Dr. Nikola Simidjievski

Senior Research Associate

University of Cambridge, Cambridge, United Kingdom

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About me

I am a Senior Research Associate at the Department of Oncology, University of Cambridge, UK. My main research focus is at the intersection of machine learning, medicine and biology. Specifically, I am interested in different topics of probabilistic methods for multimodal data analysis, data representation learning, and explainable data analysis with applications in oncology and healthcare. I have experience in computational scientific discovery (Physics-informed ML) and I am quite keen on machine learning for modelling dynamical systems.

Research interests:
• Multimodal data analysis • Data representation learning • Probabilistic Machine Learning • Deep Learning
• Explainable data analysis • Computational scientific discovery (Physics-informed ML)

Applications in : Medicine & Biology

Professional Experience

2019 -	**Senior Research Associate,** Department of Oncology, University of Cambridge, UK
	Visiting Senior Research Associate, Department of Computer Science and Technology, U. Cambridge, UK
2019 -	**Visiting Research Associate,** Department of Knowledge Technologies, Jožef Stefan Institute, Slovenia
2011 - 2019	**Research Assistant,** Department of Knowledge Technologies, Jožef Stefan Institute, Slovenia
2010	**Interring Young Researcher,** Laboratoire d'Informatique de l'univeristé de Franche-Comté, France
2009 - 2011	**Young Researcher,** Macedonian Academy of Sciences and Arts, Skopje, Republic of N. Macedonia

Education

Jožef Stefan International Postgraduate School — *Ljubljana, Slovenia*

Doctor of Philosophy (Ph.D.) — *September 2016*

- Area: Machine Learning
- Thesis title: Ensembles of process-based models of dynamic systems
- Advisors: Prof. Sašo Džeroski & Prof. Ljupčo Todorovski

Faculty of Electrical Engineering and Information Technologies, University "Ss. Cyril and Methodius" — *Skopje, Republic of N. Macedonia*

MSc. Graduate Degree — *July 2021*

- Computer Networks and e-Technologies
- Summa cum laude [10/10]

Faculty of Electrical Engineering and Information Technologies, University "Ss. Cyril and Methodius" — *Skopje, Republic of N. Macedonia*

BSc. Undergraduate Degree — *September 2009*

- Magma cum laude [9.25/10]

Projects & Grants

Projects

2023 -2028	**SYNERGIA:** Multimodal Data Analysis for Breast Cancer, U.S. Department of Defense (DOD), **Co-PI**
2019 -2022	**Integrated Cancer Medicine**, Mark Foundation & Cancer Research UK Cambridge Centre [C9685/A25177]
2014-2019	**The Human Brain Project**, FP7/H2020 FET Flagship ICT-2013-60410
2018-2021	**IMPERATRIX:** Improving reproducibility of experiments and reusability of research outputs in complex data analysis, Slovenian Research Agency J2-9230
2016-2019	**Machine Learning for System Sciences** , Slovenian Research Agency N2-0056
2014-2017	**MAESTRA:** Learning from Massive, Incompletely annotated and Structured Data , FP7 FET Open Xtrack EC ICT-2013- 612944
2011-2014	**SUMO:** Super Modelling by combining imperfect models, FP7 EC ICT-2009-266722

Grants

2023-	**AiSTRA:** Understanding spacecraft anomalies with knowledge graph reasoning, European Space Agency, **Co-PI**	*100,000 EUR*
2020 -2022	**AiTLAS:** AI4EO prototyping environment, European Space Agency [4000130508/20/I-NB], **Principal Investigator**	*500,000 EUR*
2019-2021	**GalaxAI:** Machine Learning for Spacecraft Operations, European Space Agency, [4000128994/19/D/AH], **Principal Investigator**	*500,000 EUR*

Awards & Fellowships

2011-2016	**PhD Scholarship** , Slovenian Research Agency (ARRS), Slovenia
2016	**1st Place (Team) - Mars Express Power Challenge**, European Space Agency
2005-2011	**Scholarship for talented graduate and undergraduate students**, Ministry of Education, N. Macedonia

Mentoring & Teaching

Post-docs *University of Cambridge*

- [2024-] Dr. Aris Sionakidis, Multi-modal machine learning for Breast Cancer

PhD supervisions *University of Cambridge*

- [2022-] Konstantin Hemker (co-supervised with Mateja Jamnik)
- [2021-] Andrei Margeloiu (co-supervised with Mateja Jamnik)
- [2021-] Urska Matjasec (co-supervised with Mateja Jamnik)
- [2019-2023] Paul Scherer (as an advisor)
- [2019-2022] Jacob Deasy (as an advisor)

MSc. supervisions *University of Cambridge*

- [2022-2023] Zak Buzzard (co-supervised with Mateja Jamnik & Konstantin Hemker)
- [2022-2023] Laura Wenderoth (co-supervised with Mateja Jamnik & Konstantin Hemker)
- [2022-2023] Gabriele Dominici
- [2022-2023] Jonas Jurss
- [2022-2023] Navindu Leelarathna
- [2022-2023] Anya Chen
- [2022-2023] Xiangjian Jiang (co-supervised with Mateja Jamnik)
- [2022-2023] Muhammad Hamza Sajjad (co-supervised with Mateja Jamnik)
- [2022-2023] George Pulickal (co-supervised with Pietro Lio)
- [2021-2022] Tom McIver (co-supervised with Pietro Lio)

Courses

2024 **Multimodal Machine Learning,** University of Cambridge (MPhil/Part III Graduate Studies)
2020 **Machine Learning for Modelling and Analysis of Medical Data**, CamBioScience

Publications

Complete list of publications: `https://scholar.google.com/citations?user=T5l2R6IAAAAJ`

Alimu Dayimu*, Nikola Simidjievski*, Nikolaos Demiris, Jean Abraham ”Sample size determination via learning-type curves” Biometrics 2023 (under review)

Konstantin Hemker, Nikola Simidjievski, Mateja Jamnik ”HEALNet - Hybrid Early-Fusion Attention for Multi-Modal Biomedical Learning Tasks” AAAI 2024 (under review)

Andrei Margeloiu, Nikola Simidjievski, Pietro Lio, Mateja Jamnik ”Weight predictor network with feature selection for small sample tabular biomedical data” AAAI 2023

Xiangjian Jiang, Andrei Margeloiu, Nikola Simidjievski, Mateja Jamnik ”ProtoGate: Prototype-based Neural Networks with Local Feature Selection for Tabular Biomedical Data” AAAI 2024 (under review)

Jonas Jürß, Lucie Charlotte Magister, Pietro Barbiero, Pietro Lio, Nikola Simidjievski ”Everybody Needs a Little HELP: Explaining Graphs via Hierarchical Concepts” ICLR 2024 (under review)

Gabriele Dominici, Pietro Barbiero, Lucie Charlotte Magister, Pietro Liò, Nikola Simidjievski ”Sharcs: Shared concept space for explainable multimodal learning” ICLR 2024 (under review)

Andrei Margeloiu, Nikola Simidjievski, Pietro Lio, Mateja Jamnik ”GCondNet: A Novel Method for Improving Neural Networks on Small High-Dimensional Tabular Data” AAAI 2024 (under review)

Navindu Leelarathna, Andrei Margeloiu, Mateja Jamnik, Nikola Simidjievski ”Enhancing Representation Learning on High-Dimensional, Small-Size Tabular Data: A Divide and Conquer Method with Ensembled VAEs” arXiv:2306.15661, (2023)

Ramon Vinas, Paul Scherer, Nikola Simidjievski, Mateja Jamnik, Pietro Lio ”Spatio-relational inductive biases in spatial cell-type deconvolution” ICML 2023 workhsop

Ivica Dimitrovski, Ivan Kitanovski, Dragi Kocev, Nikola Simidjievski “Current Trends in Deep Learning for Earth Observation: An Open-source Benchmark Arena for Image Classification”. ISPRS Journal of Photogrammetry and Remote Sensing 197, 18-35. 2023

Ben Day, Ramon Torne, Nikola Simidjievski, Pietro Lió “Attentional Meta-learners for Few-shot Polythetic Classification”. ICML 2022

Nikola Simidjievski, Cristian Bodnar, Ifrah Tariq, Paul Scherer, Helena Andres Terre, Zohreh Shams, Mateja Jamnik, Pietro Liò “Variational Autoencoders for Cancer Data Integration: Design Principles and Computational Practice”. (Frontiers in Genetics 2019)

Jacob Deasy, Nikola Simidjievski, Pietro Lió “Constraining Variational Inference with Geometric Jensen-Shannon Divergence”. Advances in Neural Information Processing Systems 33 pre-proceedings (NeurIPS 2020).

Alexander Norcliffe, Cristian Bodnar, Ben Day, Nikola Simidjievski, Pietro Lió. On Second Order Behaviour in Augmented Neural ODEs. Advances in Neural Information Processing Systems 33 pre-proceedings (NeurIPS 2020).

Paul Scherer, Maja Trębacz, Nikola Simidjievski, Zohreh Shams, Helena Andres Terre, Pietro Liò, Mateja Jamnik. Unsupervised construction of computational graphs for gene expression data with explicit structural inductive biases (2021). Oxford Bioinformatics Bioinformatics 38 (5), 1320-1327

Matej Petković, Blaž Škrlj, Dragi Kocev, Nikola Simidjievski. Fuzzy Jaccard Index: A robust comparison of ordered lists. (2020). Applied Soft Computing

Invited talks

[Sep. 2022] CCAIM Summer School on "AI and Machine Learning in Healthcare" 2022

[Jan. 2012] Integrated Cancer Medicine Seminar, UK

[Jan. 2021] University of Cambridge Computer Lab: Healthcare Research Showcase, UK

[March 2020] Machine Learning for Space, Frankfurt Data Science, DE

[June 2019] MFICM Data Integration Workshop, Cambridge, UK

Editorial

Discover the Mysteries of the Maya: Selected Contributions from the Machine Learning Challenge & The Discovery Challenge Workshop at ECML PKDD 2021, ISBN: 978-961-264-228-0

Proceedings of the Human Brain Project Student Conference. 2018 Edition: ISBN 978-2-88945-421-1 & 2019 Edition: ISBN 978-2-88945-588-1

The European Conference on Machine Learning & Principles and Practice of Knowledge Discovery in Databases, September 18-12, 2017, Skopje, Macedonia: Program. 2017

Community Service

Associate Editor & Program Committee member

- AE of Expert Systems with Applications
- AE of Machine Learning Journal
- PC member of ICML, NeurIPS, ICLR, IJCAI etc. (with multiple top-reviewer recognitions)

Program Chair & Organisation

- [2023] "Neuro-Explicit AI and Expert-informed Machine", ECML-PKDD 2023 workshop
- [2021] "AI for Spacecraft Longevity", IJCAI 2021 Workshop
- [2021] "Discover the mysteries of the Maya", Machine Learning Challenge & Discovery Challenge Workshop at ECML PKDD 2021
- [2017 & 2018] Human Brain Student Conference
- [2017] The European Conference on Machine Learning and Principles and Practice of Knowledge Discovery, ECML-PKDD 2017

Outreach

- [Feb. 2021] Interview for Integrated Cancer Medicine podcast series (Mark Foundation for Cancer Research and the CRUK Cambridge Centre)
- [Mar. 2020] Interview for Cambridge Communications office on AI for Integrative Cancer Medicine

References

- Prof. Pietro Lio, University of Cambridge, UK
- Prof. Mateja Jamnik, University of Cambridge, UK
- Prof. Jean Abraham, University of Cambridge, UK
- Prof. Sašo Džeroski, Jožef Stefan Institute, Slovenia
- Prof. Ljupčo Todorovski, University of Ljubljana, Slovenia