# DAVID BEINHAUER

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## RESEARCH INTERESTS

Aspiring PhD candidate with an interdisciplinary background in computer science and bioinformatics, aiming to advance the field of computational neuroscience. I am particularly interested in applying machine learning techniques to model neural systems, with a focus on developing technologies for neural restoration through brain-machine interfaces.

## EDUCATION

**M.Sc. in Bioinformatics**, Charles University, Prague, Czech Republic 2022–2025
GPA: **1.33** (1–4 | 1 is best)
*Relevant Coursework: Computational Neuroscience, Spatio-Temporal Modeling of Biological Systems, Cell Biology*

**B.Sc. in Computer Science**, Charles University, Prague, Czech Republic 2019–2022
Specialization: **Artificial Intelligence**
GPA: **1.28** (scale: 1–4 | 1 is best)
*Relevant Coursework: Machine Learning, Deep Learning, Statistics, Data Analysis*

## RESEARCH EXPERIENCE

### Modeling Visual Cortex with Biologically Inspired Recurrent Neural Networks

- **Master Thesis:** GitHub (Code) / GitHub (Thesis)
- Developed a biologically realistic model of the primary visual cortex (V1) using modular, multi-layered recurrent neural networks.
- Mapped synthetic neurons on a one-to-one basis with those from a state-of-the-art spiking neural network model of V1.
- Demonstrated that incorporating biological realism is essential for capturing the temporal dynamics of the visual system.
- Mentored a fellow bachelor student on extending the core research.
- Study results were presented at a poster session of "Bernstein Conference 2025"[1] and "The Sixth International Conference on the Mathematics Of Neuroscience and AI 2025" (by my supervisor).

### Optimization of Electric Vehicle Charging Station Placement

- **Bachelor Thesis:** GitHub (Code) / GitHub (Thesis, *Czech*)
- Developed a traffic simulation framework for analyzing optimal charging station placements.
- Designed and compared various artificial intelligence techniques for optimization.
- Demonstrated that a solution based on genetic algorithms was the most effective.

### Selected Coursework Research Projects

- **Parkinson's Disease Beta Oscillations** — Simulated a spiking network model to reproduce and analyze beta oscillations modulated by deep brain stimulation. (GitHub)
- **Eye-Tracking Data Analysis** — Analyzed gaze trajectories and pupil size variations across tasks involving visual fixation, search, and exploration. (Report)
- **Visual Search Experiment** — Designed and analyzed a behavioral study on reaction time and accuracy under varying visual load and target conditions. (Report)

## PUBLICATIONS AND PRESENTATIONS

[1] **Beinhauer, D.**, Kraus R, Baroni L, Antolík J (2025) *Bridging Biology and Deep Learning: Modeling Visual Cortex with Structured Recurrent Networks.* Bernstein Conference 2025. doi: 10.12751/nncn.bc2025.151

[2] **Beinhauer, D.**, Kraus, R., Baroni, L., Antolík, J. (2025, May 27). *Advancing visual neuroscience with biologically inspired recurrent neural networks.* [Poster presentation by J. Antolík]. *The Sixth International Conference on the Mathematics of Neuroscience and AI.* Split, Croatia.

## INDUSTRY RESEARCH EXPERIENCE

**NLP Internship, MSD Czech Republic** Oct 2023 – Present

- Member of the Artificial Intelligence team, focused on Natural Language Processing (NLP) applications in the pharmaceutical domain.
- Designed and implemented Large Language Model (LLM)-based solutions for scientific document processing and data retrieval.
- Collaborated with medical writers to integrate LLM techniques into the research and drafting of internal medical documentation.
- Contributed to the development of a modular NLP framework using state-of-the-art technologies and best software engineering practices.
- Regularly communicated technical solutions to both expert and non-expert stakeholders to promote adoption of cutting-edge NLP methods.

## AWARDS AND HONORS

**Travel Grant to the Bernstein Conference** 2025

- Awarded a travel grant as an early-career scientist presenting as first author in the poster session at the Bernstein Conference 2025.

**Nomination for Dean's Award** 2025

- Results pending. Nominated for one of the best final theses of the academic year at the faculty, an award recognizing outstanding research quality and contribution.

**Scholarship for Academic Excellence** 2021, 2023

- Awarded twice for ranking among the top 10% of students based on academic performance during both bachelor's and master's studies.

## SKILLS

**Technical Skills**

- Programming Languages: Python, C++
- Machine Learning Frameworks: PyTorch, TensorFlow, Scikit-learn
- Cloud and Computing Tools: AWS, HPC environments, Docker
- Development Tools: Git, Jira

**Theoretical and Analytical Skills**

- Computer Science: Machine Learning (Deep Learning, Natural Language Processing), Modelling in Computational Neuroscience, Statistical Analysis, Data Processing for Biological Systems
- Biological Sciences: Cell Biology, Genomics, Structural Biology, Epigenetics, Basic Neurobiology

**Languages**

- English: Professional proficiency
- Czech: Native speaker