

Roman Koshkin

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- ❖ Final-year PhD student in machine learning and computational neuroscience.
- ❖ Experienced in simultaneous machine translation and language modeling
- ❖ Interested in natural language processing and understanding.

EDUCATION

- 09/2019 - present **Okinawa Institute of Science and Technology, Neural Coding and Brain Computing Unit, Japan**
PhD (Machine Learning and Computational Neuroscience) *Expected graduation: 06/2025*
- 06/2017 **National Research University HSE, Moscow, Russia**
Master of Science, Psychology (**with distinction**, GPA: 8.9/10)
- 06/2002 **VUMO University, Moscow, Russia**
Specialist, Linguistics (**with honors**, GPA: 4.9/5)

WORK EXPERIENCE

- 07/2023 **Special Research Intern, NLP Group, AHC Lab, Nara Institute of Science and Technology, Japan**
10/2023
 - Developed speech-to-text and speech-to-speech SiMT models leveraging open-source causal LLMs.
 - Set up LLMOps/MLOps, parallel experiments to identify best design and HP choices.
- 07/2022 **Research Intern, Araya, Reinforcement Learning Research Team, Tokyo, Japan**
11/2022
 - Conduct research towards using EEG for robot control with a brain-machine interface
 - Compiled a sensor-aligned motor imagery EEG dataset on which I
 - Trained a self-supervised EEG feature extractor with a contrastive loss and
 - Achieved competitive performance in downstream tasks (incl. MI imagery classification).
 - Reimplemented and open-sourced an M/EEG speech-decoding model.
- 09/2017 **Junior Research Fellow, Center for Bioelectric Interfaces, Institute of Cognitive Neuroscience,**
07/2019 *National Research University HSE, Moscow, Russia*
 - Coordinated a research team of 3 people for 2 years
 - Conceptualized and conducted neuromarketing and consumer behavior research experiments
 - Designed and implemented EEG data collection and pre-processing pipelines
 - Wrote and maintained data acquisition software (Python front- & backend)
 - Designed and trained DL models for estimating respondents' opinion of advertised products
 - Taught EEG data pre-processing techniques, Python and MATLAB to junior lab members
 - Provided oral status updates and written progress reports to the funding company (Neurotrend)
 - Co-authored one patent (RF Patent 2747571)

PROJECTS

- 07/2023 **TransLLaMa**
10/2023 *NLP Group, NAIST*
LLM-based speech-to-text and speech-to-speech simultaneous machine translation.
- 01/2023 **convSeq**
03/2023 *Neural Coding and Brain Computing Unit, OIST*
Fast and scalable convolution-based method for unsupervised detection of patterns in neural recordings.
- 09/2020 **SoNNet**
- present *Neural Coding and Brain Computing Unit, OIST*
High-performance C++ library with a configurable user-friendly Python API for building recurrent spiking neural networks (SNNs).
- 09/2022 **graphSeq**
12/2022 *Neural Coding and Brain Computing Unit, OIST*
Graph neural network-based method for simultaneous embedding and clustering of neural spiking patterns.
- 09/2022 **M/EEG-based zero-shot speech decoding**
12/2022 *Araya Lab, Tokyo*
Re-implementation of an algorithm that decodes speech from human brain recordings (M/EEG) 0-shot.
- 04/2020 **Tutoring Object Manipulation Skills in a Human-Robot Interaction Paradigm**
09/2020 *OIST Cognitive Neurorobotics Unit, OIST*
Trained a robot to perform reach-and-grasp tasks by combining learned motor primitives.
- 1/2020 **Backpropagation-free learning for classification tasks**
4/2020 *OIST Neural Coding and Brain Computing Unit*
Built a spike-timing dependent plasticity-based spiking neural network for image classification.
- 09/2019 **Extended Ca²⁺ Buffer and Dynamics Model of the Rat Hippocampal Presynapse**
12/2019 *OIST Computational Neuroscience Unit*
Implemented a reaction-diffusion model of Ca²⁺ dynamics in the rat hippocampal presynapse.
- 10/2017 **Neurobarometer, Center for Bioelectric Interfaces, Higher School of Economics**
07/2019 Software & algorithm for EEG-based neuromarketing and consumer behavior research.
- 09/2016 **Finding Weak Effects with Known Temporal Structure in Evoked Response Data, NRU HSE**

04/2017 Contributed to designing a novel projection-based method for identifying weak effects in noisy ERP data
09/2015 **Attention and Working Memory in Simultaneous Interpreting**, *Higher School of Economics*
09/2016 Tested the Efforts Model of simultaneous interpreting using the ERP technique

SKILLS

Frameworks/tools: *Pytorch (highest proficiency), HuggingFace, Lightning, scikit-learn, JAX, Apache Spark*
Infrastructure: *AWS, slurm*
Programming languages: *Python (highest proficiency), C++, Matlab, R, HTML, JavaScript*
Frontend development: *React, Next.js*
DevOps, CI/CD: *GitHub Actions, Docker, Singularity*
Databases: *Neo4j, Redis, MongoDB*
LLMOps: *LangSmith, LangChain, LangGraph, wandb*

PATENTS

RF Patent 2747571. Electroencephalographic method and system of objective estimation of listeners' reaction to audio content based on a range of voluntary affective categories. <https://bit.ly/EEGpatent2>

AWARDS, GRANTS, FELLOWSHIPS

2023 **KAKENHI Grant-in-Aid (¥ 1.8M)** (<https://cir.nii.ac.jp/crid/1040577431243576704>)
2023 **Japan Society for the Promotion of Science Fellowship** (<http://bit.ly/3PjzL7y>)
2021 **Google PhD Fellowship (\$ 10K)** (<https://research.google/outreach/phd-fellowship/recipients/?category=2021>)

PREPRINTS & PEER-REVIEWED PUBLICATIONS

Koshkin, R., Sudoh, K., Nakamura, S. (2024). TransLLaMa: LLM-based Simultaneous Translation System. *arXiv*. <https://arxiv.org/abs/2402.04636>
Koshkin, R., Fukai, T. (2024). convSeq: Fast and Scalable Method for Detecting Patterns in Spike Data. *arXiv*. <https://arxiv.org/abs/2402.01130>
Koshkin, R., Fukai, T. (2023). Unsupervised Detection of Cell Assemblies with Graph Neural Networks. In *ICLR 2023 Tiny Papers Track*. https://openreview.net/pdf?id=Tbzv_BbjjO8
Koshkin, R., Shtyrov, Y., Myachykov, A., & Ossadtchi, A. (2018). Testing the Efforts Model of Simultaneous Interpreting. *PLoS ONE* 13(10): e0206129. <https://doi.org/10.1371/journal.pone.0206129>
Koshkin, R., & Ossadtchi, A. (2017). Commentary: Functional Connectivity in the Left Dorsal Stream Facilitates Simultaneous Language Translation: An EEG Study. *Frontiers in Human Neuroscience*, 11(2), 273. <http://doi.org/10.3389/fnhum.2017.00064>
Koshkin, R., Ossadtchi, A. & Shtyrov, Y. (2017). Attention, Working Memory And Listening In Simultaneous Interpreting. *Russian Journal of Cognitive Science*, 4(4). <http://cogjournal.org/eng/4/4/index.html>
Koshkin R. (2016). Comparative Analysis of Quantitative Dynamics of English-Russian and Russian-English Simultaneous Interpreting. *Bulletin of Moscow University, Series 22: Theory of Translation*. Vol. 2, 28-43 <https://elibrary.ru/item.asp?id=27125259>

POSTER PRESENTATIONS AND TALKS

Koshkin, R, Fukai, T. (2022). Astrocytes facilitate self-organization and remodeling of cell assemblies under STP-coupled STDP. SfN Conference, Nov 14-16, San Diego. Abstract: https://bit.ly/SfN_nov_2022
Koshkin, R., Fukai, T (2021). Leveraging Self-organized Structure for Memory Encoding in Binary Networks. RIKEN-OIST Symposium, Oct. 6-7, 2021, Japan Poster: <https://bit.ly/3lgsqGO>
Koshkin, R., Shtyrov, Y. & Ossadtchi, A. (2017). Testing One Aspect of the Efforts Model of Simultaneous Interpreting: An ERP Study. In *Proceedings of the Workshop "Neurobiology Of Speech And Language"*, Oct. 27-29, 2017, SPb, Russia Abstract: <http://bit.ly/2y52Hu3> Poster: <http://bit.ly/2ljEytV>
Koshkin, R., Ossadtchi, A. & Shtyrov, Y.(2016). N1 ERP As an Index of Depth of Processing In Simultaneous Interpreting. In *Proceedings of Communication, Computation, and Cognitive Processes*, Sept. 28-29, 2016, Moscow, Russia Abstract: <http://bit.ly/2lhyWjP>
Koshkin, R., Ossadtchi, A. & Shtyrov, Y.(2017). Working Memory Load In Simultaneous Language Interpretation: An ERP Study. *IEEE International Symposium «Video and Audio Signal Processing in the Context of Neurotechnologies»*, Jun. 26-30, 2017, SPb, Russia Abstract: <http://bit.ly/2ANhSVD>
Kuznetsova A., **Koshkin R.,** Ossadtchi A. (2017). Localizing Hidden Regularities With Known Temporal Structure in the EEG Evoked Response Data. *IEEE International Symposium «Video and Audio Signal Processing in the Context of Neurotechnologies»*, Jun. 26-30, 2017, SPb, Russia Abstract: <http://bit.ly/2ANhSVD>

CONFERENCE PROCEEDINGS AND BOOK CHAPTERS

Koshkin, R., Ossadtchi, A. (2017). Working Memory Load in Simultaneous Language Interpretation: An ERP Study. In *Proc. of the 4th Conference "Cognitive Science in Moscow: New Research"*. July 15, 2017, Moscow, Russia. p. 434 <http://virtualcoglab.ru/MoscowCogSci2017Proceedings.pdf>
Garcia, A., **Koshkin, R.,** Paiva, T. (2023). EEG. In *Cognitive Translation and Interpreting Studies*. Amsterdam: John Benjamins. (In review)

TEACHING, MENTORSHIP AND OTHER EXPERIENCE

11/2021 **Science Mentor, Okinawa, Japan**
Taught Introduction to Deep Learning with Python to high-school students.