Barbora Rehák Bučková, PhD

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Employment History

2023 – ongoing 🔖 **Postdoctoral researcher**
Radboud University Medical Center, Nijmegen, Netherlands
● Developing methods for harmonizing multi-site-large-scale cognitive data from to ensure consistency and comparability in multi-site analyses.
● Developing personalized inference frameworks for cognition data, focusing on methodological innovation and scalability.
● Collaborating with interdisciplinary teams, including clinicians and lived experience experts, to incorporate diverse perspectives and develop methodological approaches that balance robustness, interpretability, and practical utility.

2018 – 2023 🔖 **Junior researcher**
Institute of Computer Science of the Czech Academy of Sciences, Prague, Czech Republic
● Developed and evaluated machine learning methodologies for individual-level classification and prediction in neuroimaging, focusing on longitudinal data and multimodal integration.
● Advanced neuroimaging data analysis through novel techniques for dimensionality reduction, confounder control, and independent replication studies.
● Bridged technical innovation with clinical applications by integrating pretrained normative models to enhance personalized predictions and patient care.

2015 – 2019 🔖 **Data analyst and methodologist**
Institute of Health Information and Statistics of the Czech Republic, Brno, Czech Republic
● Designed and managed databases supporting the Czech National Screening Programs, improving data accessibility and analysis efficiency.
● Analyzed national health records to evaluate the effectiveness of screening programs, contributing to the development of national health policies.
● Developed methodological guidelines for the National Screening Center to design, pilot, and implement screening programs.

Education

2018 – 2024 🔖 **PhD, Artificial Intelligence and Biocybernetics**
Czech Technical University in Prague, Prague, Czech Republic
Thesis: Classification and prediction of interindividual differences from multimodal neuroimaging data, development of machine learning models to advance personalized medicine in neurological and psychiatric conditions.

2016 – 2018 🔖 **Master of Science (MSc), Computational Biology**
Masaryk University, Brno, Czech Republic
Thesis: Computational methods in synthesizing evidence on health interventions in early disease detection, applying computational approaches to meta-analysis of diagnostic accuracy tests for systematic reviews, influencing the design of effective screening programs.

Education (continued)

2013 – 2016   **Bachelor of Science (BSc), Computational Biology**
Masaryk University, Brno, Czech Republic
Thesis: Estimation of colon capsule endoscopy accuracy for the detection of colorectal neoplasia, using statistical modeling to assess the diagnostic utility of potential screening technologies.

Collaborative Initiatives and Research Funding

Sept. 2022 – March 2023   **Fulbright Fellowship at the University of Pennsylvania**, Philadelphia, USA
Supervisor: Christos Davatzikos
Center for Biomedical Image Computing and Analytics
Secured funding for a six-month research stay to develop multimodal approaches to predict the outcome of early-onset psychosis.

Jan. 2022 – March 2022   **Donders Institute**, Nijmegen, Netherlands
Supervisor: Andre Marquand
Predictive Clinical Neuroscience Lab
Supported by mobility funding for a three-month research stay, focused on developing a longitudinal normative modeling method to personalize neuroimaging data analysis.

2019-2021   **3-year Grant from the Czech Technical University**
The Effective Use of Pattern Recognition Methods in Brain Imaging, aimed at advancing machine learning techniques for neuroimaging data analysis.

Community Service and Outreach

Community Service

2025–ongoing   **Chair of Postdoctoral Council**
● Chairing the meetings of postdoctoral council and communication with the management of the Donders Institute.

2024   **A Team Player Award by the Department of Medical Neuroscience**

2023–ongoing   **Postdoctoral Representative**
● Of the Medical Neuroscience Department at the Donders Institute.
● Organized postdoc-specific networking and career-development events.

Member, Halkes Women Faculty Network Board
● Advocated for gender equality at Radboud University.
● Organized round tables and outreach events on equality and social safety.

Outreach

2025   **Invited Speaker, Pint of Science**
Delivered a talk for general public "Mind the Gap, How to analyze what' missing."

Community Service and Outreach (continued)

2024   **Invited Speaker, PhD Organization Nijmegen**
Delivered a talk for PhD candidates on "Growing up in Science."

Science Blogs for the Public
Wrote a blog series to make scientific topics more understandable to the general public.

2023   **Website Administrator**
Developed and maintained the Precognition Project website.

2020   **Co-organizer, International Workshop on Modeling and Analysis of Brain Activity**
Prague, Czech Republic.

Reviewer

Biological Psychiatry

Developmental cognitive neuroscience

Schizophrenia Research

Presentations and Talks

2024   **Brain Dynamics Workshop, Prague**
Talk: Multimodal neuroimaging machine learning for disease and symptom prediction.

2023   **Human Brain Mapping Conference, Montreal**
Poster: Multimodal analysis of second-level neuroimaging features to identify first-episode schizophrenia.

16. International workshop on functional magnetic resonance imaging in the neurosciences
Talk: Normative modeling and longitudinal studies: opportunities and challenges.

2022   **Human Brain Mapping Conference, Glasgow**
Poster: Longitudinal normative modeling using pre-trained models

2021   **Human Brain Mapping Conference (online)**
Poster: Linking early imaging of stroke and gradual cognitive decline: a DTI and tractography study

2020   **Human Brain Mapping Conference (online)**
Poster: Bridging the gaps between clinical scales and brain imaging in Multiple Sclerosis

Joint Workshops on Modeling and Analysis of Brain Activity, Prague
Talk: Multimodal integration in Multiple Sclerosis

2019   **Human Brain Mapping Conference, Rome**
Poster: Does change of frontal theta cordance predict depression treatment outcome?

Teaching and Supervision

Supervised Students

2024   **Supervised Master's student**: Jakub Svoboda
Master Thesis: Classification and Prediction from Multimodal Neuroimaging Data in the Context of Schizophrenia Treatment

Teaching and Supervision (continued)

■ **Supervised Bachelor's student**: Joanna Pasiarska
Bachelor Thesis: Accuracy of an Imputation Task on Human Cognitive Data

■ **Supervised Master's student**: Adéla Veselá
Master Thesis: Structural Brain Changes in Multiple Sclerosis Patients and Their Clinical
Implications

2022 ■ **Supervised Bachelor's student**: Adéla Veselá
Bachelor Thesis: Monitoring Brain Structural Changes After Following Ambulatory Facil-
itation Physiotherapy in People with Multiple Sclerosis

Teaching

Nov 2024 ■ **Invited Lecturer**
Computational NeuroPsychiatry Focus Group Workshop
Delivered hands-on workshop on normative modeling in neuroscience.

■ **Invited Lecturer**
Advanced Modeling Workshop, Nijmegen
Delivered hands-on workshop on normative modeling in neuroscience.

■ **Invited Lecturer**
Advanced Modeling Workshop, Nijmegen
Delivered hands-on workshop on normative modeling in neuroscience.

Sep 2024 ■ **Invited Lecturer**
Computational Psychiatry Course, Zurich
Delivered hands-on workshop on normative modeling in computational psychiatry.

Jun 2024 ■ **Co-organizer of Educational Course**
Human Brain Mapping Conference, Seoul
Co-organized a course on normative modeling methods in brain imaging.

Publications

First-Authored

1 A. F. Marquand, B. R. Bučková, G. Cattaranusi, *et al.*, "Learning latent profiles via cognitive growth charting in psychosis: Design and rationale for the precognition project," *Schizophrenia Bulletin Open*, vol. 6, no. 1, sgaf007, 2025. ⊘ DOI: 10.1093/schizbullopen/sgaf007.

2 B. Rehák Bučková, C. Fraza, R. Rehák, *et al.*, "Using normative models pre-trained on cross-sectional data to evaluate intra-individual longitudinal changes in neuroimaging data," *eLife*, Apr. 2024. ⊘ DOI: 10.7554/elife.95823.1.

3 B. Rehák Bučková, D. Kala, J. Kořenek, *et al.*, "Structural connectivity-based predictors of cognitive impairment in stroke patients attributable to aging," *PLOS ONE*, vol. 18, no. 4, e0280892, 2023, ISSN: 1932-6203. ⊘ DOI: 10.1371/journal.pone.0280892.

4 B. Rehák Bučková, J. Mareš, A. Škoch, *et al.*, "Multimodal-neuroimaging machine-learning analysis of motor disability in multiple sclerosis," *Brain Imaging and Behavior*, pp. 1–17, 2022. ⊘ DOI: 10.1007/s11682-022-00737-3.

5 B. Bučková, J. Kopal, K. Rasova, J. Tintera, and J. Hlinka, "Open access: The effect of neurorehabilitation on multiple sclerosis–unlocking the resting-state fmri data," *Frontiers in Neuroscience*, vol. 15, p. 615, 2021. ⊘ DOI: 10.3389/fnins.2021.662784.

6 B. Bučková, M. Brunovsky, M. Bares, and J. Hlinka, "Predicting sex from eeg: Validity and generalizability of deep-learning-based interpretable classifier," *Frontiers in Neuroscience*, 2020. 🔗 DOI: `doi:10.3389/fnins.2020.589303`.

Co-Authored

1 S. Ghosh, I. Dallmer-Zerbe, B. R. Buckova, and J. Hlinka, *Amplitude entropy captures chimera resembling behavior in the altered brain dynamics during seizures*, Scientific Reports, vol. 15, 1, p. 14 212, 2025. 🔗 DOI: `10.1038/s41598-025-97854-y`.

2 P. Hok, Q. T. Thai, B. R. Bučková, *et al.*, *Global functional connectivity reorganization reflects cognitive processing speed deficits and fatigue in multiple sclerosis*, European Journal of Neurology, e16421, 2024. 🔗 DOI: `10.1111/ene.1642`.

3 M. Neidhart, R. Kjelkenes, K. Jansone, *et al.*, *A protocol for data harmonization in large cohorts*, Nature Mental Health, pp. 1–4, 2024. 🔗 DOI: `10.1038/s44220-024-00315-0`.

4 A. Škoch, B. Rehák Bučková, J. Mareš, *et al.*, *Human brain structural connectivity matrices–ready for modelling*, Scientific Data, vol. 9, 1, pp. 1–9, 2022. 🔗 DOI: `10.1038/s41597-022-01596-9`.

5 K. Řasová, B. Bučková, T. Prokopiusová, *et al.*, *A three-arm parallel-group exploratory trial documents balance improvement without much evidence of white matter integrity changes in people with multiple sclerosis following two months ambulatory neuroproprioceptive" facilitation and inhibition" physical therapy*, European journal of physical and rehabilitation medicine, 2021. 🔗 DOI: `10.23736/S1973-9087.21.06701-0`.

6 G. Vojtechova, O. Ngo, T. Grega, *et al.*, *The conversion factor for predicting adenoma detection rate from polyp detection rate varies according to colonoscopy indication and patient sex*, European Journal of Cancer Prevention, vol. 29, 4, pp. 294–302, 2020. 🔗 DOI: `10.1097/CEJ.0000000000000558`.

7 M. Voska, M. Zavoral, T. Grega, *et al.*, *Accuracy of colon capsule endoscopy for colorectal neoplasia detection in individuals referred for a screening colonoscopy*, Gastroenterology Research and Practice, vol. 2019, 1, p. 5 975 438, 2019. 🔗 DOI: `10.1155/2019/5975438`.