Mikolaj Aleksander Kegler, Ph.D.

Audio Machine Learning Scientist, Bose Research
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EDUCATION

10.2018 - 05.2022
PhD in Neurotechnology
Department of Bioengineering & Centre for Neurotechnology,
Imperial College London, UK
Thesis: *Computational modelling of neural mechanisms underlying natural speech perception*. DOI: 10.25560/97669.

10.2017 - 09.2018
MRes in Neurotechnology (*Distinction*)
Department of Bioengineering & Centre for Neurotechnology,
Imperial College London, UK
Thesis: *Computational model for the modulation of speech-in-noise comprehension through transcranial electrical stimulation*

10.2016 - 09.2017
MSc in Biomedical Engineering (*Distinction*)
Department of Bioengineering,
Imperial College London, UK
Thesis: *Complex model for detecting the brainstem response to natural speech*

10.2012 - 02.2016
BEng in Biomedical Engineering (*Distinction*)
Department of Mechatronics,
Warsaw University of Technology, Poland
Thesis: *Control system using lower limbs EMG signal to initialize movement procedures of exoskeleton*

EXPERIENCE (selected)

05.2022 - present
Audio Machine Learning Scientist (remote)
Bose Corporation, Framingham, MA, USA
Duties: Design and development of lightweight machine learning algorithms for on-device audio/speech signal processing, with a focus on speech enhancement and hearing augmentation. Supervision of research interns.

10.2021 - 05.2022
Consultant - Clinical Data Analysis (remote)
INBRAIN Neuroelectronics, Barcelona, Spain
Duties: Design and development of automated signal processing, analysis & machine learning pipelines for invasively-recorded neural data.

06.2021 - 10.2021
Applied Scientist Intern - Lab126 (remote)
Amazon, Sunnyvale, CA, USA
Duties: Development of deep learning algorithms (PyTorch) for low-latency, multichannel speech enhancement. Preparation of publications (*ICASSP*).

11.2019 - 05.2022
Scientific Advisor - CTO office (remote)
Logitech, Lausanne, Switzerland
Duties: Advisory and contributions to collaborative applied research projects in the fields of machine learning for audio/speech processing and human-computer interaction. Co-supervision of research interns.

06.2019 - 10.2019 **Research Intern - CTO office**
Logitech, Lausanne, Switzerland
Duties: Development of deep learning algorithms (Tensorflow) for speech signal processing with a focus on speech enhancement, learning representation and transfer learning. Preparation of publications (*InterSpeech*, *EUSIPCO*).

09.2018 - 02.2021 **Data Science Mentor**
Decoded, London, UK
Duties: One-to-one personalized mentoring of professionals taking part in the *Data Academy* course covering a broad range of topics from the fields of data science, applied mathematics & statistics, and machine learning.

10.2017 - 03.2022 **Graduate Teaching Assistant - Dept. of Bioengineering & Computing**
Imperial College London, UK
Courses:

- Machine Learning and Neural Computations (2017 - 2019)
- Reinforcement Learning (2019 - 2021)
- Computational Neuroscience (2018 - 2021)
- Brain-Machine Interfaces (2018 - 2021)
- Statistics and Data Analysis (2018 - 2022)
- Statistical and Computational Methods for Research (2021 - 2022)
- Hearing and Speech Processing (2018 - 2021)
- Introduction to MATLAB (2020 - 2021)

04.2016 - 10.2016 **Research Assistant & Clinical Engineer - Bioimaging Research Center**
Institute of Physiology and Pathology of Hearing, Kajetany, Poland
Duties: Acquisition and analysis of neuroimaging data (EEG, fMRI, fNIRS) of hearing aid users & cochlear implant patients, as well as, normal-hearing adults & children. Active involvement in grant-funded research projects.

SKILLS & AREAS OF EXPERTISE

Machine learning & data science: Broad training in engineering, applied mathematics & statistics with a focus on (bio)signal processing, data science and computational modelling. Demonstrable experience in developing custom machine- & deep learning algorithms (Tensorflow/Keras, PyTorch, scikit-learn).

Speech/audio signal processing: Demonstrable experience in audio/speech signal processing with particular focus on deep-learning-based speech enhancement & source separation (single- & multi-channel), learning speech representations and paralinguistics. Applied knowledge in spatial/binaural audio, room acoustic simulations, and classic audio/speech DSP methods (e.g., beamforming, etc.).

Auditory cognitive neuroscience (methods): Psychoacoustics, computational neuroscience & modelling, electroencephalography (EEG), brain-computer interfacing (BCI), non-invasive brain stimulation (NIBS), electrocorticography (ECoG), electromyography (EMG).

Programming and computational methods: Demonstrable strong programming skills in Python and MATLAB, including many specialized packages/toolboxes/APIs. Basic programming skills in C/C++ & JavaScript. Experience in processing large volumes of data and high-performance computing.

LANGUAGES

English: Professional proficiency
German: Elementary knowledge
Polish: Native speaker

NATIONALITY

United Kingdom
Poland (European Union)

PUBLICATIONS (* - equal contribution, 📖/🗎 - journal/conference paper)

🗎 Daod Nathoo, R.*, **Kegler, M.***, Stamenovic, M. (2024). Two-Step Knowledge Distillation for Tiny Speech Enhancement. To appear at *2024 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. DOI: 10.48550/arXiv.2309.08144.

🗎 Irvin, B., Stamenovic, M., **Kegler, M.**, Yang, L-C. (2023) Self-Supervised Learning for Speech Enhancement through Synthesis. *2023 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. DOI: 10.1109/ICASSP49357.2023.10094705.

📖 Elbanna, G., Scheidwasser-Clow, N., **Kegler, M.**, Beckmann, P., El Hajal, K., Cernak, M. (2022) BYOL-S: Learning Self-supervised Speech Representations by Bootstrapping. *HEAR: Holistic Evaluation of Audio Representations (NeurIPS 2021 Competition), PMLR*, 166, 25-47. DOI: arXiv:2206.12038. **Featured as one of the top-performing audio representation models at the *NeurIPS HEAR 2021*.**

🗎 Elbanna, G., Biryukov, A., Scheidwasser-Clow, N., Orlandic, L., **Kegler, M.**, Beckmann, P., Cernak, M. (2022) Hybrid Handcrafted and Learnable Audio Representation for Analysis of Speech Under Cognitive and Physical Load. *Proc. Interspeech 2022*, 386-390. DOI: 10.21437/Interspeech.2022-10498.

🗎 Cherep M., **Kegler, M.**, Thiran, J-P., Mainar, P. (2022) Mental Flow Estimation Through Wearable EEG. *2022 44th Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)*, 4672-4678. DOI: 10.1109/EMBC48229.2022.9871594.

📖 **Kegler, M.**, Weissbart, H. & Reichenbach, T. (2022). The neural response at the fundamental frequency of speech is modulated by word-level acoustic and linguistic information. *Frontiers in Neuroscience*, 16, 915744. DOI: 10.3389/fnins.2022.915744.

🗎 Scheidwasser-Clow, N., **Kegler, M.**, Beckmann, P. & Cernak, M. (2022). SERAB: A multilingual benchmark for speech emotion recognition. *2022 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*. DOI: 10.1109/ICASSP43922.2022.9747348.

📖 Kulkarni, A., **Kegler, M.** & Reichenbach, T. (2021). Effect of visual input on syllable parsing in a computational model of a neural microcircuit for speech processing. *Journal of Neural Engineering*, 18, 056055. DOI: 10.1088/1741-2552/ac28d3.

🗎 Beckmann, P.*, **Kegler, M.***, & Cernak, M. (2021). Word-level Embeddings for Cross-Task Transfer Learning in Speech Processing. *2021 29th European Signal Processing Conference (EUSIPCO)*, 446-450. DOI: 10.23919/EUSIPCO54536.2021.9616254.

📖 **Kegler, M.** & Reichenbach, T. (2021). Modelling the effects of transcranial alternating current stimulation on the neural encoding of speech in noise. *NeuroImage*, 224, 117427. DOI: 10.1016/j.neuroimage.2020.117427.

🗎 **Kegler, M.***, Beckmann, P.* & Cernak, M. (2020). Deep Speech Inpainting of Time-Frequency Masks. *Proc. Interspeech 2020*, 3276-3280, DOI: 10.21437/Interspeech.2020-1532.

📖 Vanheusden, F., **Kegler, M.**, Ireland, K., Constantina, G., Reichenbach, T., Simpson, D.M. & Bell, S.L. (2020). Hearing aids do not alter cortical entrainment to speech at audible levels in mild-to-moderately hearing-impaired subjects. *Frontiers in Human Neuroscience*, 14, 109. DOI: 10.3389/fnhum.2020.00109.

📖 Keshavarzi, M., **Kegler, M.**, Kadir, S. & Reichenbach, T. (2020) Transcranial alternating current stimulation in the theta band but not in the delta band modulates the comprehension of naturalistic speech in noise. *NeuroImage*, 210, 116557. DOI: 10.1016/j.neuroimage.2020.116557.

📖 Etard, O.*, **Kegler, M.***, Braiman, C., Forte, A.E. & Reichenbach, T. (2019). Decoding of selective attention to continuous speech from the human auditory brainstem response. *NeuroImage*, 200, 1-11. DOI: 10.1016/j.neuroimage.2019.06.029.