ALEXANDRU DUMITRESCU

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ACADEMIC BACKGROUND

Doctoral Researcher

Aalto University, Computational Systems Biology in collaboration with Helsinki University, Helsinki Institute of Life Science

04/2021 – Present

> Research exchange: Broad Institute of MIT and Harvard.
02/2024-08/2024

M.Sc. in Machine Learning, Data Science and Artificial Intelligence

Aalto University

08/2018 – 04/2021

B.Eng. in Computer System Engineering

Politehnica University of Bucharest

09/2014 – 07/2018

PUBLICATIONS

> E(3)-equivariant models cannot learn chirality: Field-based molecular generation. Chiral-aware diffusion models for 3D molecular generation using field representations.

> TSignal: a transformer model for signal peptide prediction. Fully data-driven approach for signal peptide type identification and cleave site prediction for various organism groups, using protein language models.

> Structure-guided T cell receptor and epitope interaction prediction. Utilizing predicted structures from AlphaFold 2 and protein language model residue embeddings to aid epitope specificity prediction.

> TCRconv: predicting recognition between T cell receptors and epitopes using contextualized motifs. Deep learning models for epitope specificity prediction using contextualized protein language models.

> EPIC-TRACE: predicting TCR binding to unseen epitopes using attention and contextualized embeddings TCR-peptide-MHC binding for unseen epitopes.

> M.Sc. Thesis: "TCR Sequence Representations Using Deep, Contextualized Language Models". Developed and fine-tuned contextual language models for T-cell receptors using recurrent architectures (ELMO) and transformer-based protein language models (BERT).

ONGOING PROJECTS

> Generalized binding prediction of peptide-MHCII: a citrullination case study: Peptide-MHC binding prediction methods for post-translationally modified peptides utilizing chemical features of amino acids.

SCHOOL PROJECTS

> Hyperbolic discounting reinforcement learning: Off policy methods with hyperbolically discounted future rewards.

> Graph Clustering: Clustering binary graphs using spectral clustering methods.

> WimblePong: Reinforcement learning project for the Atari Pong game on pixel space.

> Bayesian Demographic Prediction: Probabilistic hierarchical models with MCMC inference.

> String Embedding: Non-contextualized word embeddings (Skip-gram, CBOW, GloVe).

WORK EXPERIENCE

Research assistant

Aalto University

03/2020 – 03/2021 Espoo, Finland

> Language models for T cell receptors.

AI developer

IPRally Technologies Oy

03/2019 – 02/2020 Helsinki, Finland

> Deep learning methods for a patent search engine based on graph representations of patents.

SKILLS

Libraries: PyTorch, Scikit-learn, NumPy, Pandas, Matplotlib, Jax, Keras, Tensorflow, PyStan

Technologies: Linux, git

Languages: Python, Julia, C

ML knowledge: Deep Learning, Generative Models (Diffusion, Flow matching, Autoregressive, VAE) Probabilistic Models, Data Mining, Reinforcement Learning

FREE TIME

I enjoy playing chess, reading, and climbing.