Hamza Abdelhedi

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Education

Université de Montréal – Faculty of Medicine Montréal, Canada
PhD in Biomedical Engineering *Sept. 2024–Present*
Supervisor: Prof. Karim Jerbi • Research affiliations: CoCo Lab, Mila

Université de Montréal – Dep. of Computer Science and Operations Research (DIRO) Montréal, Canada
MSc in Computer Science – Artificial Intelligence *Sept. 2022–Aug. 2024*
Supervisor: Prof. Karim Jerbi • Co-supervisor: Prof. Shahab Bakhtiari • Research affiliations: CoCo Lab, Mila

University of Carthage – Higher School of Communication of Tunis (SUP'COM) Ariana, Tunisia
Engineering Diploma in Telecommunications – Smart Imaging Applications *Sept. 2018–Oct. 2021*

University of Sfax – Sfax Preparatory Institute for Engineering Studies Sfax, Tunisia
Preparatory Studies in Mathematics and Physics *Sept. 2016–June 2018*
National engineering schools' entrance exam rank: 150/1,500 (top 10%)

Farhat Hached Pioneer High School Sfax, Tunisia
Baccalaureate in Mathematics *Sept. 2012–June 2016*
Selective national Pioneer High School track

Research & Professional Experience

Graduate Research Assistant *Sept. 2024–Present*

Cognitive & Computational Neuroscience Lab (CoCo Lab) • Mila – Quebec AI Institute Montréal, Canada

- **Dynamic decision-making:** Analyzing EEG, MEG, and behavior using low-dimensional neural trajectories, connectivity and complexity measures, and computational models.
- **Foundation models:** Evaluating and developing EEG/MEG foundation models with a focus on representations and cross-dataset generalization.
- **Research software:** Developing reusable EEG/MEG tools and pipelines for lab-wide use, including MNE-Denoise, CoCo-PiPe, and Jamica.
- **Research infrastructure:** Standardizing and managing shared lab datasets and computational resources; led a successful Digital Research Alliance of Canada Resource Allocation Competition (RAC) application securing 715 CPU-years and 150 RGU-years (score: 4.3/5).
- **Mentoring:** Mentoring junior researchers and developing technical documentation, tutorials, and onboarding materials.

Research Collaborator *Jan. 2025–Present*

CHU Sainte-Justine • Dr. Alexander G. Weil • Dr. Aristides Hadjinicolaou Montréal, Canada

- **Clinical data:** Curated ∼1,300 pediatric EEG recordings spanning epilepsy, ADHD, and autism, with medication and comorbidity metadata.
- **Computational analysis:** Studied brain dynamics and candidate biomarkers using electrophysiological features, foundation-model representations, machine learning, and dimensionality reduction, including embedding extraction, linear probing, and fine-tuning.
- **Medication effects:** Comparing medicated and unmedicated ADHD cohorts and medication groups, stratified by age, sex, and comorbidities.

AI Lab Member / Research Contributor *2024–Present*

Abundant Intelligences • Part-time since Mar. 2026 Montréal, Canada

- **AI development:** Supporting pods developing AI systems and language models for low-resource and Indigenous-language applications.
- **Training & knowledge mobilization:** Designed and delivered technical workshops for the Future Imaginaries Workshop Series.
- **Research infrastructure:** Helped design a new computational infrastructure request supporting shared AI experimentation, local model development, and community-governed research workflows.

Graduate Research Assistant *Sept. 2022–Aug. 2024*

CoCo Lab • Systems Neuroscience and AI Lab (SNAILab) • Mila Montréal, Canada

- **Face familiarity:** Investigated how familiarity shapes the temporal evolution of neural representations of familiar and unfamiliar faces.
- **Computational analysis:** Applied time-resolved multivariate and representational analyses to MEG and ANNs.

Research Intern – Engineering Graduation Project *Apr.–Oct. 2021*

UNIQUE – Unifying Neuroscience and Artificial Intelligence in Quebec • CoCo Lab Montréal, Canada

- Investigated human and artificial neural representations underlying face recognition using MEG and convolutional neural networks.

Machine Learning Intern *July–Aug. 2020*

SFM Technologies Tunis, Tunisia

- Developed machine-learning methods for appliance identification from electrical signals using state changes, harmonics, and device signatures.

Natural Language Processing Intern *July–Aug. 2019*

HEXASTACK Ariana, Tunisia

- Developed Tunisian Arabic NLP methods for intent extraction, keyword/NER extraction, and sentence segmentation.

Publications & Manuscripts

Peer-Reviewed Journal Articles

Oswald, V., Landry, M., **Abdelhedi, H.**, Lippé, S., Robaey, P., & Jerbi, K. Resting-State Neural Oscillations Predict Individual Differences in Verbal Learning and Encoding Strategy Use. *iScience*, 29(9), 117377. [DOI] 2026

Dehgan, A., **Abdelhedi, H.**, Hadid, V., Rish, I., & Jerbi, K. Artificial Neural Networks for Magnetoencephalography: A Review of an Emerging Field. *Journal of Neural Engineering*, 22(3). [DOI] 2025

Thölke, P., Mantilla-Ramos, Y.-J., **Abdelhedi, H.**, et al. Class Imbalance Should Not Throw You Off Balance: Choosing the Right Classifiers and Performance Metrics for Brain Decoding with Imbalanced Data. *NeuroImage*, 277, 120253. [DOI] 2023

Peer-Reviewed Conference Proceedings

Elvers, G., Landau, G., Mantegna, F., . . . , **Abdelhedi, H.**, et al. Benchmarking Non-Invasive Speech BCIs: Lessons Learned from the 2025 PNPL Competition. *Proceedings of Machine Learning Research (NeurIPS 2025 Competition Track)*, **in press**. [Paper] 2026

Landau, G., Özdogan, M., Elvers, G., Mantegna, F., Somaiya, P., Jayalath, D., Kurth, L., Kwon, T., Shillingford, B., Farquhar, G., Jiang, M., Jerbi, K., **Abdelhedi, H.**, et al. The 2025 PNPL Competition: Speech Detection and Phoneme Classification in the LibriBrain Dataset. *NeurIPS 2025 Competition Track*. [arXiv] [NeurIPS] 2025

Under Review

Benslimane, M., **Abdelhedi, H.**, Hadid, V., & Jerbi, K. Pretraining and Model Specialization Shape EEG Alignment During Dynamic Facial Expression Perception. *NeurIPS 2026 Main Track*. 2026

Oswald, V., Jerbi, K., Sombrun, C., **Abdelhedi, H.**, et al. Exploring Aperiodic, Complexity and Entropic Brain Changes During Non-Ordinary States of Consciousness. *Neuroscience of Consciousness*. [arXiv] 2025

Peer-Reviewed Conference Abstracts & Short Papers

Abdelhedi, H., Bakhtiari, S., & Jerbi, K. Temporal Dynamics of Face Recognition: Insights from Combining MEG and Artificial Neural Networks. *Conference on Cognitive Computational Neuroscience (CCN)*. [Paper] 2024

Abdelhedi, H., & Jerbi, K. Linking Human and Artificial Neural Representations Underlying Face Recognition: Insights from MEG and CNNs. *Conference on Cognitive Computational Neuroscience (CCN)*. [DOI] 2022

Preprints

Abdelhedi, H., Bakhtiari, S., & Jerbi, K. Stage-Dependent Signatures of Face Familiarity in Representational Timing and Strength: Evidence from MEG and Task-Optimized Neural Networks. [bioRxiv] 2026

Mantegna, F., Elvers, G., Jayalath, D., . . . , **Abdelhedi, H.**, et al. The 2026 PNPL Competition: Word Classification and Efficient Cross-Subject Generalisation in LibriBrain100. [arXiv] 2026

Thölke, P., **Abdelhedi, H.**, Mantilla-Ramos, Y.-J., et al. A Roadmap for MEG Foundation Models. [arXiv] 2026

Abdelhedi, H., Mantilla-Ramos, Y.-J., Esmaeili, S., Pascarella, A., Hadid, V., & Jerbi, K. Coord2Region: A Python Package for Mapping 3D Brain Coordinates to Atlas Labels, Literature, and AI Summaries. [arXiv] 2025

Mekki Berrada, L., Dehgan, A., Postuma, R. B., Harel, Y., **Abdelhedi, H.**, et al. Predicting Cognitive Decline in Prodromal Synucleinopathies Using Clinical Markers and Machine Learning. [Research Square] 2025

Research Software & Open-Source Contributions

MNE-tools Oct. 2025–Present

Organization Member

MNE-Denoise — *Co-Creator & Core Maintainer* [Code] [Docs]

Co-developing an MNE-native toolbox for spatial, temporal, spectral, and reference-based M/EEG denoising, including ASR, DSS, ZapLine, iCanClean, BSS-CCA, spectrum interpolation, SSA, and Sensor-Noise Suppression (SNS), with MNE/scikit-learn-compatible APIs.

MNE-Python — *Contributor* [Code]

Contributed 5 merged pull requests to core MNE-Python spanning source-estimate processing, covariance estimation and bug fixes.

CoCo-PiPe — *Creator & Maintainer* Apr. 2025–Present [Code] [Docs]

Building a modular end-to-end biosignal-analysis framework spanning electrophysiological descriptors, including spectral, aperiodic, and complexity measures; subject and temporal alignment; dimensionality reduction and neural-trajectory analysis; classical and foundation-model decoding; statistical assessment; and automated experiment reporting.

Coord2Region — *Creator & Maintainer* Jan. 2025–Present [Code] [Docs]

Developing a neuroinformatics package linking 3D brain coordinates and anatomical regions to brain atlases, nearby neuroimaging studies, and literature-derived summaries through reproducible Python, CLI, and web-based workflows.

Jamica — *Contributor* 2026–Present [Code] [Docs]
Contributing to a JAX-accelerated implementation of Adaptive Mixture ICA (AMICA) for EEG/MEG, including MNE-Python integration.

Awards & Scholarships

Scholarships & Fellowships

Merit Scholarship, AI Research Fund, Faculty of Medicine, Université de Montréal — C$25,000/year • 2024–2027
Full Scholarship, Simons Computational Neuroscience Imbizo *(competitive selection)* — Full funding • 2026
UNIQUE Excellence Scholarship, PhD level, Centre UNIQUE *(competitive merit-based award)* — C$15,000 • 2025
Computer Science Merit Scholarship for Excellent Students, Université de Montréal — C$3,000 • 2024
Master's Scholarship, CIRCA *(competitive research scholarship)* — C$8,000 • 2023
Cerebrum Scholarship, Cerebrum *(competitive research scholarship)* — C$5,000 • 2023
UNIQUE Excellence Scholarship, MSc level, Centre UNIQUE *(competitive merit-based award)* — C$10,000 • 2023
Computer Science International Student Scholarship, Université de Montréal — C$3,000 • 2023
Globalink Research Award, Mitacs — C$6,000 • 2021

Awards & Travel Grants

New Attendee Travel Award, COSYNE *(competitive travel award)* — US$1,000 • 2024
Conference Travel Grant, Centre UNIQUE *(competitive travel award)* — C$1,000 • 2024
Conference Travel Grant, Réseau de Bio-Imagerie du Québec (RBIQ) — C$500 • 2024
Best Poster Award, Montreal AI & Neuroscience Conference, Institut intelligence et données — C$200 • 2022
Best Ambassador, Entrepreneurship Initiative, IEEE Region 8 — Distinction • 2020
Third Prize, SUP'COM Entrepreneurial Challenge, SUP'COM — TND 2,500 • 2020
Smart Green Island Makeathon Travel Grant, Smart Green Island — EUR 500 • 2020

Teaching Experience

Teaching Assistant & Instructor, Indigenous Pathfinders in AI *Summers 2024–2026*
Mila – Quebec AI Institute — Montréal, Canada

- Designed and delivered sessions on topics including programming in the age of AI, supervised learning, model evaluation, and building AI systems.
- Held office hours and provided hands-on support with programming, course material, exercises, and participant projects.

Workshop Instructor, Future Imaginaries Workshop Series *2026*
Abundant Intelligences — USA & Canada

- **Nitsitapi Pod, University of Lethbridge (Mar. 2026):** Delivered an introduction to AI with hands-on activities.
- **Haudenosaunee Pod, Western University (Mar. 2026):** Taught language-modeling concepts with a technical working session on LLMs.
- **Tkaronto Pod, OCAD University (June 2026):** Delivered an introduction to AI followed by hands-on activities using CNNs and LLMs.
- **Huwai Pod (Nov. 2026):** Scheduled to deliver an additional workshop as part of the series.

Teaching Assistant, PSY2008: Methods in Cognitive Neuroscience I *Fall 2023–2026*
Department of Psychology, Université de Montréal — Montréal, Canada

- Led question-and-answer and recap sessions, supported students throughout course activities, and assessed session assignments.

Teaching Assistant, PSY2007: Laboratory I *Fall 2024–2026*
Department of Psychology, Université de Montréal — Montréal, Canada

- Taught Python programming and computational analysis of EEG data.
- Designed hands-on tutorials spanning EEG preprocessing and cleaning through machine-learning analyses of data collected during the course.

Teaching Assistant, Computational Neuroscience Summer School *Summer 2024*
Arabs in Neuroscience — Online

- Supported coding tutorials in probability, calculus, linear algebra, and statistics; mentored a two-day hands-on project applying machine learning to fMRI decoding.

Research Mentoring

Maryem Benslimane *(MSc Student)* *Summer 2024–Present*

- EEG–ANN representational similarity analysis of emotion processing, from engineering graduation internship through ongoing MSc work.

Syrine Mattousi *(MSc Student)* *Summer 2025–Present*

- EEG-based analysis of epilepsy versus non-epilepsy using electrophysiological features, machine learning and foundation models.

Fouad Lbakali *(Undergraduate Research Intern)* *Summer 2026*

- Foundation-model development for MEG data.

Alexandre Louis *(Undergraduate Research Intern)* *Summer 2026*

- Classification of low versus high dream recallers using Riemannian geometry and machine learning.

Mehdi Jerbi *(Undergraduate Research Intern)* *Summer 2025*

- ADHD versus non-ADHD classification from pediatric EEG using machine-learning methods.

Anis Abdeladim *(Undergraduate Research Intern)* *Summer 2024*

- Face-identity classification extending computational analyses developed during prior MSc research.

Meriem Rebaani *(Engineering Graduation Intern)* *Summer 2024*

- Effect of loss functions on learned representations in face-recognition models; subsequently completed her engineering degree.

Selected Scientific Presentations

Oral Presentations

MNE-Denoise: Denoising methods for the MNE ecosystem *Aug. 2026*
MNE-Python Maintainers Conference and Sprint — Meta Paris Office, Paris, France

Linking human and artificial neural representations underlying face recognition *Apr. 2024*
CIRCA Scientific Day — Montréal, Canada

Brain Similarity Scaling *Nov. 2023*
4th Scaling Workshop — Mont-Tremblant, Canada

Poster Presentations

Temporal dynamics of face recognition: Insights from combining MEG and artificial neural networks *Oct. 2024*
From Neuroscience to Artificially Intelligent Systems (NAISys) — Cold Spring Harbor, USA

Temporal dynamics of face recognition: Insights from combining MEG and artificial neural networks *Aug. 2024*
Conference on Cognitive Computational Neuroscience (CCN) — Boston, USA

Neural representations of face recognition in biological and artificial systems: Insights from MEG and CNNs *Mar. 2024*
Computational and Systems Neuroscience (COSYNE) — Lisbon, Portugal

Linking human and artificial neural representations underlying face recognition: A spectro-temporal analysis *Dec. 2022*
Best Poster Award • Montreal AI & Neuroscience Conference (MAIN) — Montréal, Canada

Leadership & Scientific Service

Scientific & Community Service

Invited Participant, MNE-Python Maintainers Conference and Sprint *Aug. 2026*
MNE-Python — Meta Paris Office, Paris, France

- Participating in maintainer discussions and the development sprint for MNE-Python and the broader MNE ecosystem.

Founding Member *Feb. 2025–Present*
TuNA, Tunisians in Neuroscience and AI Community — Montréal, Canada

- Contributing to a community connecting Tunisians working across neuroscience, artificial intelligence, cognitive science, and related fields.

Organizer *Mar. 2024–Dec. 2025*
Against Military AI Reading Group — Mila, Montréal, Canada

- Organized bi-weekly discussions on the harms, risks, and misuse of artificial intelligence in military applications.

Organizer *Dec. 2024*
Harms and Risks of AI in the Military Workshop — Montréal, Canada

- Co-organized a two-day cross-disciplinary workshop fostering discussion on the harms and risks associated with military uses of AI.

Student Representative, Scientific Committee *Sept. 2022–Aug. 2024*
UNIQUE, Unifying Neuroscience and Artificial Intelligence in Quebec — Montréal, Canada

- Represented student interests within UNIQUE's scientific committee and contributed to the organization of the Montreal AI & Neuroscience Conference, UNIQUE Student Symposium, Fellows Get-Together, Scientific Retreat, and related activities.

Moderator, DEI and Ethics in Neuro-AI Panel *May 2024*
UNIQUE Student Symposium — Québec City, Canada

Organizer *Oct. 2023*
CuttingEEG Montreal Garden — Montréal, Canada

- Helped organize the three-day Montreal Garden bringing together researchers and practitioners working with EEG and MEG.

Moderator, Career Perspectives in Neuro-AI Panel *Dec. 2022*
Montreal AI & Neuroscience Conference (MAIN) Montréal, Canada

Leadership & Representation

Chair & Mentor *Sept. 2018–Dec. 2023*
IEEE SUP'COM Student Branch Ariana, Tunisia

- Served as **Chair** from June 2019 to May 2020, leading executive committee meetings, general assemblies, events, workshops, and student projects; the branch ranked **third** nationally and received two IEEE Region 8 awards during this period.
- Served as **Mentor** from June 2020 to Dec. 2023, advising successive executive committees on strategic planning and projects.
- Previously served as a member from Sept. 2018 to May 2019, supporting branch activities including IEEEXtreme and Coding 101.

Student Representative, Scientific Council *Mar. 2019–Feb. 2020*
Higher School of Communication of Tunis (SUP'COM) Ariana, Tunisia

- Represented students within the scientific council and relayed student priorities and proposals to school leadership.

Outreach & Event Organization

Event Manager *Nov. 2020*
Tunisia Entrepreneurship Summit Tunis, Tunisia

- Month-long entrepreneurship program within the IEEE Region 8 Entrepreneurship Initiative, combining keynotes, workshops, and a final competition; received the IEEE Region 8 Best Entrepreneurship Initiative Award.

Organizer *Sept. 2020*
Smart Green TUNISIA Makeathon Tunis, Tunisia

- Live makeathon bringing together 120 participants to develop, build, and pitch software and hardware projects.

Event Manager *Nov. 2019*
Hack for Earth Ariana, Tunisia

- One-day hackathon in collaboration with Zindi, focused on technology-based solutions to environmental challenges.

Organizer *Apr. 2019*
Deep Learning IndabaX Tunis Ariana, Tunisia

- First local Deep Learning IndabaX edition in Tunisia, featuring AI research talks and technical workshops.

Volunteer *June 2019*
RightsCon Tunis Tunis, Tunisia

- International conference on human rights in the digital age; supported conference logistics and attendee coordination.

Organizer *Feb. 2019*
PACTE Project Kef, Tunisia

- Breast-cancer awareness initiative serving women in rural communities in the Kef region.

Volunteer *Oct. 2018*
Coding 101 Ariana, Tunisia

- Three-day Scratch programming event for primary-school students, with a focus on encouraging girls in STEM.

Selected Scientific Training & Summer Schools

Simons Computational Neuroscience Imbizo Cape Town, South Africa
Selected Scholar *2026*

Intensive computational neuroscience program spanning theoretical, experimental, and data-driven approaches to neural systems.

Technical Skills

Neuroimaging & Biosignals	EEG, MEG, MNE-Python, NiBabel; preprocessing and denoising, time-resolved multivariate analysis, representational analysis
Machine Learning & AI	PyTorch, JAX, scikit-learn, Keras; deep learning, foundation models, representation learning, dimensionality reduction
Programming	Python, Bash, C++, Java, SQL
HPC & Research Computing	Linux, Slurm, CUDA, GPU computing, Digital Research Alliance of Canada clusters
Scientific Software	Git, GitHub, Python package development, testing and continuous integration, reproducible research workflows, LaTeX
Languages	Arabic (native), English (C2), French (professional proficiency)