Tamás Takács

PhD Student (AI)

I am currently pursuing a **PhD in Artificial Intelligence** at Eötvös Loránd University. My professional experience includes **two years in the AI industry**, focusing on deep learning, **natural language processing** and **computer vision** technologies aimed at **automation**. I have **two years of research experience** and have contributed to the publication of a paper on graph neural networks in medical diagnostics. In the future, I **plan to teach at the faculty** and continue my research in machine unlearning and its applicability in reinforcement learning, NLP and complex systems.

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Work Experience

Research Assistant

Apollo 2028

2024/07 - (ongoing) **Budapest, HU**

- Currently researching the **integration of Machine Learning** and Reinforcement Learning models **into Agent-Based Models** (ABM).
- Investigating learnable behaviors that contribute to the **formation of scale-free networks** within organizational structures.
- Addressing critical issues of **mental health** and **resilience** among healthcare professionals.

AI Backend Engineer

LifeSync Pro - Incubator

2024/02 - (ongoing) **Budapest, HU**

- As an active participant in the **Hungarian Startup University Program**, I contribute to **ethical considerations and the governance** of AI in healthcare. Additionally, I am involved in **engineering** healthcare information systems **(HIS) compatible** tools.
- I am working on a baseline for a **summarization system** for medical anamnesis in **Hungarian hospital emergency rooms (GraphRAG)**.

AI Engineer

Swabber.io

2024/06 - (ongoing) **Budapest, HU**

- I am currently developing an **agent-based model** to simulate the **transmission dynamics** of **common STIs** in multi-agent systems using the Mesa framework in Python.

Deep Learning Intern

Robert Bosch Kft.

2022/03 - 2023/01 (10 months) **Budapest, HU**

- I helped improve the company's **Adaptive Cruise Control (ACC)** system by using deep learning tech to create an auto-labeling method. This approach utilized **object tracking, depth estimation, and object detection techniques** to improve accuracy and **reduce the costs** associated with manual labeling.
- I worked on a **single dashboard camera** that was cost-efficient and computationally effective in **calculating different actions** of the target vehicle.
- Throughout the development process, I **worked closely with the labeling teams**, as well as the validation and development teams, to define and test the required cruise control actions in diverse scenarios.

Software Engineer Intern

NI Hungary Kft.

2020/05-2020/09 (3 months) **Debrecen, HU**

- I undertook the **development of a web application** that facilitated seamless communication with the company's dedicated services designed for **testing a wide range of devices on-site**.
- I integrated this application as a plugin within a comprehensive **test monitoring software**. To achieve this, I extensively utilized the **Angular** framework to conduct thorough research, establish a proof of concept, implement the application, and conduct rigorous testing.

Education

Eötvös Loránd University

- **Artificial Intelligence (PhD)** 2024/07 -
- **Artificial Intelligence (MSc)** 2022/09 - 2024/07

University of Debrecen

- **Computer Science (BSc)** 2018/09 - 2022/01

Publications

Scalable Distributed Reinforcement Learning in Multi-Agent Environments

ELTE - TDK 1st Place -> OTDK

- I have studied the **scalability and compatibility** capabilities of state-of-the-art reinforcement learning algorithms in **multi-agent environments**, showing that they are **typically optimized for single-agent environments**.
- I addressed the complexities of **managing dynamic and populous multi-agent environments**, such as those in the **Lux AI Kaggle competition**, by implementing a **single-brain monolithic method** as a baseline, utilizing global observations, rewards, and trajectories.
- I developed a **hybrid model** that integrates local observations with a **distributed reward system** and a **trajectory separation technique**, tripling training speed compared to initial attempts.
- I **reduced the model** size by a **factor of 30** compared to the **best deep reinforcement learning submission** in the competition.
- I **streamlined the training processes**, which made my model learn basic environmental skills **24 times faster, using 600 times less training data**.
- Finally, **I developed a framework** for a neural network architecture using PPO, highlighting the **importance of initialization and robust regularization**. In the future, my main goal is to **build a multi-agent extension of PPO** (MA-PPO).

GitHub

Graph Embedding Algorithms

UNIDEB - TDK 2nd place -> OTDK

- On April 22, 2021, I participated in the locally hosted **Scientific Student Association (TDK)** event at The University of Debrecen. The focus of my presentation was to demonstrate the advancements and potential applications of **graph embedding algorithms in smart-city environments**.
- Developed a **taxonomy of novel graph embedding algorithms** and demonstrated their effectiveness across datasets with varying domains.
- Showed that **employing ensemble systems**, which combine models specialized in various domains, **enhances generalization capabilities by 5%** on average across all algorithms.

Skills

Technical Skills

- **Programming Languages: Python** (Proficient), **JS/TS** (Experienced), **C++** (Familiar)
- **AI Frameworks:** PyTorch, Tensorflow, Keras, NumPy, Pandas, Scikit-learn, Seaborn
- **Cloud Platforms:** AWS, Azure, Google Cloud
- **Project Management:** Agile, Kanban, Git
- **MLOps:** CI/CD procedures, GitHub Actions, TF-Serving, KubeFlow, Docker, Kubernetes, ETL Pipelines, AWS Glue, Amazon SageMaker, GCloud AutoML
- **Platforms**: Windows, Linux, macOS
- **Additional:** Ethics and Governance of AI, AI Alignment

Soft Skills

Eötvös Loránd University - Demonstrator

2023/09 - 2024/07

Deep Network Developments

- Developed **homework assignments and exams** and conducted oral defenses to evaluate student performance.
- I worked closely with the tutors in **developing the course curriculum**.

Game Theory

- I was responsible for converting homework and exams into digital formats using **LaTeX**.
- I worked on **updating the lesson topics**, incorporating coding examples and **improving the course material**.

University of Debrecen - Demonstrator

2021/02 - 2022/01

C Programming

- I created a **tailored coding curriculum** with interactive exercises and **challenging C coding assignments** to enhance students' coding skills.
- I developed a **specialized homework** assignment that taught students the basics of **OpenMP and socket programming**.

IOAI 2024 - Mentor

2024/04 - (ongoing)

- As part of the local organizing team for the **International Olympiad for AI**, I helped manage a national qualifier round for the international series by creating various programming and scientific exercises.
- This included **LLM prompting**, quizzes, and **NLP and CV** programming tasks.

Certificates

- **Machine Learning**, DeepLearning.AI - **Coursera**
- **Self-Driving Cars**, University of Toronto - **Coursera**
- **Reinforcement Learning**, University of Alberta - **Coursera**
- **MLOps**, DeepLearning.AI - **Coursera, Google**
- Practical **Data Science** on the **AWS Cloud** - **Amazon**
- **Docker and Kubernetes** - **Udemy**
- Microsoft **Azure AI** Fundamentals - **Microsoft**

Hackatons

Scrummy

Lablab.AI

- I managed a small team to develop an **AI-based Scrum bot** aimed at streamlining communication with customers within the IT industry.
- I implemented a custom pipeline utilizing the **OpenAI API to summarize emails** received through a corporate email service, automatically **generating Jira tickets** with **assigned tasks and deadlines**.
- I solely utilized **n8n.io** to create a proof of concept **(POC)** for the project.
- The project concept earned acceptance into an **international incubator program** based in Germany.

Compass

Cohere.AI

- I combined a substantial custom dataset with **sanitized web-crawled data** to create a champion selection **assistant** for League of Legends.
- I developed a bot that **uses state-of-the-art NLP** via the **Cohere API** to analyze character descriptions and **recommend champions**, providing **personalized suggestions** based on textual input.

Competitions

OITM 2023/2024

- **AWS Fundamentals** - 23rd/426
- **Artificial Intelligence** - 8th/546
- **LLMs** - 19th/710
- **Azure Cloud** - 33rd/428
- **DevOps** - 112th/616
- **Kubernetes** - 46th/366
- **Python** - 51th/871

LuxAI Season 2 (Kaggle)

- I developed a **multi-agent reinforcement learning (MARL)** solution using **Python and Stable Baselines3**, securing **18th place** in the competition.

Languages

- **English** - Fluent (C1)
- **Romanian** - Fluent (C1)
- **Russian** - Light conversation
- **Hungarian** - Native