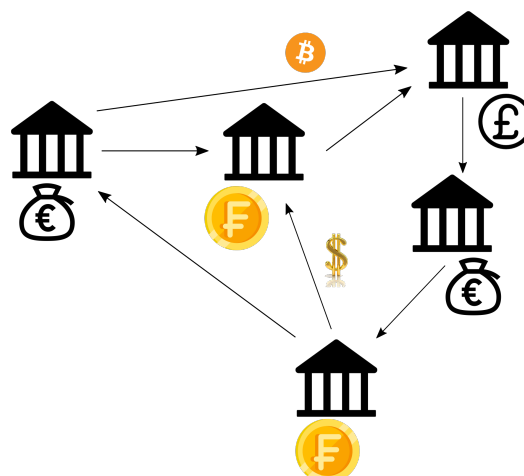




Graph Neural Networks in Finance

Graph Neural Networks (GNNs) are bringing the power of deep neural networks to the domain of graph-structured problems. They allow complex analysis on a variety of problems, for example understanding properties of molecules or dynamics in social graphs. In this thesis, we want to look at the domain of financial networks. In today's economy banks across the globe enter various forms of contracts creating a complex network of financial dependencies. We want to investigate these networks with the capabilities of state of the art machine learning models.

Banks often grant each other loans or enter into other forms of financial relationships. It is not uncommon that such relationships develop into dependency cycles. This system can have weaknesses. For example, if one bank cannot pay its debts and as such defaults, this can cause other banks to default leading to a so-called default cascade. Identifying such dangerous default cascades and preventing them is one important task faced by central banks. This can for example be done by introducing additional funds into the system to “bail out” certain banks. Some natural questions arise. Which bank should be bailed out? Should some bank receive another loan? How can we keep one particular bank alive? These are some of the questions we would like to answer with the help of graph neural networks.



Requirements: Knowledge in Machine Learning and or Deep Learning is advantageous as is understanding of graph theory. We will have weekly meetings to discuss the intermediate progress, think together about future ideas, and tackle open questions.

Interested? Please contact us for more details!

Contact

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Detailed Project Outline

We denote the following primary tasks mandatory (on the right side you find a rough estimate for the time that we allocate to the respective task):

- Literature research (★)
- Familiarize yourself with the existing project (★)
- Select and balance one game mode for online play. (★)
- Adapt the game to support an online mode with multiple client devices. (★★)
- Find a way to connect clients over the Internet. (★)
- Allow players to form game parties. (★)
- Add achievements to provide challenge and motivation. (★★★)
- Add statistics and a leaderboard. (★★)
- Write a report (★★)
- Present your findings. (★)

Extensions

Apart from these requirements, we can think of plenty of ways to extend the project with cool features:

- Add a chat during the game setup.
- Develop an AI as an alternative to played against instead of human players.
- Create an online exchange for game mods and settings.
- Develop new game modes.
- Protect fair players from cheaters.
- Extend the game with your own ideas.

The Student's Duties

- One meeting per week with the advisors to discuss current matters.
- Regular check-ins into the provided *revision control system*.
- A final report in English, presenting work and results.
- A final presentation (15 min) of the work and results obtained in the project.