DAVID BEINHAUER

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RESEARCH INTERESTS

I am primarily interested in applying computational neuroscience to clinical treatments, particularly neurorehabilitation and neural restoration. My goal is to develop machine learning-driven models for personalized therapies that improve patient outcomes in individuals with neurological impairments. I aim to bridge the gap between computational models and clinical interventions, exploring neural prosthetics and other neurorestorative strategies to restore brain function and enhance the quality of life. My work is driven by the goal of translating cutting-edge neuroscience and AI techniques into real-world solutions for medical challenges.

EDUCATION

Charles University in Prague   June 2025
Master of Science (Mgr.) in Bioinformatics
GPA: **1.33** (1-4 | 1 is the best)
Relevant coursework: Computers and Cognitive Sciences, Biology of the Cell, Spatiotemporal modeling and simulation of biological systems.

Charles University in Prague   Sep 2019 - Sep 2022
Bachelor of Science (Bc.) in Computer Science
Specialization: **Artificial Intelligence**
GPA: **1.28** (1-4 | 1 is the best)
Related coursework: Introduction to Machine Learning, Deep Learning, Probability and Statistics

RESEARCH EXPERIENCE

Modeling spatio-temporal dynamics in primary visual cortex using deep neural network model
Supervisor: Dr. Ján Antolík   CSNG

- **Master's Thesis** | GitHub (Code), GitHub (Thesis)
- **Advancing Visual Neuroscience with Biologically Inspired Recurrent Neural Networks** - Poster presentation at the *Sixth International Conference on the Mathematics of Neuroscience and AI*, May 2025. Presented by my supervisor, Dr. Ján Antolík, on my behalf.
- Developed a recurrent neural network model to simulate neuronal responses in V1 layers IV and II/III, based on stimuli from the Lateral Geniculate Nucleus (LGN).
- Incorporated biological constraints to improve model interpretability and realism.
- Utilized a data-driven model of the cat V1 cortex (Antolík et al., *PLOS Computational Biology*, 2024) for training data.
- Investigated the spatio-temporal dynamics of neuronal responses through simulation.

Optimization of the Placement of Electric Vehicle Charging Stations
Supervisor: Dr. Martin Pilát   KTIML

- **Bachelor's thesis** | GitHub (Code), GitHub (Thesis, *Czech)*
- Designed a traffic simulator to evaluate different machine learning optimization approaches.
- Implemented and compared three optimization techniques to improve electric vehicle charging station placement.
- Analyzed results and proposed an optimal placement strategy.

Selected Coursework Research Projects

- Parkinson Disease Beta Oscillations (GitHub)
- Differences Between Acetylcholinesterase Inhibitors (Report)
- Ant Colony Model (*Czech*) (GitHub)
- Visual Search Experiment (Report)
- Eye-Tracking Data Analysis (Report)

INDUSTRY RESEARCH EXPERIENCE

NLP Internhip in MSD Czech Republic   Oct 2023 - Present

- Member of the Artificial Intelligence team, specializing in NLP applications in the pharmaceutical sector.
- Developed Large Language Model (LLM)-based solutions for scientific document processing and data retrieval.
- Researched and implemented Retrieval-Augmented Generation (RAG) for scientific data retrieval.
- Led bi-weekly presentations to communicate research findings and progress.
- Effectively communicated technical solutions to both specialists and non-specialists.
- Delivered a functional demo of a novel LLM-powered retrieval system for internal use.

ACHIEVEMENTS

Scholarship for Academic Excellence
2021, 2023   Charles University

- Awarded twice for being among the top 10% of students based on academic performance in both bachelor's and master's programs.

SKILLS

Computational Neuroscience	· Machine Learning Applications in Neuroscience Research · Spiking Data Analysis and Cortical Modeling · Spiking Neural Networks (Familiar with)
Computer Science	· Machine learning, statistics, data analysis · Mathematical modeling and software development · Data visualization
Biology	· Neurobiology fundamentals · Visual processing mechanisms · Cell biology, genomics, and structural biology
Technical Skills	· Python · Pytorch, TensorFlow, Scikit-learn · HPC, Git, AWS, Docker
Languages	· English (Fluent)