

# SIMEON SPASOV

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## ABOUT ME

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I am passionate about the intersection of ML and health and biology. I have experience in causal methods, graph representation learning, compute and data efficiency. In my previous employment I led a research project in Amazon Alexa, and now I am working on scalable causal models for biology.

## EDUCATION

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### Department of Computer Science, University of Cambridge, UK

PhD in Artificial Intelligence (Oct 2016 - Dec 2020)

MRes in Sensor Technologies (Oct 2015 - Sep 2016)

*Grade: 73%*

### University of Manchester, Manchester, UK

BEng Electrical and Electronic Engineering

*Sep 2012 - June 2015*

First Class: 81% (**top 5% ranking**)

## ML EXPERIENCE AND INTERNSHIPS

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### Postdoc - DZNE, Bonn, Germany

Leading research on scalable causal methods and co-supervising 5 PhD students.

*April 2023 - present*

### ML Consultant - sea.dev (London, remote)

Integrated temporal graph embeddings for a LLM knowledge graph RAG application.

*Feb - March 2024*

### Applied Scientist II/Tech Lead - Amazon Alexa

Tech lead of a team of 3 working on automatic voice evaluation. I led the creation of a PoC deep learning system which reduced the need for manual voice evaluation by  $2\times$ - $5\times$  for several languages.

*April 2021 - Nov 2022*

### ML Research Intern - Amazon Alexa

*Offered a conversion to a full time position.* Developed and validated a method to integrate long-range interactions in node representation learning for graph neural networks.

*June 2020 - Oct 2020*

### Research Intern - Montreal Institute for Learning Algorithms

Developed a probabilistic generative model for joint community detection and dynamic representation learning on graphs. Resulted in paper GRADE: Graph Dynamic Embedding and several spinout papers in *ICML* and *MIDL*.

*July 2019 - Sep 2019*

### Software Engineering Intern - HSBC GBM, Technology (London)

Created an app to automate performance tracking of software teams in Forex IT. Pushed to production.

*June 2014 - Sep 2014*

### Software Engineering Intern - iFD Engineering Joint Venture (Sofia)

Researched and implemented a vehicle routing system for Deutsche Bundesbank.

*June 2015 - Aug 2015*

## AWARDS

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**HPC-Europa3 Transnational Access programme:** £2,500 project funding for modelling the dynamic interactions of brain networks from fMRI data (Oct - Dec 2020).

**Research Studentship by the Cambridge Philosophical Society:** March - June 2020

**Full EPSRC studentship:** 4-year funding for fees and stipend

**BP Achievement Awards 2014, 2015:** £2,000 given to 3 people in a class of 160 at the School of Electrical Engineering at the University of Manchester for academic achievement.

## SUPERVISION WORK

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**Master’s projects:** “Graph coarsening from substructures using spatial information” (2020-2021, co-supervised), “Training high-performing compact neural networks” (2019-2020), “Mean-field infinite-Restricted Boltzmann Machines” (2018-2019)

**Undergraduate projects:** “Exploring Variational Autoencoders and Their Latent Space” (2017-2018), “Design Choices in Neural Style Transfer” (2018-2019), “Intelligent Navigation of Text Adventure Games” (2018-2019, co-supervised)

**Undergraduate Courses:** *Machine Learning and Bayesian Inference* (Lent terms in academic years 2016, 2017, 2018), *Scientific Computing* (Michaelmas terms in academic years 2017, 2018).

## TECHNICAL SKILLS

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<b>Deep Learning APIs</b>	Keras, TensorFlow, PyTorch, MXNet
<b>Programming Languages</b>	Python, Java, C, L <sup>A</sup> T <sub>E</sub> X

## PREVIOUS ACHIEVEMENTS

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<b>National Competition in Physics:</b>	4 <sup>th</sup> place	<i>Bulgaria, 2011</i>
<b>National English Language Olympiad:</b>	2 <sup>nd</sup> , 6 <sup>th</sup> , 7 <sup>th</sup> places	<i>Bulgaria, years 2009-2011</i>

## LANGUAGES

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English (proficient), Bulgarian (native)

## SELECTED RESEARCH PUBLICATIONS

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### **DBGDGM: Dynamic Brain Graph Deep Generative Model**

Published in *ICML Workshop on Interpretable Machine Learning in Healthcare (IMLH)*, 2023 and *Medical Imaging with Deep Learning (MIDL)*, 2023 as an Oral talk.

### **TG-DGM: Clustering Brain Activity using a Temporal Graph Deep Generative Model**

Published in *Medical Imaging with Deep Learning (MIDL)*, 2021

### **RicciNets: Curvature-guided Pruning of High-performance Neural Networks Using Ricci Flow**

Presented at *ICML 2020 AutoML Workshop*.

### **Dynamic Neural Network Channel Execution for Efficient Training**

Published in *BMVC, 2019*. Presented at *NeurIPS 2019 EMC<sup>2</sup> Workshop*.

Proposed a bandit-based algorithm for NN sparsification during training by dynamically identifying and running highly salient channels. Method reduces parameter count by up to  $\times 9$  and FLOPs  $\times 4$ .

### **Co-Attentive Cross-Modal Deep Learning for Medical Evidence Synthesis and Decision Making**

Presented at *NeurIPS 2019 ML4H Workshop*.

An attention-based model to combine 3D MRI and methylation data for predictive healthcare applications. Outperforms benchmarks by 2.5% with 50% fewer parameters.

### **A Parameter-efficient Deep Learning Approach to Predict Conversion from Mild Cognitive Impairment to Alzheimers Disease within Three Years**

Published in *NeuroImage*. Published (oral talk) at *EMBC 2018* and *OHBM 2019*.

A parameter-efficient cross-modal NN architecture for 3D structural MRI and clinical data. Outperforms all existing benchmarks on early Alzheimer’s disease diagnosis.