ILYA KUZOVKIN

CURRICULUM VITAE

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https://www.linkedin.com/in/ilyakuzovkin
https://www.ikuz.eu
https://twitter.com/IlyaKuzovkin
https://github.com/kuz
Google Scholar

12 years of experience working with machine learning and AI in industry and academia. Deep knowledge of machine learning principles, spanning all the way from the classical methods to deep neural networks and the technology behind the modern AI. Leadership and project management experience as a Head of ML at a Californian robotics company in the US; Data Science Lead in an FDA-approved neurotechnology firm in Sydney, Australia. PhD in artificial intelligence and computational neuroscience, with publications at top venues and more than a thousand citations of my academic works. Large social media following, ties with global and local machine learning and technology communities, invited speaker.

PERSONAL DATA

Locations	Syndey, Australia (primary) Pasadena, CA, USA (visiting) Tartu, Estonia (visiting)
Citizenship	Australia

EMPLOYMENT IN INDUSTRY

2023 – NOW **Director** at Neurotech Lab
Consultancy and Research Services in Neurotechnology, Neuroscience, and AI
Sydney, Australia; https://www.neurotechlab.ai

2020 – 2022 **Head of Machine Learning Strategy and Research** at OffWorld Inc
Deep reinforcement learning, Machine Learning, Robotics
Pasadena, California, US; https://offworld.ai

2022 **Lead Data Scientist** at Omniscient Neurotechnology
Machine Learning, Brain Imaging, fMRI, Tractography
Sydney, Australia; https://o8t.com

2016 – 2020 **Machine Learning Architect** at OffWorld Inc
Deep reinforcement learning, Machine Learning, Robotics
Pasadena, California, US; http://offworld.ai

2012 – 2016 **Software Engineer** at Ideelabor OÜ
Development of a country-wide graduate school plagiarism detection system, python, text processing
Tartu, Estonia; http://kratt.edu.ee

2011 – 2012 **Research Engineer** at University of Tartu, Department of Psychology
Joint project with Realeyes Inc.: predicting human emotional response from visual and biophysical data, data analysis, machine learning

2007 – 2011 **Software Engineer** at Surflink OÜ
Web development, System analysis, Technical advising
Tallinn, Estonia

EDUCATION

2013 – 2020 PhD Computer Science, University of Tartu
Computational Neuroscience Lab, `neuro.cs.ut.ee`
Machine Learning, Deep Learning, Neuroscience, Brain-Computer Interfaces
PhD thesis: "Understanding Information Processing in Human Brain by Interpreting Machine Learning Models"

2011 – 2013 MSc Computer Science, University of Tartu
Master's thesis: "Adaptive Interactive Learning: a Novel Approach to Training BCI Systems"

2007 – 2011 BSc Computer Science, University of Tartu
Bachelor thesis: "Pattern recognition for non-invasive EEG-based Brain-Computer Interface"

EMPLOYMENT IN ACADEMIA

2015 – 2019 **Junior Researcher** @ University of Tartu, Institute of Computer Science
Research Topic: Machine Learning on Brain Data
TA: Introduction to Computational Neuroscience
TA: Machine Learning
TA: Computational Neuroscience Seminar

2014 – 2015 **Research project technician** @ University of Tartu, Institute of Computer Science
Research Topic: Machine Learning on Brain Data

2012 – 2015 **Teaching Assistant** @ University of Tartu, Institute of Computer Science
TA: Deep Learning Introductory Seminar
TA: Introduction to Computational Neuroscience (2 semesters)
TA: Machine Learning (3 semesters)
TA: Advanced Algorithmics
TA: Computer Graphics
TA: Computational Neuroscience Seminar (4 semesters)

SKILLS

●●● expert
●●○ confident user
●○○ can apply
◐○○ familiar

Machine Learning	DEEP LEARNING ●●● CONVOLUTIONAL NEURAL NETWORKS ●●● TRANSFORMERS ●●○ NEURAL NETWORK ARCHITECTURES ●●● RECURRENT NEURAL NETWORKS ●●○ FOUNDATIONAL MODELS DESIGN ●●● REINFORCEMENT LEARNING ●●● MDP ●●○ STATISTICAL LEARNING THEORY ●●○ RANDOM FORESTS ●●● CLUSTERING ALGORITHMS ●●○ BAYESIAN LEARNING ●○○ SUPPORT VECTOR MACHINES ●●● REGRESSION MODELS ●●●
Leadership	PROJECT PLANNING ●●● PROJECT MANAGEMENT ●●● TECH HIRING ●●● ALIGNING TEAM STRUCTURE TO COMPANY GOALS ●●● INTERNAL STAKEHOLDER ENGAGEMENTS ●●● EXTERNAL STAKEHOLDER COMMUNICATIONS ●●○ DATA VISUALISATION AND PRESENTATION ●●● COMMUNICATING TECHNICAL CONCEPTS ●●● EMPLOYEE FEEDBACK AND PROFESSIONAL GROWTH ●●○ PUBLIC SPEAKING ●●○
Generative AI	TRANSFORMERS ●●○ DENOISING AUTOENCODERS ●○○ LANGUAGE MODELS ●○○ STABLE DIFFUSION ●○○ CHATGPT ●●○ GENERATIVE ADVERSARIAL NETWORKS ●○○ PROMPT ENGINEERING ●●○ LANGCHAIN ●○○

ML and AI Frameworks	KERAS ●●● PYTORCH ●○○ TENSORFLOW ●○○ SCIKIT-LEARN ●●● THEANO ●○○ HUGGINGFACE ●○○
Programming Languages	PYTHON ●●● MATLAB ●●● R ●●○ C/C++ ●○○ PROLOG ◐○○ HASKELL ◐○○ JAVA ●○○ PHP ●●○ JAVASCRIPT ●●○ PERL ●○○ PASCAL ●○○
Neuroscience and Neurotechnology	COMPUTATIONAL NEUROSCIENCE ●●○ ELECTROPHYSIOLOGY ●●○ EEG ●●● LFP ●●● FMRI ●●○ CONNECTOMICS ●●○ TRACTOGRAPHY ●○○ FNIRS ◐○○ CALCIUM IMAGING ◐○○ INTRACORTICAL ELECTRODE RECORDINGS ●●○ BRAIN-COMPUTER INTERFACES ●●● ECOG ●○○ DECODING MODELS OF BRAIN ACTIVITY ●●● NEUROANATOMY ●○○
Scalability	AWS ●●○ DOCKER ●●○ VECTOR DATABASES ●○○ MICROSERVICE ARCHITECTURE ●○○ HPC CLUSTERS ●●○ GOOGLE CLOUD PLATFORM ●○○
Academic Research	EXPERIMENTAL DESIGN ●●● RESEARCH PLANNING ●●● UNDERSTANDING SCIENTIFIC LITERATURE ●●● ACADEMIC WRITING ●●○ ACADEMIC PUBLISHING ●●○ LATEX ●●● TEACHING ●●○ JOURNAL AND CONFERENCE REVIEWS ●●● THESIS SUPERVISION ●●● CONFERENCE PRESENTATIONS ●●○
Robotics	ROS ●●○ SLAM ●○○ MOTION PLANNING ●○○ ROBOTIC HARDWARE DESIGN ◐○○ ELECTRICAL ENGINEERING ◐○○
Computer Science	ALGORITHMS AND DATA STRUCTURES ●●○ GRAPH THEORY ●●○ CRYPTOGRAPHY ●○○ QUANTUM COMPUTING ◐○○ COMPLEXITY THEORY ●●○ BIOINFORMATICS ●●○ FORMAL LOGIC ●○○ RELATIONAL DATABASES ●●● NO-SQL DATABASES ●●○ LINUX ADMINISTRATION ●●○ COMPUTER NETWORKS ●○○ COMPUTER GRAPHICS ●●○ CODING THEORY ●○○ DESIGN PATTERNS ●●○ SIGNAL PROCESSING ●●○ GAME THEORY ●○○ CYBERSECURITY ●○○

PATENTS

2022 **Brain Data Anomaly Detection Using Tensor Processing**
Inventors: Stephane P. Doyen, Ilya Kuzovkin, Peter W. Rudder, Michael E. Sughrue
Assignee: Omniscient Neurotechnology Pty Limited; WO US [pending]

PUBLICATIONS

CITATIONS: 1078
H-INDEX: 6
AS OF 9 JAN 2024

2022 **Offline Robot Reinforcement Learning with Uncertainty-Guided Human Expert Sampling**
A. Kumar, I. Kuzovkin
NeurIPS 2022 Offline RL Workshop `https://openreview.net/forum?id=KglZOZ1s9W`

2020 **Identifying task-relevant spectral signatures of perceptual categorization in the human cortex**
I. Kuzovkin, J.R Vidal, M. Perrone-Bertlotti, P. Kahane, S. Rheims, J. Aru, J.-P. Lachaux, R. Vicente
Scientific Reports `https://www.nature.com/articles/s41598-020-64243-6`

Mental state space visualization for interactive modeling of personalized BCI control strategies
Ilya Kuzovkin, Konstantin Tretyakov, Andero Uusberg, Raul Vicente
Journal of Neural Engineering https://iopscience.iop.org/article/10.1088/1741-2552/ab6d0b

2019 **Addressing Sample Complexity in Visual Tasks Using HER and Hallucinatory GANs**
Himanshu Sahni, Toby Buckley, Pieter Abbeel, Ilya Kuzovkin
NeurIPS 2019 https://papers.nips.cc/paper/8818-addressing-sample-complexity-in-visual-tasks-using-her-and-hallucinatory-gans

OffWorld Gym: open-access physical robotics environment for real-world reinforcement learning benchmark and research
A. Kumar, T. Buckley, Q. Wang, A. Kavelaars, I. Kuzovkin
arXiv https://arxiv.org/abs/1910.08639

2018 **Activations of deep convolutional neural network are aligned with gamma band activity of human visual cortex**
I. Kuzovkin, R. Vicente, M. Petton, J.-P. Lachaux, M. Baciu, P. Kahane, S. Rheims, J. R. Vidal, J. Aru
Nature's Communications Biology https://www.nature.com/articles/s42003-018-0110-y

Direct information transfer rate optimisation for SSVEP-based BCI
A. Ingel, I. Kuzovkin, R. Vicente
Journal of Neural Engineering http://iopscience.iop.org/article/10.1088/1741-2552/aae8c7

2016 **Combining static and dynamic features for multivariate sequence classification**
A. Leontjeva, I. Kuzovkin
in Proceedings of the 3rd IEEE International Conference on Data Science and Advanced Analytics 2016

Adaptive interactive learning for training BCI systems
I. Kuzovkin, K. Tretyakov, A. Uusberg, R. Vicente
in Proceedings of the Sixth International Brain-Computer Interface Meeting 2016

2015 **Multiagent cooperation and competition with deep reinforcement learning**
A. Tampuu, T. Matiisen, D. Kodelja, I. Kuzovkin, K. Korjus, J. Aru, J. Aru, R. Vicente
arXiv:1511.08779

TALKS & APPEARANCES

2021 **Poster** "OffWorld Gym: Open-Access Physical Robotics Environment for Real-World Reinforcement Learning Benchmark and Research"
4th Robot Learning Workshop: Self-Supervised and Lifelong Learning @ NeurIPS, http://www.robot-learning.ml/2021

Guest lecture 'Introduction to Reinforcement Learning"
Machine Learning Course @ University of Tartu, https://courses.cs.ut.ee/2021/ml/fall/Main/Lectures

Talk 'Introduction to Reinforcement Learning"
AI Frontiers @ AI Labs Commonwealth Bank of Austrlia

Poster "OffWorld Gym: Open-Access Physical Robotics Environment for Real-World Reinforcement Learning Benchmark and Research"
Reinforcement Learning for Real Life Workshop @ ICML 2021, https://sites.google.com/view/RL4RealLife

Talk "Deep Reinforcement Learning for Real-World Robotics"
Reinforcement Learning Seminar Series, University of Maryland, https://www.cs.umd.edu/talks/rlss

Talk "Open-Access Physical Lunar Analog Environment for Reinforce ment Learning and Robotics Research"
43rd Scientific Assembly of the Committee on Space Research (COSPAR), Sydney, Australia

2020 **Talk** "Deep Reinforcement Learning for Real-World Robotics"
Artificial Intelligence in Robotics Meetup, Sydney, Australia

2019 **Talk** "The Brain and the Modern AI: Drastic Differences and Curious Similarities"
Machine Learning Meetup, Sydney, Australia

Booth talk "Machine Learning for Autonomous Robot Control"
International Astronautical Congress, Wastington, DC

Presenter and **panelist** "AI-Powered Industrial Robotic Workforce"
Off Earth Mining Forum 2019, Sydney, Australia

2018 Nanosymposium **talk** "Activations of deep convolutional neural networks are aligned with gamma band activity of human visual cortex"
Society for Neuroscience Annual Meeting 2018 (SfN 2018), San Diego, USA

Session chair "Vision: Representation of Objects and Scenes"
Society for Neuroscience Annual Meeting 2018 (SfN 2018), San Diego, USA

2017 Machine Learning **mentor** @ Garage48 Big Data hackathon, Tartu, Estonia

Machine and Deep Learning **mentor** @ Social Impact Data Hack 2017, Tartu, Estonia

2016 Introduction to Machine Learning – **talk** @ Mooncascade ML Camp, Tartu, Estonia
Adaptive Interactive Learning for Training BCI Systems – **poster**
Brain-Computer Interface Meeting 2016, Pacific Grove, CA, USA

2015 Brain-Computer Interfaces – **talk** @ TEDxLasnamäe, Tallinn, Estonia

Introduction to the Machine Learning Pipeline – **instructor** @ BNNI 2015

2014 Machine Learning on Neuroimaging Data – short course **lecturer** @ AACIMP'14
Awarded with "Best Teacher"

Replicating DeepMind – co-author, **poster** & talk @ ESSCaSS'14

Soft Introduction to BCI – **talk** @ EPSÜ Summer School

2013 Brain-Computer Interface: Technology, Theory and Practice – short course **lecturer** @ AACIMP'13

Adaptive Interactive Learning: a Novel Approach to Training BCI Systems – **talk** @ ESSCaSS'13

2011 Brain-Computer Interfaces – **poster** @ ESSCaSS'11

NOTABLE PROJECTS

2022
FMRI, BRAIN, STATISTICS, ML, LEAD

Anomaly Detection in Functional Connectivity of the Human Brain
Contributed to and improved a method for anomaly detection in human connectomes based on resting state fMRI and Glasser parcellation. Formulated the improved method, conducted and supervised the execution of supporting experiments, visualized and presented the results to stakeholders.
`https://www.o8t.com`

2019 – 2022
RL, SPACE, ROBOTICS, PYTHON, ROS, NODEJS

OffWorld Gym: physical robotics environment for real-world reinforcement learning
Conceived, led, and developed a platform that allows reinforcement learning researchers to test their algorithms on a real physical robot by accessing it remotely, without any knowledge in robotics and via a well-established API of OpenAI gym. Ran research experiments on this platform to explore the applicability of RL methods to real-world robotics. The project is live and ongoing.
`https://gym.offworld.ai`

2017 – 2019 **Understanding the mechanisms of human vision with machine learning methods**
BRAIN, IMPLANTS, ML, RF, DNN, PYTHON, MATLAB
Formulated and developed the experiments, wrote the code, analyzed the data, prepared masnuscripts and published two research papers on applying machine learning techniques to a unique dataset of intracortical electrophysiological recordings from 100+ human subjects.
https://www.nature.com/articles/s41598-020-64243-6
https://www.nature.com/articles/s42003-018-0110-y

2017 – 2022 **Leading OffWorld's Machine Intelligence Team**
ML, RL, ROBOTICS, LEADERSHIP
Formulated the goal and the strategy of a machine learning team of a robotics company. Formulated the objectives and designed experiments to try and achieve imprinting of human knowledge into industrial robotic units by transferring behaviors from human experts into reinforcement learning agents. Structured team's activities to yield both academic and industrial outcomes.
https://www.offworld.ai/ai

2015 – 2016 **Mental state space visualization for Brain-Computer Interfaces**
BCI, EEG, ML BRAIN
Conceived and developed an application of a topology-preserving dimensionality reduction technique to Brain-Computer Interfaces, replacing classical feedback loop with a more informative interaction between the human and the learning system. Conducted experiments, analyzed data, published results.
https://iopscience.iop.org/article/10.1088/1741-2552/ab6d0b

REVIEWS AND PANELS

2023 **Journal reviewer** for the Journal of Neural Engineering
Awarded "IOP Trusted Reviewer" certificate.
Journal reviewer for Machine Learning: Science and Technology
Conference reviewer at Neural Information Processing Systems (NeurIPS'23)
Conference reviewer at International Conference on Learning Representations (ICLR'24)

2022 **Journal reviewer** for the Journal of Neural Engineering
Conference reviewer at Neural Information Processing Systems (NeurIPS'22)
Conference reviewer at International Conference on Learning Representations (ICLR'23)

2021 **Conference reviewer** at Neural Information Processing Systems (NeurIPS'21)
Expert Reviewer at International Conference on Machine Learning (ICML'21)
Highlighted Reviewer at International Conference on Learning Representations (ICLR'22)

2020 **Conference reviewer** at International Conference on Machine Learning (ICML'20)
Conference reviewer at International Conference on Learning Representations (ICLR'21)

2018 **Panel member** for Radical Innovation Breakthrough Inquirer
Identifying the most promising innovative technologies and their timeline https://ribri.isi-project.eu.

ACADEMIC TEACHING

2016/17 Seminar on Computational Neuroscience

2015/16 Seminar on Computational Neuroscience

2014/15 Introduction to Computational Neuroscience (Teaching assistant), Machine Learning (Teaching assistant)
Seminars on Computational Neuroscience, Seminars on Deep Learning

2013/14 Introduction to Computational Neuroscience (Teaching assistant) ,Machine Learning (Teaching assistant) Computer Graphics (Teaching assistant), Seminars on Computational Neuroscience

2012/13 Advanced Algorithmics (Teaching assistant)

THESES SUPERVISION

2020/21 Web-based Toolbox for Interactive 3D Visualization of Neural Recordings
Fedor Stomakhin, BSc

2017/18 Replicating DeepMind StarCraft II Reinforcement Learning Benchmark with Actor Critic Methods
Roman Ring, BSc

Emotional State Recognition Based on Physiological Signals
Artem Bachynskyi, MSc

EEG Source Localization: A Machine Learning Approach
Gagandeep Singh, MSc

2016/17 Direct ITR Optimization for SSVEP-based BCI
Anti Ingel, MSc

Towards Reliable Brain-Computer Interface: Achieving Perfect Accuracy by Sacrificing Time
Jevgeni Savostkin, MSc

2014/15 Control a Robot via VEP Using Emotiv EPOC
Anti Ingel, BSc

Empirical Comparison of Machine Learning Algorithms Based on EEG Data
Madis Masso, BSc

2013/14 Usage of Fuzzy Classification Algorithms in Brain-Computer Interfaces
Stepan Bolotnikov, BSc

POPULAR ARTICLES & MEDIA

2015 Quote for "Game-Playing Software Holds Lessons for Neuroscience" article @ Nature News

2014 Artificial Intelligence That Plays Atari Video Games: How Did DeepMind Do It?
co-author, article @ Robohub.org

OPEN SOURCE PROJECTS & COMPETITIONS

Replicating DeepMind — Attempt to repeat the results achieved by the DeepMind team in their first Atari paper (`http://arxiv.org/abs/1312.5602`)
GitHub: `https://github.com/kristjankorjus/Replicating-DeepMind`

Caffe with Spearmint — Automatic parameter search via Bayesian optimization for Caffe deep learning framework.
GitHub: `https://github.com/kuz/caffe-with-spearmint`

BCI Challenge @ Kaggle	Detect when a user is dissatisfied with a system from EEG brain signals. 27th / 260 (Top 25%) GitHub: `https://github.com/kuz/Kaggle-BCI-Challenge`
Diabetic Retinopathy @ Kaggle	Identify Diabetic Retinopathy and its stage from images of the retina. 159th / 661 (Top 25%) GitHub: `https://github.com/skyfallen/Kaggle-Diabetic-Retinopathy-Detection`

AWARDS, SCHOLARSHIPS & FELLOWSHIPS

2023 DAAD Fellow : German Academic Exchange Service

2022 Nominated for Sigma Xi membership

2018 HITSA Mobility Grant for SfN Neuroscience 2018 in San Diego, US

2014 HITSA Mobility Grant for Brain-Computer Interface Conference in Graz, Austria

2012 Dora T8 scholarship for short-term visit for AACIMP'12 in Kiev, Ukraine

FURTHER PROFESSIONAL TRAINING

Independent coursework

Neuromatch Computational Neuroscience 2023
Learning From Data @ edX
Machine Learning @ Coursera
Neural Networks for Machine Learning @ Coursera
Game Theory @ Coursera
Astrobiology and the Search for Extraterrestrial Life @ Coursera
Statistical Analysis of fMRI Data @ Coursera
Analysing the Universe @ Coursera
From the Big Bang to Dark Energy @ Coursera

Conferences

Neuroscience
Organisation for Human Brain Mapping (Australian chapter) OHBM Australia '23
Australian Cognitive Neuroscience Society ACNS '23
g.tec Brain-Computer Interface and Neurotechnology Sprint School '23
Neurotechnology and Law Forum by Baker McKenzie '22
Oxford Autumn School in Neuroscience '20
Society for Neuroscience Annual Meeting, SfN '18
Brain-Computer Interface Meeting '16
Computational Neuroscience, CNS '15
Bernstein Conference Conference '14
Graz Brain-Computer Interface Conference '14

Reinforcement Learning and Robotics
Conference on Robot Learning, CoRL '17, '18, '19, '20, '21
International Conference on Robotics and Automation, ICRA '18

Machine Learning and Computer Science
International Conference on Machine Learning, ICML '15, '16, '19
Neural Information Processing Systems, NeurIPS '16, '19, '20, '21, '22, '23
Estonian Summer School(s) on Computer and Systems Science, '14, '15, '16, '17
Achievements and Applications of Contemporary Informatics, Mathematics and Physics '14, '15
Estonian Winter School(s) in Computer Science '14, '15, '16
Estonian Computer Science Theory Days '15, '17

Space
Committee on Space Research (COSPAR) 43rd Scientific Assembly '20
International Astronautical Congress, IAC '19
Off Earth Mining Forum, OEMF '19

Hackathons
BrainHack Sydney '23
Garage48 SpaceTech '17
Garage48 Hardware & Arts '14, '15, '16
Garage48 '13, '14

ADMINISTRATIVE & SOCIAL ACTIVITIES

2016 – 2017 Member of BSc and MSc Curriculum Board @ University of Tartu

2013 – 2017 Graduate students representative in the Council of the Institute of Computer Science @ University of Tartu

Last updated on January 9, 2024