



# Pavol Harar, Ph.D. – Curriculum Vitæ

Developing deep learning methods for complex time-series and 3D biomedical data analysis.  
Currently expanding expertise in self-supervised speech and language modeling.

pavol.harar.eu

## Professional Biography

Machine learning research engineer with 9 years of experience in deep learning, computer vision, and time-series analysis. Holds a MSc in System Engineering and Informatics and a PhD in Machine Learning from Brno University of Technology. Expertise in high-performance multi-GPU computing, predictive modeling, and signal processing. Proven track record in both academic and industry settings, including post-doctoral research at the University of Vienna and the Research Institute of Molecular Pathology. Co-founded a tech startup, managing a team of 10+ developers and raising capital. Published in top journals including Cell Structure, Journal of Mathematical Imaging and Vision, Frontiers in Public Health, and Neural Computing and Applications. Co-founder of ACAI.AI and author of FakET and Redistributor.

## Higher Education

09/2015 - 11/2019 PhD in Machine Learning, FEEC, Brno University of Technology, CZ  
PhD thesis: Audio Classification with Deep Learning on Limited Data Sets  
09/2012 - 06/2015 MSc in System Engineering and Informatics, FBM, Brno University of Technology, CZ  
MSc thesis: Improved Prediction of Social Tags Using Data Mining

## Work Experience

01/2020 - \* **Co-Founder & Freelance Machine Learning Engineer at ACAI.AI** (specific projects here)  
Highlights: Developed a churn detection model for a bank, outperforming their data science team by 35%. Built an image recognition system for automated claim processing for Generali Česká Pojišťovna.  
04/2019 - \* **ML Research Engineer at Mat. Data Science, Faculty of Mathematics, UniVie**  
Highlights: Created Gabor and Mel-Scattering Python packages for audio feature extraction. Advised Austrian government on Covid-19, optimizing group-testing efficiency 10-fold. Created Redistributor, a Python library for data redistribution. Deployed Nvidia HGX 8x A100 supercomputer.  
09/2015 - 12/2023 **ML Research Engineer at Brain Diseases Analysis Laboratory (BDALab), FEEC, BUT**  
Highlights: Reviewed dozens and released 4 voice pathology datasets - submitted to Nature Scientific Data. Established a listening group of 40+ logopedists reevaluating public voice pathology datasets. Developed RCNN model for voice pathology detection using sustained vowel phonation.  
09/2011 - 08/2014 **CEO & Co-founder of a tech startup UNITEUS Social Cloud**  
Highlights: Formulated the business idea, raised capital, formed the company, assembled the team, established the company's culture, implemented Scrum, led 10+ full-time developers, released a beta version.

## Invited Positions

01/2020 - 03/2024 **Visiting PostDoc at Research Institute of Molecular Pathology (IMP), Vienna, Austria**  
Highlight: Created FakET, an efficient deep-learning-based simulator of transmission electron microscopes using PyTorch. Built a fully-differentiable algorithm for tomographic reconstructions in PyTorch.  
10/2022 - 11/2022 **Visiting PostDoc at IDeTIC, ULPGC, Spain**  
Highlight: Curated a clinical voice pathology dataset. Initiated partnerships with 4 international institutions.  
04/2022 - 04/2022 **Visiting PostDoc at MINS, ETH Zürich, Switzerland**  
Highlight: Conducted numerical experiments for a project on intrinsic vs. extrinsic dimensionality of data.  
04/2018 - 04/2019 **Visiting PhD at NuHAG, UniVie, Austria**  
Highlight: Co-authored a study on augmented loss functions in Journal of Mathematical Imaging and Vision.  
01/2017 - 02/2017 **Visiting PhD at IDeTIC, ULPGC, Spain**  
Highlight: Proposed a system for automated assessment of voice pathologies.

## Awards & Distinctions

2018 EU Grant Awardee: International Mobility of Researchers (65 000 EUR)  
2017 The best lecturer at the Department of Telecommunications, FEEC, BUT

## Skills & Technical Competencies & Other

Artificial Intelligence, Machine Learning, Deep Learning, Computer Vision, Signal Processing, Data Science, Research, Teaching, Keras, TensorFlow, PyTorch, OpenCV, Scipy, Scikit, Pandas, Numpy, HPC, Google Cloud, Amazon AWS, Vienna Scientific Cluster, Linux, Slurm, Docker, Git, Bash, Python, Team Leadership, Teamwork, Fundraising, Startups

**Scientific Impact:** H-index: 7; Cited by: 448; Reviewer for multiple high-impact scientific journals.  
**Mentoring:** Supervised multiple bachelor, master, and PhD students.  
**Community Service:** Organizer of Vienna Deep Learning Meetup, Ex Fundraiser & Organizer of TEDxTrenčín.  
**Languages:** Native in Slovak & Czech, English C1, German B1

- 2024 D. Kovac, J. Mekyska, V. Aharonson, **P. Harar**, Z. Galaz, S. Rapcsak, J.R. Orozco-Arroyave, L. Brabenec, I. Rektorova. Exploring Digital Speech Biomarkers of Hypokinetic Dysarthria in a Multilingual Cohort, *Biomedical Signal Processing and Control*, 2024. doi:10.1016/j.bspc.2023.105667.
- 2023 \* **P. Harar**, L. Herrmann, P. Grohs, and D. Haselbach. FakET: Simulating Cryo-Electron Tomograms with Neural Style Transfer, *accepted in Cell Structure*, 2023. doi:10.48550/arxiv.2304.02011.  
**Relevance:** A method for simulating cryo-electron tomograms using Neural Style Transfer, speeding up data generation by a factor of 750 while using 33 times less memory. The approach performs on par with existing benchmarks and offers a scalable data generation solution for computational microscopy.
- 2022 \* **P. Harar**, D. Elbrächter, M. Dörfler, and K.D. Johnson. Redistributor: Transforming Empirical Data Distributions, *preprint in review*, 2022. doi:10.48550/arXiv.2210.14219.  
**Relevance:** An algorithm for estimation and transformation of empirical data distributions. This tool is especially useful in image processing for correcting and enhancing photography, in synthetic data generation, and serves as an efficient data preprocessing or augmentation step in machine learning.
- 2021 \* C.M. Verdun, T. Fuchs, **P. Harar**, D. Elbrächter, D.S. Fischer, J. Berner, P. Grohs, F.J. Theis and F. Kraemer. Group Testing for SARS-CoV-2 Allows for Up to 10-Fold Efficiency Increase Across Realistic Scenarios and Testing Strategies. *Front. Public Health*, 2021. doi:10.3389/fpubh.2021.583377.  
**Relevance:** A study presenting optimized group testing methods for COVID-19 that can increase testing throughput tenfold. These strategies enable more efficient use of limited resources to improve pandemic tracking and containment. Accompanied by a web application visualizing precomputed scenarios useful for testing laboratories.
- 2020 \* A. Breger, J. Orlando, **P. Harar**, M. Dörfler, S. Klimscha, Ch. Grechenig, B.S. Gerendas, U. Schmidt-Erfurth, and M. Ehler. On Orthogonal Projections for Dimension Reduction and Applications in Augmented Target Loss Functions for Learning Problems. *Journal of Mathematical Imaging and Vision*, 2020. doi:10.1007/s10851-019-00902-2.  
**Relevance:** A study introducing a general framework for augmented target loss functions, an approach to enhance performance in machine learning tasks involving high-dimensional data useful in applications such as clinical image segmentation and sound classification.
- 2019 R. Bammer, M. Dörfler, and **P. Harar**. Gabor Frames and Deep Scattering Networks in Audio Processing. *Axioms*, 8(4):106, 2019. doi:10.3390/axioms8040106.
- 2018 \* **P. Harar**, Z. Galaz, J.B. Alonso-Hernandez, J. Mekyska, R. Burget, and Z. Smekal. Towards robust voice pathology detection. *Neural Computing and Applications*, 1–11, 2018. doi:10.1007/s00521-018-3464-7.  
**Relevance:** A study introducing systems for detecting voice pathologies using advanced machine learning classifiers, incl. deep learning. It is the first to systematically compare classifiers and input features in cross-database experiments, providing important insights for robust diagnosis of voice conditions.
- 2018 V. Hájek, **P. Harar**, J. Schimmel, and R. Burget. But-czas: Korpus kvalitních nahrávek české řeči pořízených v bezodrazové komoře. *Elektrorevue*, 20(2):48–52, 2018.

## Publications in Conference Proceedings

- 2019 **P. Harar**, R. Bammer, A. Breger, M. Dörfler, and Z. Smekal. Improving machine hearing on limited data sets. In *2019 11th International Congress on Ultra Modern Telecommunications and Control Systems and Workshops (ICUMT)* pages 1–6. IEEE, 2019. doi:10.1109/ICUMT48472.2019.8970740.
- 2018 Z. Galaz, J. Mekyska, T. Kiska, V. Zvoncak, J. Mucha, **P. Harar**, et al. Monitoring progress of parkinson’s disease based on changes in phonation: a pilot study. In *2018 41st International Conference on Telecommunications and Signal Processing (TSP)*, pages 1–5. IEEE, 2018. doi:10.1109/TSP.2018.8441307.
- 2017 **P. Harar**, J. B. Alonso-Hernandez, J. Mekyska, Z. Galaz, R. Burget, and Z. Smekal. Voice Pathology Detection Using Deep Learning: a Preliminary Study. In *2017 international conference and workshop on bioinspired intelligence (IWOBI)*, pages 1–4. IEEE, 2017. doi:10.1109/IWOBI.2017.7985525.
- 2017 **P. Harar**, R. Burget, and M.K. Dutta. Speech emotion recognition with deep learning. In *2017 4th International Conference on Signal Processing and Integrated Networks (SPIN)*, pages 137–140. IEEE, 2017. doi:10.1109/SPIN.2017.8049931.
- 2016 G. Vyas, M.K. Dutta, J. Prinosil, and **P. Harar**. An automatic diagnosis and assessment of dysarthric speech using speech disorder specific prosodic features. In *2016 39th International Conference on Telecommunications and Signal Processing (TSP)*, pages 515–518. IEEE, 2016. doi:10.1109/TSP.2016.7760933.

---

### Released Software

---

2023	P. Harar, L. Herrmann, P. Grohs and D. Haselbach. FakET.
2022	P. Harar, D. Elbrächter, M. Dörfler and K. Johnson. Redistributor.
2021	J. Berner, D. Elbrächter, P. Grohs, P. Harar. Group-testing.com.
2019	P. Harar. Gabor and Mel scattering.
2018	P. Harar and D. Elbrächter. Gaussifier.

---

### Peer Review Activity

---

2023	Biomedical Signal Processing and Control
2023	IEEE Signal Processing Letters
2022	IEEE/ACM Transactions on Audio, Speech, and Language Processing
2022	IEEE Signal Processing Letters
2020	IEEE Journal of Selected Topics in Signal Processing
2020	IEEE Journal of Biomedical and Health Informatics
2020	Arabian Journal for Science and Engineering
2018	Cognitive Computation

---

### Participation in Scientific Projects

---

2018 - 2019	Vienna Science and Technology Fund (WWTF) (MA14-018): Semantic Annotation by Learned Structured and Adaptive Signal Representations (SALSA)
2017 - 2019	Brno University of Technology (FEKT-S-17-4476) : Multimodal processing of unstructured data using machine learning and sophisticated methods of signal and image analysis
2016 - 2019	Ministry of Health of Czech Rep. (NV16-30805A): Effects of non-invasive brain stimulation on hypokinetic dysarthria, micro-graphia, and brain plasticity in patients with Parkinson's disease
2015 - 2019	Czech Ministry of Education, Youth And Sports of Czech Rep. (LO1401): Interdisciplinary research of wireless technologies (INWITE)

---

### Additional Qualifications - Schools & Workshops

---

11/2023	6 <sup>th</sup> Austrian CryoEM Symposium (Research Institute of Molecular Pathology)
09/2023	Napari Workshop: Multidimensional Optical Microscopy (Politecnico di Milano, IT )
04/2023	Tomography and Cryo-FIB Workshop 2023 – MCCET (University of Wisconsin–Madison, US)
09/2022	5 <sup>th</sup> Austrian CryoEM Symposium (Research Institute of Molecular Pathology)
07/2022	Workshop on The Reproducibility Crisis in ML-based Science (Princeton, NJ, US)
10/2021	Societal impact of my research Workshop (UniVie, AT)
03/2021	Workshop on the Tomographic Reconstructions and Applications (ESI, UniVie, AT)
10/2019	School on Math. and Comput. Aspects of Machine Learning (Scuola Normale Superiore, IT)
08/2019	Methods in Biology and Medicine: Mathematical Models in Cancer (WPI, Vienna, AT)
09/2018	Deep Learning and Visual Data Analysis Summer School (RNDS, UniVie, AT)
10/2017	Machine Learning Weekend (Kiwi.com, CZ)
09/2017	Workshop on Systematic Approaches to Deep Learning Methods for Audio (ESI, UniVie, AT)

---

### Teaching & Supervision & Mentoring

---

09/2023 - 10/2023	Host and mentor of a visiting PhD student: D. Kováč from Brno University of Technology
10/2020 - 02/2021	Host and mentor of a visiting PhD student: M. Kolařík from Brno University of Technology
02/2017 - 05/2017	Coach: PyLadiesCZ (public course of Python language initiated by PyLadies mentorship group)
2016 - 2017	Assistant lecturer: Basics of Object Oriented Programming in Java
2017	Bachelor thesis advisor: V. Hájek, Creating a database of audio recordings with artificial noise in an anechoic chamber
2016	Master thesis advisor: M. Majtán, Trainable image segmentation using deep neural networks

---

### Invited Lectures

---

15/05/2024	Comprehending Biomedical Data with Machine Learning, Vienna BioCenter, AT
04/04/2024	How to Capture and Navigate the Spatiotemporal Heterogeneity of Microscopic Bodies?, Institute of Science and Technology Austria (ISTA), AT
09/11/2023	From Pixels to Proteins: Neural Style Transfer's Unexpected Journey into Computational Microscopy, Young Scientist Symposium 2023, ISTA, AT
12/04/2023	Object Detection using Diffusion Models, Deep Learning Seminar, UniVie, AT
22/02/2023	FakET: Simulating Cryo-Electron Tomograms with Neural Style Transfer, Vienna Region CryoEM Seminar, AT
27/01/2023	FakET: Simulating Cryo-Electron Tomograms with Neural Style Transfer, Deep Learning Seminar, UniVie, AT
07/12/2022	Redistributor, UTKO, FECC, BUT, CZ
16/11/2022	Cold Diffusion, Deep Learning Seminar, UniVie, AT

12/07/2022	A Tool a Day Keeps the Bad Review Away, ESI-DCAFEM-TACO-VDSP Summer School on Machine Learning for Materials Hard and Soft, ESI Vienna, AT
27/10/2021	Let's Not Solve For What We Know (in cryoET), Vienna Region CryoEM Seminar, AT
14/09/2021	Planning, Execution and Dissemination of a ML Project, Summer School on AI, ÖAW, AT
05/06/2019	Hands on Introduction to Attention Mechanism, Deep Learning Seminar, UniVie, AT
21/11/2018	Automatic Transformation of Empirical Data Distribution as an Experimental Pre-Processing Step for Neural Networks, Acoustic Research Institute (ARI), Vienna, AT
25/06/2018	Basics of Neural Networks (Regression & Classification), NuHAG, UniVie, AT
05/06/2018	Towards Robust Voice Pathology Detection, Poster session at Strobl 2018, AT
02/02/2018	Battle-proven Machine Learning Workflow from Venv to Docker, UTKO, FECC, BUT, CZ
13/09/2017	Voice Pathology Detection Using Deep Learning: a Preliminary Study, Systematic approaches to DL methods for audio, ESI, Vienna, AT

---

### Volunteering

---

06/2024 - *	Organizer of Vienna Deep Learning Meetup.
01/2015 - 01/2019	Fundraiser and Co-organizer of TEDxTrenčín conference.

---

### Personal Information & Links

---

Languages	Native in Slovak & Czech, English C1, German B1
Webpage	<a href="https://pavol.harar.eu">https://pavol.harar.eu</a>
LinkedIn	<a href="https://www.linkedin.com/in/pavol-harar">https://www.linkedin.com/in/pavol-harar</a>
Twitter	<a href="https://twitter.com/HararPavol">https://twitter.com/HararPavol</a>
ORCID	<a href="https://orcid.org/0000-0001-5206-1794">https://orcid.org/0000-0001-5206-1794</a>
Google Scholar	<a href="https://scholar.google.cz/citations?user=L6tw-ZoAAAAJ">https://scholar.google.cz/citations?user=L6tw-ZoAAAAJ</a>
ResearchGate	<a href="https://www.researchgate.net/profile/Pavol_Harar">https://www.researchgate.net/profile/Pavol_Harar</a>
ArXiv	<a href="https://arxiv.org/a/0000-0001-5206-1794.html">https://arxiv.org/a/0000-0001-5206-1794.html</a>
GitLab	<a href="https://gitlab.com/paloha">https://gitlab.com/paloha</a>
GitHub	<a href="https://github.com/paloha">https://github.com/paloha</a>

---

### Open Science Statement

---

- All of my publications are openly available on preprint servers such as ArXiv, MedRxiv, or ResearchGate.
- The code for reproducing all of my publications submitted after 2018 is open-source via GitLab or GitHub.
- Unless license explicitly forbids, I make all data openly available.