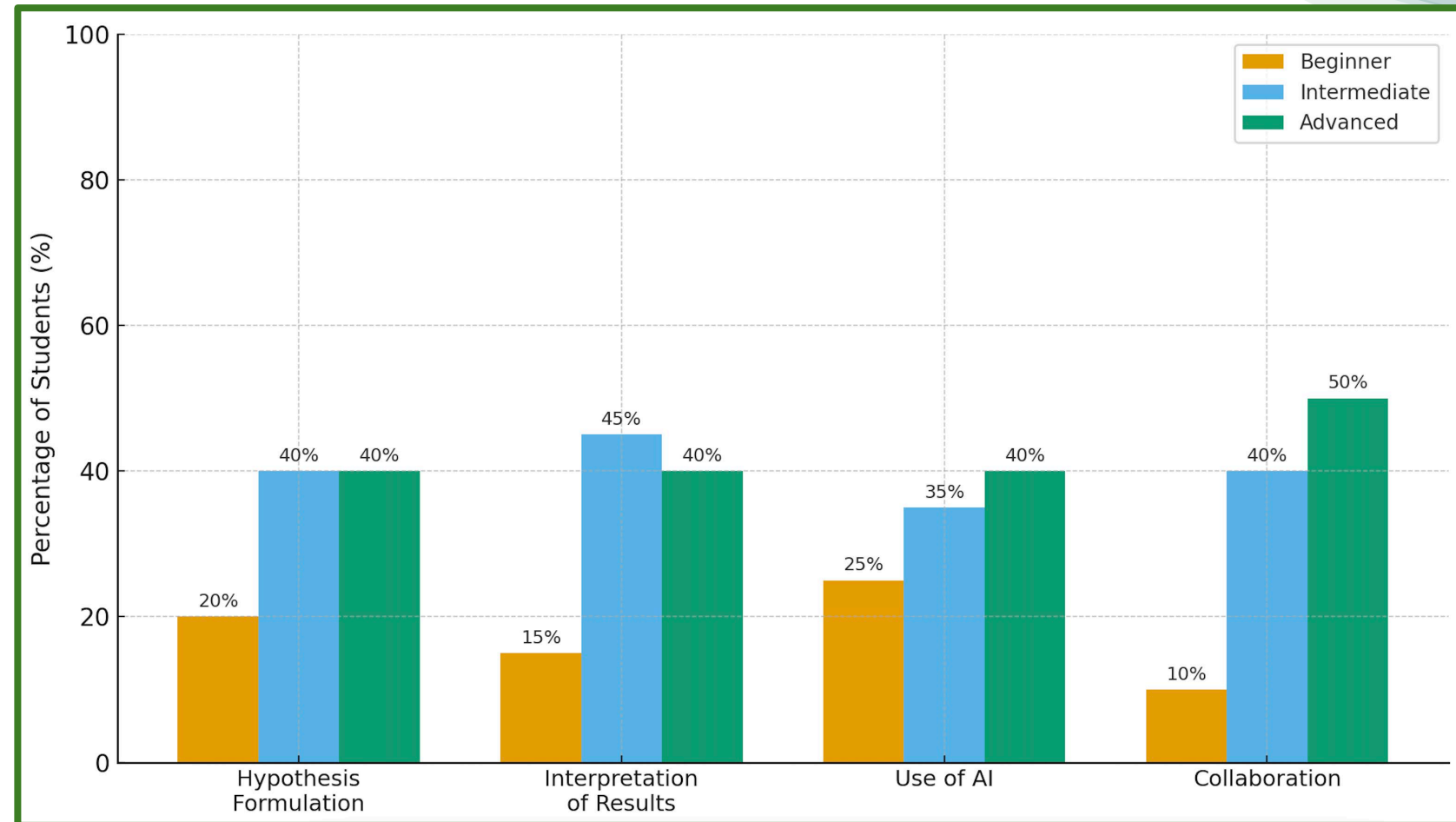
□ Theoretical Framework

Students showed **greater autonomy** in problem solving

Improved **question formulation** and use of statistical language

More **critical and reflective** use of AI

Stronger **collaboration** and **peer discussion**

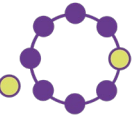


Conclusions

AI integration in math classes can:

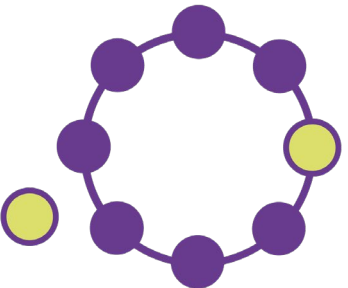
- Strengthen critical thinking
- Enhance student autonomy
- Improve understanding of statistical inference

Teacher training is essential for meaningful AI use



□ Future Directions

- Test approach in **different education levels**
- Develop **curriculum frameworks** with critical thinking as a transversal skill
- Explore **human + AI combined assessment** strategies



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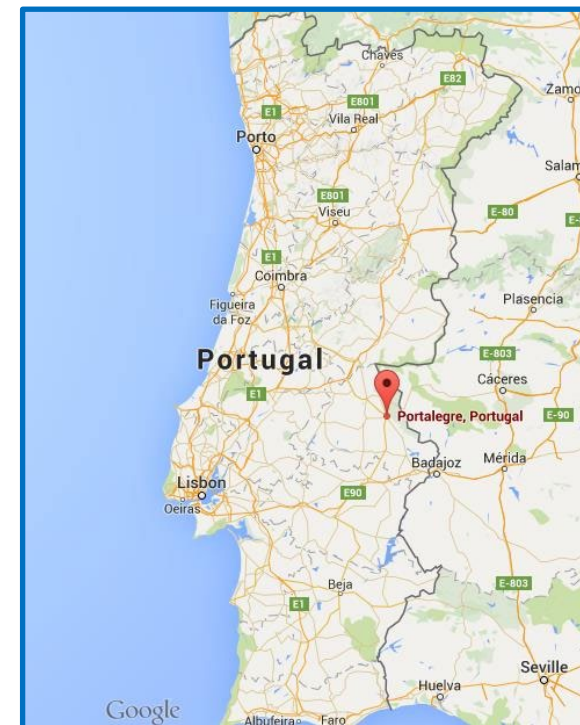
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Q & A



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