NEMANJA RAKIĆEVIĆ

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Google Scholar

I am a Research Scientist at Google DeepMind where I am working on developing novel capabilities for Large Language Models such as Gemini. I have done research on improving exploration and efficiency of Reinforcement Learning methods and Open-Ended Learning approaches.

I hold a PhD degree from Imperial College London, during which I conducted and published research in robotics, physics simulators and machine learning methods for robot control. I designed, developed and deployed novel control algorithms for robot control based on Quality-Diversity and RL algorithms.

Besides my scientific and technical contributions, I am dedicated and committed to sharing knowledge in the field of AI through mentoring, scientific education, and the popularisation of science. I am involved in the organisation of the Mediterranean (M2L) and Eastern European (EEML) ML summer schools, and I have given talks at student organised conferences (SINFO, talk video).

Work and Academic experience

11/2024 - now — **Senior Research Scientist: Google DeepMind**, London, UK
Gemini Agents - post-training via SFT and RL, data flywheel, pushing GAIA benchmark.

12/2021 - 10/2024 — **Research Scientist: Google DeepMind**, London, UK
Gemini - Large language models advanced capabilities (RAG, Tool use, RLHF),
Improving exploration approaches and optimising RL algorithms for efficiency,
Open-ended and curriculum learning for RL agents in combinatorial task spaces.

(10-12)/2021 — **Research Engineer: Tractable**, London, UK
Implementing vision-based models for car part segmentation and damage classification.

2020-2021 — **Research consultant at Imperial College London,** London, UK
Developing simulators for various terrains and robot designs, as well as corresponding robot controllers based on Quality-Diversity algorithms for a DARPA project.

09/2018 – 01/2019 — **Research Intern: DeepMind**, London, UK
Researching methods for state-space exploration for efficient Sim2Real transfer, in the context of reinforcement learning for continuous robot control.

(06 – 08)/2017 — **Data Scientist: WeAreHuman.io** (**previously CitySail**), London, UK
Developing and implementing models for real-time human personality estimation.

01/2015 – 05/2016 — **Research Assistant: iBug group, Imperial College London**, UK
Researching non-linear sequential probabilistic models for emotion intensity recognition, based on facial expressions and audio data. Developed multimodal neural conditional random fields for behaviour analysis, specifically interpersonal agreement.

2015 – 2021 — **Graduate Teaching Assistant: Imperial College London**, UK
Machine Learning (prof Maja Pantic),
Computing II, Robotics (Dr Petar Kormushev)
Data Structures and Algorithms (Dr Heikki Peura)

12/2013 – 07/2014 — **Research Engineer: RIS group, LAAS-CNRS**, Toulouse, France
Researching methods for rover locomotion diagnostics using proprioceptive sensor signals obtained in field experiments. Focusing on sequential machine learning methods for modelling temporal dynamics of rover locomotion.

07/2013 — **MSc thesis internship: Japanese Aerospace Exploration Agency** (**JAXA**), Tsukuba, Japan
Institute of Space and Astronautical Science on the "Cuatro" rover test bed

Education

2016 – 2021 **PhD researcher** Robot Intelligence Lab, Imperial College London
Thesis title: Parameter Space Abstractions for diversity-based Policy Search
Researched approaches for efficient diversity-based policy search, in the context of movement control policies for continuous robot control. Developed methods based on active learning, gaussian processes, generative models and evolutionary algorithms.

2011 – 2013 **MSc European Master On Advanced Robotics (EMARO), double degree**
Thesis development: Keio University, Japan
2nd year: Ecole Centrale de Nantes, grade average A
1st year: University of Genova, grade average A

2007 – 2011 **BSc Mechatronics, Robotics and Automatization.**
Faculty of Technical Sciences, University of Novi Sad, grade average 10 [100/100]

Publications

Gemini Team - core contributor, *"Gemini 1.5: Unlocking multimodal understanding across millions of tokens of context"*, arXiv preprint arXiv:2403.05530, 2024

Gemini Team - core contributor, *"Gemini: a family of highly capable multimodal models"*, arXiv preprint arXiv:2312.11805, 2023

AdA Team - partial contributor, *"Human-Timescale Adaptation in an Open-Ended Task Space"*, ICML (oral presentation), 2023

S Kapturowski, V Campos, R Jiang, **N Rakicevic**, H van Hasselt, C Blundell, and A Puigdomenech Badia. *"Human-level Atari 200x faster"*, ICLR (oral presentation), 2023

N Rakicevic, A Cully, P Kormushev. *"Policy Manifold Search: Exploring the Manifold Hypothesis for Diversity-based Neuroevolution"*, GECCO (oral presentation), 2021

RP Saputra, **N Rakicevic**, I Kuder, J Bilsdorfer, A Gough, A Dakin, E de Cocker, S Rock, R Harpin, P Kormushev. *"ResQbot 2.0: An Improved Design of a Mobile Rescue Robot with an Inflatable Neck Securing Device for Safe Casualty Extraction"*, MDPI Applied Sciences, 2021

RP Saputra, **N Rakicevic**, D Chappell, K Wang, P Kormushev. *"Hierarchical Decomposed-Objective Model Predictive Control for Autonomous Casualty Extraction"*, IEEE Access, 2021

N Rakicevic, A Cully, P Kormushev. *"Policy Manifold Search for Improving Diversity-based Neuroevolution"*, Beyond Backpropagation Workshop (NeurIPS), 2020 [**oral 8% acceptance rate**]

RP Saputra, **N Rakicevic**, P Kormushev. *"Sim-to-Real Learning for Casualty Detection from Ground Projected Point Cloud Data"*, IROS, 2019

N Rakicevic, P Kormushev. *"Active Learning via Informed Search in Movement Parameter Space for Efficient Robot Task Learning and Transfer"*, AURO, 2019

N Rakicevic, P Kormushev. *"Efficient Robot Task Learning and Transfer via Informed Search in Movement Parameter Space"*, AIRW (NIPS), 2017

N Rakicevic, O Rudovic, S Petridis, M Pantic. *"Multi-Modal Neural Conditional Ordinal Random Fields for Dynamic Agreement Level Classification"*, ICPR, 2016

N Rakicevic, O Rudovic, S Petridis, M Pantic. *"Neural Conditional Ordinal Random Fields for Agreement Level Estimation"*, WASA, 2015.

Community Services

Organiser **Eastern European Machine Learning Summer School,** 2024 [LINK]
Talk **SINFO conference**, Lisbon, Portugal, 2024 [LINK]
Tutor and Organiser **Mediterranean Machine Learning Summer School,** 2022, 2023, 2024 [LINK]
Reviewer **International Conference Learning Representations,** 2021
Reviewer **Journal of Intelligent & Robotic Systems,** 2020
Reviewer **International Conference Machine Learning,** 2020 (**awarded top reviewer**)
Reviewer **NeurIPS 2019 Workshop on Robot Learning**, 2019, 2020
Reviewer **IEEE International Conference on Humanoid Robots,** 2019
Reviewer **IEEE International Conference on Robotics and Automation,** 2018, 2020
Team leader **National robotics competition** (**EUROBOT**) 2011

Awards and recognitions

2023	Patent pending PCT/EP2023/075512: Data-efficient Reinforcement Learning with Adaptive Return Computation Schemes
2016 – 2020	Imperial College London President's PhD Scholarship
2011 – 2014	Erasmus Mundus scholarship laureate for the EMARO MSc programme
2010/2011	Awarded the best student in generation 2010/11 recognition, University of Novi Sad
2010 – 2013	"Dositeja" scholarship laureate, Ministry of Youth and Sport, Republic of Serbia
2009/2010	University of Novi Sad scholarship laureate
2008 – 2012	Annual award to exceptional students, Ministry of Education, Republic of Serbia

Skills

Computer skills	[active] Python, PyTorch, JAX, Tensorflow, MuJoCo, Box2D, PyBullet, LaTeX [passive] MATLAB, C/C++, Solid Edge, Pro/ENGINEER
Languages	Serbian, English, Italian, Spanish, French
Hobbies	Capoeira Club "Capoeira Associação Sérvia" (since 2005), Surfing, Drawing