TURUN YLIOPISTO

Aalto-yliopisto

DIGITAL GAMES and Quantum Physics in University

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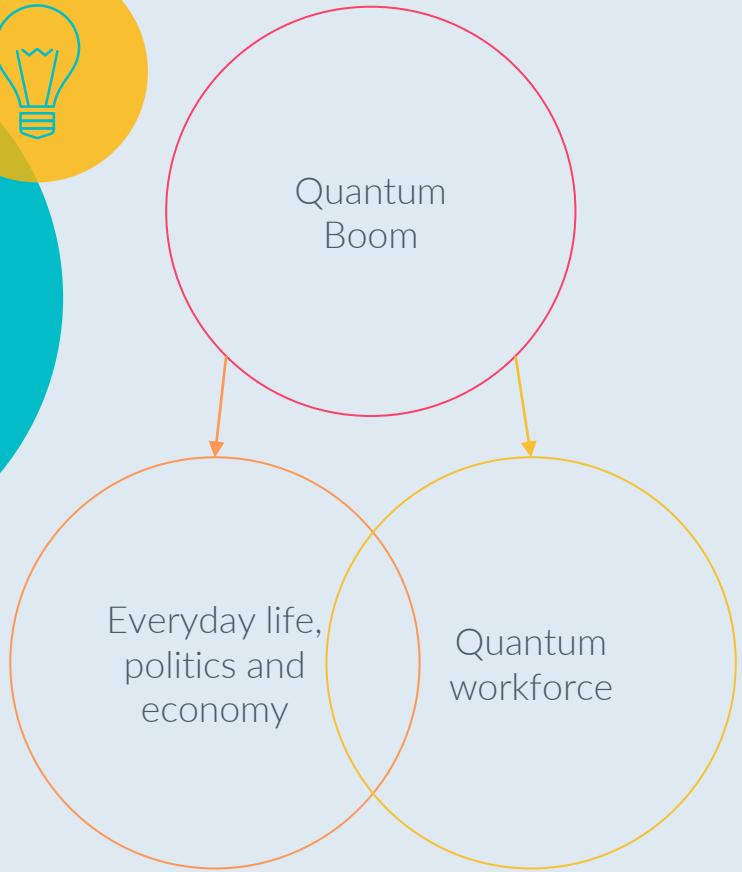
MPTL'26


1.
Motivation

Why Quantum Physics for university students?

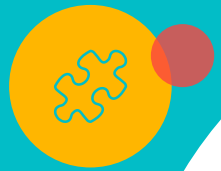


Challenges in educating students with Quantum Physics

Interest

Conceptual change

GAMES



2.
Games

Quantum Games

Defined by Piispanen et. al.

”Quantum Games are games that reference the theory of quantum physics, quantum technologies, or quantum computing through perceivable means, connect to quantum physics through a scientific purpose or use quantum technologies.”

SCAN ME

L. Piispanen, M. Pfaffhauser, A. Kultima, and J. R. Wootton, *Defining Quantum Games*, arXiv:2206.00089 (2023).

Ways of using quantum games

Event
or
Workshop

Online
studying

Course
or
Course with a twist

Event or workshop

FUN IN THEORY

Annual event in the University of Turku,

aimed to inform and attract bachelor students to Theoretical Physics courses, or master's programme.

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FUN IN THEORY

1. Introductory lecture (Theory)	2. Playing games (Fun)	3. Sozializing with snacks
Information (2 h)	Application (2 h)	Reflection (1,5 h)

https://quantumgame.io/

Quantum game with photons 2

https://testtubegames.com/srel101.html

Velocity Raptor

https://quantumfrontiers.com/2019/07/15/tiqtaqtoe/

Quantum TiqTaqToe

Online Platform

QPlayLearn

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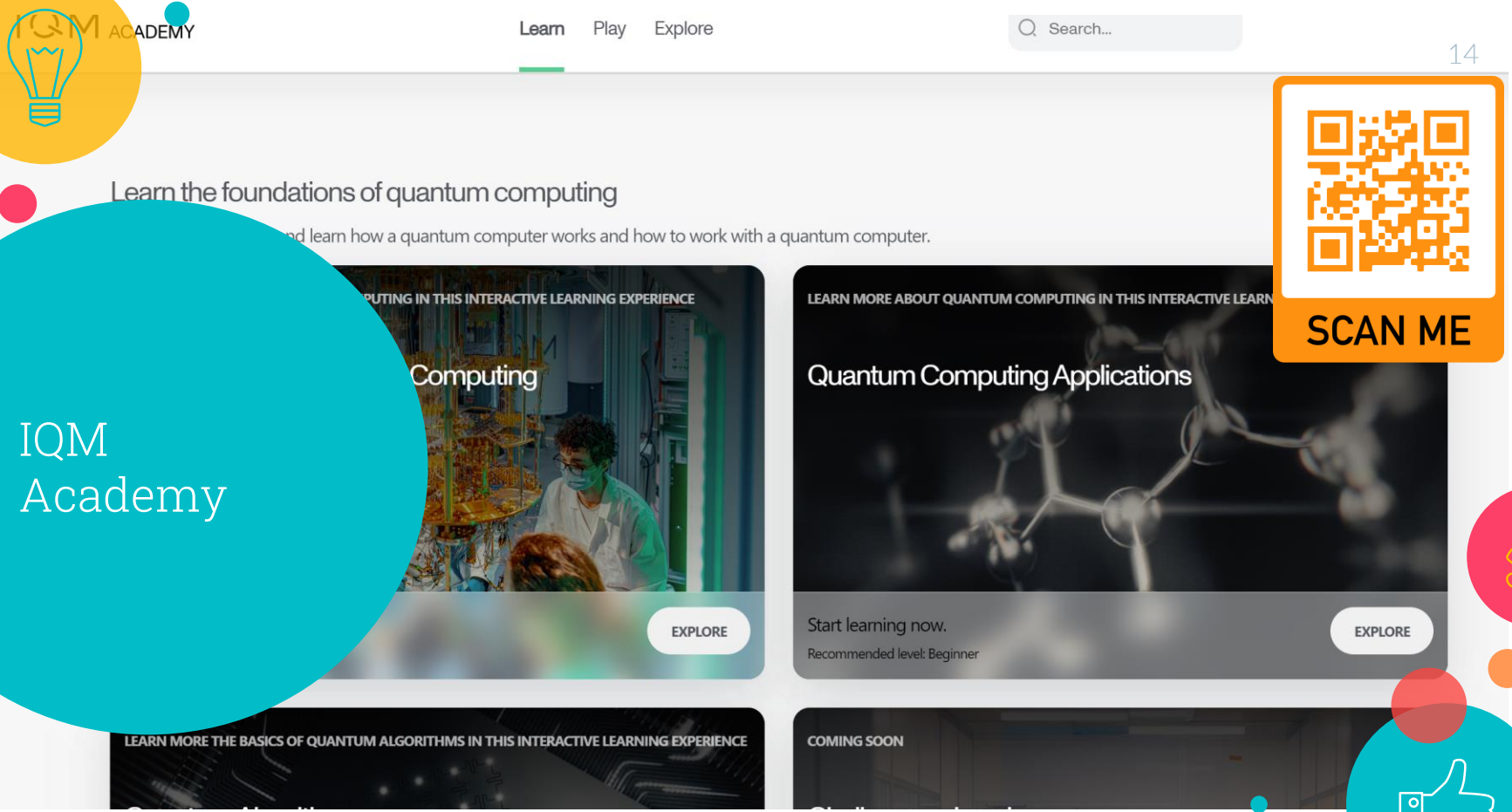
IQM Academy



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Quantum Games Course

Aalto Quantum Games

At Quantum Games university course, while creating games,

students get to know both quantum physics and game development process.

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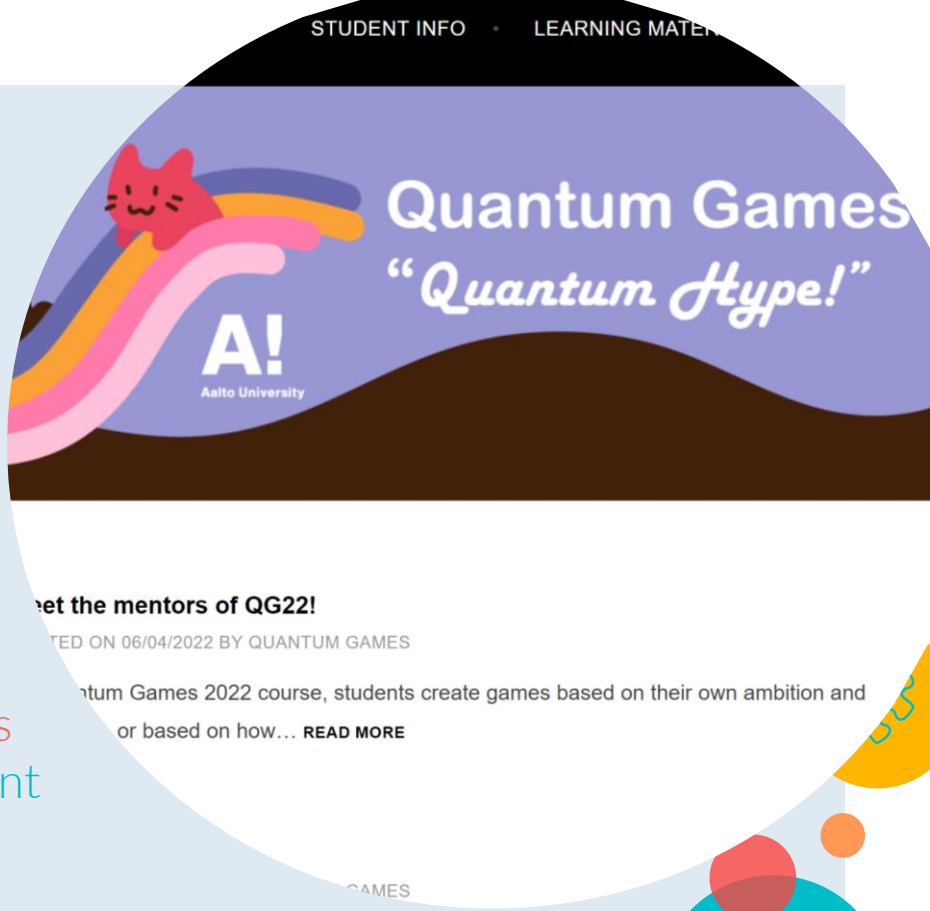


Pilars of the course

1. Discord channel

For student-teacher, student-mentor interactions,

For updates on the progress,

For materials and homework

2. Homeworks and learning legacies

What quantum physics related have you learned?

What have you learned about game development?

3. Flexibility of learning

3-9 ETCS available

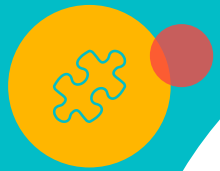

3.
Results

Fun in Theory:

- The event seemed to have planted seeds for potential later growth of interest. It affected participants' attitudes and views as well as the topics of interest related to quantum physics. These aspects became more positive, realistic, rational, and versatile.

Aalto Quantum Games:

- We received positive feedback from students about the source and its structure. They also seemed to effectively learn at least some basics both about quantum physics and game development.

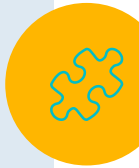


4.
Take home message

- The research about benefits of quantum games in quantum physics education is only “in its infancy” (Michelini et. al.) →

  We need yohu to help developing this area of research.

- Get inspired by all the ideas and resources from this presentation.
- Use them!
- Let us all together do more research!



M. Michelini and A. Stefanel, Research studies on learning quantum physics, in *The International Handbook of Physics Education Research: Learning Physics*, pp. 8-1-8-34.

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Quantum Game Jam

Three-day game jam
15.-17.9.
aimed at
creating games
related to
Quantum Physics.

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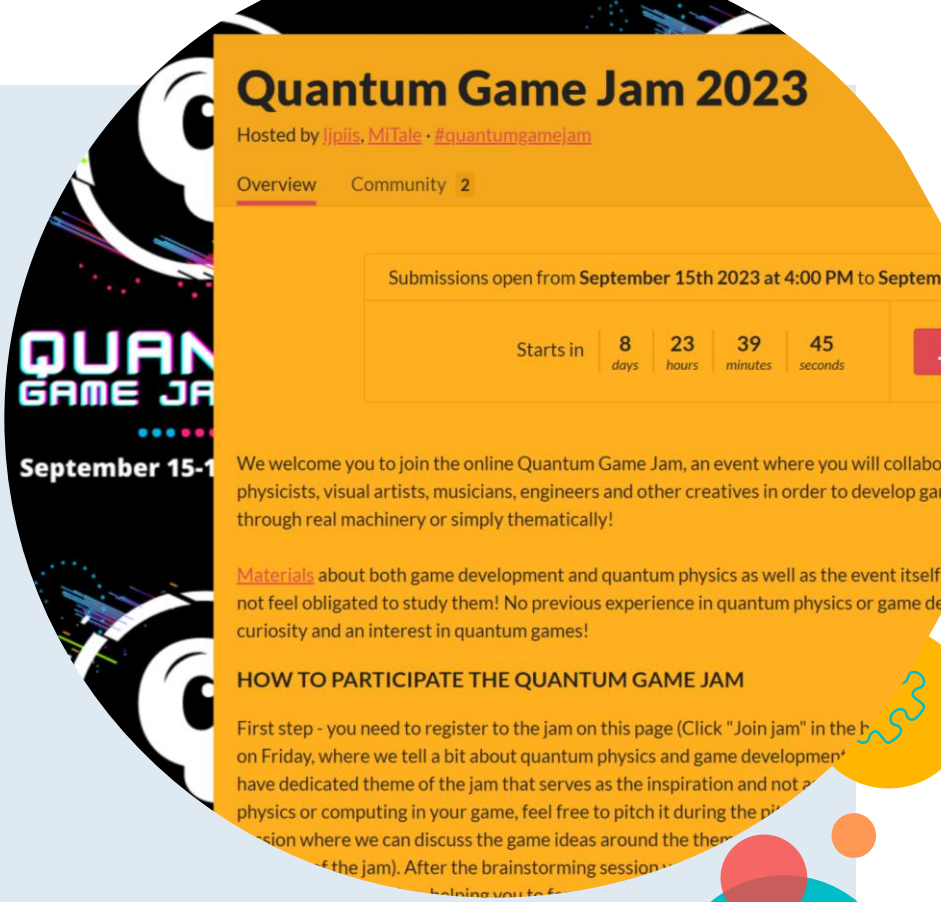
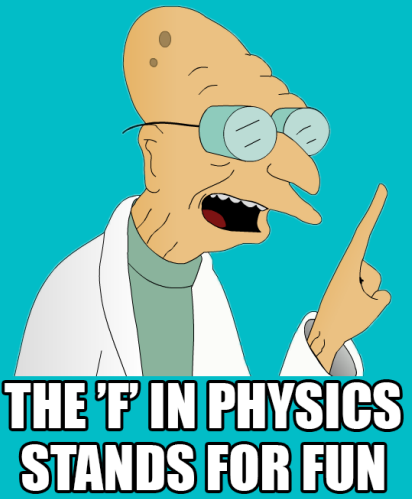


Thank you!

... and remember



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