Razvan Valentin Marinescu

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Research Interests

- Machine learning for medicine, particularly for neuroscience applications
- Generative modeling using deep learning architectures, for image reconstruction and manipulation
- Bayesian modelling, statistical inference, efficient sampling
- Time-series models with latent variables, for capturing disease processes
- Causal machine learning, for building robust models able to deal with distribution shifts

Current Employment & Entrepreneurship

2022 - now | **Assistant Professor, CSE Department, University of California Santa Cruz**
Research focus: Machine Learning for Healthcare and Biology, Generative Models, Image Reconstruction, Bayesian Inversion, ML Compositionality

2020 - now | **Co-founder and CTO, GiwoTech Inc.**
Focus: Developing a next generation drug screening platform through molecular dynamics simulations and weighted ensembles. Current focus on Hepatitis B virus particles.

Education

2019 - 2021 | **Postdoctoral Associate, CSAIL, Massachusetts Institute of Technology**
Advisor: Prof. Polina Golland
Research focus: generative models, image reconstruction, Bayesian inversion

2014 - 2019 | **PhD, Center for Medical Image Computing, University College London**
PhD thesis: "Modelling the Neuroanatomical Progression of Alzheimer's Disease and Posterior Cortical Atrophy" – Supervisors: Prof. Daniel Alexander, Prof. Sebastian Crutch, Dr. Neil Oxtoby
Research focus: bayesian latent-variable models, machine learning, neuroimaging, disease progression modelling.

2010 - 2014 | **MEng, Department of Computer Science, Imperial College London**
First Class Honours (top 10% of class in final year)
Master thesis: "On a new metric to compare internal structures in biological networks"
Supervisor: Prof. Natasa Przulj

Past Employment

2016 - 2018 | **Teaching Assistant in Computational Modelling, UCL**
Taught computational modelling, bayesian statistics and numerical optimisation to Master students. Marked the students' coursework.

2014 - 2018 | **Graduate Residence Advisor, University College London**
Provided pastoral support to students and emergency support.

2012 - 2013 | **Teaching Assistant in Programming, Imperial College London**
Taught Haskell, Java and C to undergraduate students. Weekly marking of students' coursework.

2013 | **Industrial Placement at J.P. Morgan Chase & Co, Emerging Markets**
Assisted the retirement of a legacy system that was processing end-of-day market risk.

Awards

2021	Best paper award at the NeurIPS Deep Generative Models and Downstream Applications
2017	Runner up (jointly) for the Francois Erbsmann Prize (best paper award) at the IPMI conference.
2015-17	Travel and registration fellowships for several conferences: IPMI, AAIC and Human Brain Project.
2013	DAAD Scholarship for doing a German Language course in Aachen, Germany over the summer.
2011	Prize for the best undergraduate project in Artificial Intelligence, Imperial College London
2010	Sponsored visit to NATO Headquarters, Brussels, for achievements in international projects and contests.
2009	Grand Prize at the International Space Settlement Design Competition offered by NASA Johnson Space Center.
2008	Diploma of Excellency awarded by the Government of Romania for results obtained in mathematics competitions.
2007	Bronze Medal at the 6th International Computer Project Competition "Infomatrix". Silver Medal at the *National Mathematics Olympiad* in Romania.

Other significant activities

2019-20	President of the MIT Postdoctoral Association
2016-17	Taught Robotics and Computer Graphics courses at the Oxford for Romania Summer School
2011-14	Year representative at Imperial College faculty meetings

Selected publications

2021

Talk **Marinescu, R.V.**, Moyer, D., Golland, P., 2021. Bayesian Image Reconstruction using Deep Generative Models. NeurIPS Deep Generative Models and Downstream Applications Workshop.

2020

Journal **Marinescu, R.V.**, Oxtoby, N.P., Young, A.L., Bron, E.E., Toga, A.W., Weiner, M.W., Barkhof, F., Fox, N.C., Eshaghi, A., Toni, T. and Salaterski, M., 2020. The Alzheimer's Disease Prediction Of Longitudinal Evolution (TADPOLE) Challenge: Results after 1 Year Follow-up. arXiv preprint arXiv:2002.03419., under review for Nature Communications

2019

Poster **Marinescu, R.V.**, Lorenzi, M., Blumberg, S., Young, A.L., Morell, P.P., Oxtoby, N.P., Eshaghi, A., Yong, K.X., Crutch, S.J. and Alexander, D.C., 2019. Disease Knowledge Transfer across Neurodegenerative Diseases. MICCAI, 2019.

Journal **Marinescu, R.V.**, Eshaghi, A., Lorenzi, M., Young, A.L., Oxtoby, N.P., Garbarino, S., Crutch, S.J., Alexander, D.C. and Alzheimer's Disease Neuroimaging Initiative, 2019. DIVE: A spatiotemporal progression model of brain pathology in neurodegenerative disorders. NeuroImage, 192, pp.166-177.

Journal (*joint first-authors) *Firth, N.C., *Primativo, S., ***Marinescu, R.V.**, Shakespeare, T.J., Suarez-Gonzalez, A., Lehmann, M., Carton, A., Ocal, D., Pavisic, I., Paterson, R.W. and Slattery, C.F., 2019. Longitudinal neuroanatomical and cognitive progression of posterior cortical atrophy. Brain.

2017

Talk **Marinescu, R.V.**, Eshaghi, A., Lorenzi, M., Young, A.L., Oxtoby, N.P., Garbarino, S., Shakespeare, T.J., Crutch, S.J., Alexander, D.C. and Alzheimer's Disease Neuroimaging Initiative, 2017, June. A vertex clustering model for disease progression: application to cortical thickness images. In International Conference on Information Processing in Medical Imaging (pp. 134-145). Springer, Cham. (Erbstman Prize Runner-up)

Other First author publications

2020

Talk **Marinescu, R.V.**, Bron, E.E., Oxtoby, N.P., Young, A.L., Toga, A.W., Weiner, M.W., Barkhof, F., Fox, N.C., Golland, P., Klein, S. and Alexander, D.C., 2020, July. Predicting Alzheimer's disease progression: Results from the TADPOLE Challenge. In 2020 Alzheimer's Association International Conference.

2019

Talk **Marinescu, R.V.**, Alexander, D.C. and Golland, P., 2019. BrainPainter: A software for the visualisation of brain structures, biomarkers and associated pathological processes, MICCAI MBIA Workshop, 2019

Talk **Marinescu, R.V.**, Oxtoby, N.P., Young, A.L., Bron, E.E., Toga, A.W., Weiner, M.W., Barkhof, F., Fox, N.C., Golland, P., Klein, S. and Alexander, D.C., 2019, October. TADPOLE challenge: Accurate Alzheimer's disease prediction through crowdsourced forecasting of future data. In MICCAI Workshop on PRedictive Intelligence In MEdicine.

2018

Journal **Marinescu, R.V.**, Oxtoby, N.P., Young, A.L., Bron, E.E., Toga, A.W., Weiner, M.W., Barkhof, F., Fox, N.C., Klein, S. and Alexander, D.C., 2018. TADPOLE Challenge: Prediction of Longitudinal Evolution in Alzheimer's Disease. arXiv preprint arXiv:1805.03909.

2017

Poster **Marinescu, R.V.**, Primativo, S., Young, A.L., Oxtoby, N.P., Firth, N.C., Eshaghi, A., Garbarino, S., Cardoso, J.M., Yong, K., Fox, N.C. and Lehmann, M., 2017. Analysis Of The Heterogeneity Of Posterior Cortical Atrophy: Data-driven Model Predicts Distinct Atrophy Patterns For Three Different Cognitive Subgroups. Alzheimer's & Dementia: The Journal of the Alzheimer's Association, 13(7), pp.P106-P108.

2016

Poster **Marinescu, R.V.**, Young, A.L., Oxtoby, N.P., Firth, N.C., Lorenzi, M., Eshaghi, A., Wottschel, V., Cardoso, M.J., Modat, M., Yong, K. and Primativo, S., 2016. A Data-driven Comparison Of The Progression Of Brain Atrophy In Posterior Cortical Atrophy And Alzheimer's Disease. Alzheimer's & Dementia: The Journal of the Alzheimer's Association, 12(7), pp.P401-P402.

Joint publications

2019

Journal Eshaghi, A., **Marinescu, R.V.**, Young, A.L., Firth, N.C., Prados, F., Jorge Cardoso, M., Tur, C., De Angelis, F., Cawley, N., Brownlee, W.J. and De Stefano, N., 2018. Progression of regional grey matter atrophy in multiple sclerosis. Brain, 141(6), pp.1665-1677.

Poster Slator, P.J., Hutter, J., **Marinescu, R.V.**, Palombo, M., Young, A.L., Jackson, L.H., Ho, A., Chappell, L.C., Rutherford, M., Hajnal, J.V. and Alexander, D.C., 2019, June. InSpect: INtegrated SPECTral Component Estimation and Mapping for Multi-contrast Microstructural MRI. In International Conference on Information Processing in Medical Imaging (pp. 755-766). Springer, Cham.

Journal Garbarino, S., Lorenzi, M., Oxtoby, N.P., Vinke, E.J., **Marinescu, R.V.**, Eshaghi, A., Ikram, M.A., Niessen, W.J., Ciccarelli, O., Barkhof, F. and Schott, J.M., 2019. Differences in topological progression profile among neurodegenerative diseases from imaging data, eLife

2018

Journal Young, A.L., **Marinescu, R.V.**, Oxtoby, N.P., Bocchetta, M., Yong, K., Firth, N.C., Cash, D.M., Thomas, D.L., Dick, K.M., Cardoso, J. and van Swieten, J., 2018. Uncovering the heterogeneity and temporal complexity of neurodegenerative diseases with Subtype and Stage Inference. Nature communications, 9(1), p.4273.

Journal Wijeratne, P.A., Young, A.L., Oxtoby, N.P., **Marinescu, R.V.**, Firth, N.C., Johnson, E.B., Mohan, A., Sampaio, C., Scahill, R.I., Tabrizi, S.J. and Alexander, D.C., 2018. An image-based model of brain volume biomarker changes in Huntington's disease. Annals of clinical and translational neurology, 5(5), pp.570-582.

Poster Young, A.L., Scelsi, M.A., **Marinescu, R.V.**, Schott, J.M., Ourselin, S., Alexander, D.C. and Altmann, A., 2018. Genomewide Association Study Of Data-driven Alzheimer's Disease Subtypes. Alzheimer's & Dementia: The Journal of the Alzheimer's Association, 14(7), pp.P1042-P1043.

Poster Garbarino, S., Lorenzi, M., Vinke, E., **Marinescu, R.V.**, Oxtoby, N.P., Eshaghi, A., Ikram, M.A., Niessen, W.J., Ciccarelli, O., Barkhof, F. and Vernooij, M.W., 2018. Mechanistic Profiles Of Neurodegeneration: A Study In Alzheimer's Disease, Healthy Ageing And Primary Progressive Multiple Sclerosis. Alzheimer's & Dementia: The Journal of the Alzheimer's Association, 14(7), pp.P1280-P1281.

2017

Poster Young, A.L., **Marinescu, R.V.**, Yong, K., Firth, N.C., Oxtoby, N.P., Cash, D.M., Fox, N.C., Crutch, S.J., Rohrer, J.D., Schott, J.M. and Alexander, D.C., 2017. Characterising The Progression Of Alzheimer's Disease Subtypes Using Subtype And Stage Inference (Sustain). Alzheimer's & Dementia: The Journal of the Alzheimer's Association, 13(7), pp.P791-P792.

Poster Young, A.L., **Marinescu, R.V.**, Oxtoby, N.P., Bocchetta, M., Cash, D.M., Thomas, D.L., Dick, K.M., Cardoso, M.J., Ourselin, S., van Swieten, J.C. and Borroni, B., 2017. Multiple Distinct Atrophy Patterns Found In Genetic Frontotemporal Dementia Using Subtype And Stage Inference (Sustain). Alzheimer's & Dementia: The Journal of the Alzheimer's Association, 13(7), pp.P453-P454.

Poster Primativo, S., **Marinescu, R.V.**, Firth, N.C., Yong, K., Shakespeare, T.J., Gonzalez, A.S., Carton, A.M., Lehmann, M., Slattery, C.F., Paterson, R.W. and Foulkes, A.J., 2017. Longitudinal Evaluation Of Neuropsychological And Neuroimaging Progression In Posterior Cortical Atrophy. Alzheimer's & Dementia: The Journal of the Alzheimer's Association, 13(7), pp.P1382-P1383.

Poster Oxtoby, N.P., Young, A.L., **Marinescu, R.V.** and Alexander, D.C., 2017. Data-driven Models Of Disease Progression And Applications To Alzheimer's Disease: Event-based Model And Differential Equation Models Of Biomarker Changes In ADNI. Alzheimer's & Dementia: The Journal of the Alzheimer's Association, 13(7), pp.P1323-P1325.

2016

Poster Firth, N.C., Brotherhood, E., Primativo, S., Young, A.L., **Marinescu, R.V.**, Oxtoby, N.P., Crutch, S.J. and Alexander, D.C., 2016. Data-driven Disease Progression Modelling Using Neuropsychological Tests: Posterior Cortical Atrophy Vs Alzheimer's Disease. Alzheimer's & Dementia: The Journal of the Alzheimer's Association, 12(7), pp.P963-P964.

2015

Poster Young, A.L., Oxtoby, N.P., Huang, J., **Marinescu, R.V.**, Daga, P., Cash, D.M., Fox, N.C., Ourselin, S., Schott, J.M., Alexander, D.C. and Alzheimer's Disease Neuroimaging Initiative, 2015, June. Multiple orderings of events in disease progression. In International Conference on Information Processing in Medical Imaging (pp. 711-722). Springer, Cham.

Grants

- NSF I-Corps: $50,000 awarded for customer discovery and market research, to help study the biopharma industry.

Theses

- PhD thesis: Modelling the Neuroanatomical Progression of Alzheimer's Disease and Posterior Cortical Atrophy, arXiv preprint arXiv:2003.04805 (2020). Supervisors: Daniel Alexander, Sebastian Crutch, Neil Oxtoby
- MEng thesis: On a new signature that quantifies topological structure in biological and economic networks. Supervisors: Natasa Przulj, Marek Sergot.

Talks

- *Building Bayesian priors over the manifold of medical images*, University of Birmingham, School of Computer Science, Sept 2022
- *Building Bayesian priors over the manifold of medical images*, University College London, Joint seminar of the AI Center and the Center for Medical Image Computing, Sept 2022
- *Bayesian Image Reconstruction using Deep Generative Models*, NeurIPS Deep Generative Models and Downstream Applications Workshop, Dec 2021
- *Medical Image Generation and Analysis using Bayesian Generative Models*, Stanford University, Computational Neuroscience Laboratory, June 2021
- *Medical Image Generation and Analysis using Bayesian Generative Models*, University of California Santa Cruz, Computer Science Dept, Mar. 2021
- *Medical Image Generation and Analysis using Bayesian Generative Models*, University of British Columbia, Electrical and Computer Engineering Dept., Mar. 2021
- *GAN Tutorial - From basics to current state-of-the-art, and towards key applications in medicine*, Harvard DBMI Clinical Informatics Lecture Series, Sept. 2020
- *Machine learning for prediction and visualisation of brain diseases. Demonstration on Alzheimer's disease*, Boston PyData meetup, Feb. 2020
- *BrainPainter: A software for the visualisation of brain structures, biomarkers and associated pathological processes*, MICCAI MBIA workshop, Nov. 2019
- *TADPOLE Challenge: Accurate Alzheimer's disease prediction through crowdsourced forecasting of future data*, MICCAI PRIME workshop, Nov. 2019
- *Modelling the Neuroanatomical Progression of Alzheimer's Disease and Posterior Cortical Atrophy*, Athinoula A. Martinos Center, Cambridge MA, April 2019
- *A vertex clustering model for disease progression: application to cortical thickness images.* International Conference on Information Processing in Medical Imaging, 2017 (Erbsmann Prize Runner-up)

Review experience

- Computer Vision and Pattern Recognition (CVPR), 2021
- Medical Image Computing and Computer Assisted Surgery (MICCAI), 2018, 2020
- Information Processing in Medical Imaging (IPMI), 2019, 2021
- Neural Information Processing Systems (NeurIPS), 2020
- NeurIPS Machine Learning for Health Workshop (ML4H), 2019
- International Conference on Machine Learning (ICML), 2020
- NeuroImage, 2019
- Conference on Health, Inference, and Learning (CHIL), 2019
- Nature Communications, 2021
- IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI), 2021
- Alzheimer's and Dementia, 2019, 2020
- Journal of Alzheimer's Disease (JAD), 2019, 2020

News Coverage

- https://www.alzforum.org/news/community-news/tadpole-challenge-seeks-best-predictors-alzheimers
- https://www.alzforum.org/news/community-news/tadpole-challenge-winners-forecast-ad-symptoms
- https://adevarul.ro/locale/cluj-napoca/cercetator-roman-mit-domeniul-inteligentei-artificiale-robotii-vor-mai-multe-sarcini-chirurgii-vor-continua-conduca-operatiile-1_5e4525095163ec42710d3fb8/index.html

Software

- BrainPainter: https://brainpainter.csail.mit.edu/

About me

- Nationality: dual Romanian-British
- Languages spoken: Romanian (native), English (fluent), German (intermediate)
- Programming languages: Python, Java, C++, Haskell, Matlab, Prolog, Assembly x86
- Technical Experience with: Git, Vim, LaTeX, OS programming, Compilers