Alexander **Johansen**

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Research Interest

I am curious about the underlying latent structure of language. I investigate language through mathematical constructs, bioinformatics, and chemistry. My recent work is focused on building neural components that can extrapolate and transferring natural language processing methods into bioinformatics and cheminformatics. Proteins are the most structurally complex and sophisticated molecules in existence. This structure has been developed and fine-tuned over billions of years of evolutionary history. The language of proteins is structured with many unknown rules of behavior. This makes proteins a interesting vessels for learning latent features.

Education

Technical University of Denmark

Kongens Lyngby, Denmark

M.Sc. Mathematical Modeling and Computation, GPA: 11.44/12.00 — *Sept. 2014 - Dec. 2016*

- **Nanyang Technological University**, Singapore — *Semester Abroad Fall 2015*
- **Honors program**, Supervised by Professor Ole Winther

Copenhagen Business School

Frederiksberg, Denmark

B.Sc. Business Administration and Information Systems, GPA: 10.70/12.00 — *Sept. 2011 - Jun. 2014*

- **Lincoln University**, Canterbury, New Zealand — *Semester Abroad Fall 2013*

Experience

Technical University of Denmark

Kongens Lyngby, Denmark

Research Assistant — *Jan 2019 - Present*

Inspired by my time at Salesforce Research, I started a student based research lab with research meetings every Tuesday and one-on-ones every Thursday. More than 30 students (M.Sc. and Ph.D.) have participated in the lab in 2019 resulting in several paper submissions. To find research projects I utilize the many professors at the university for ideation and to find interesting datasets. The majority of my students have previously done projects with me in 02456 Deep Learning.

Salesforce

172 University Ave, Palo Alto, CA 94301, USA

Deep Learning Research, Intern — *Jan 2017 - Jan 2018*

Under the supervision of Richard Socher (Salesforce Research) I researched in probability based decision making (+100k impression blogpost, ACL workshop paper); multi-task learning for NLP; and mixture-of-experts using distributed computing, PyTorch, and TorchText.

Teaching

Technical University of Denmark

Head TA

Deep Learning, 02456 — *Fall 2016, Fall 2018, Fall 2019*

In 2018 and 2019 I have been the head TA with significant course material contributions. Half of the course is project based and I supervise the NLP, Bioinformatics, and RL projects; the most popular amongst students for 2018 and 2019.

Co-Supervisor

Master Thesis Supervision — *Spring 2019, Fall 2019*

I co-supervise 11 Master Thesis projects (an M.Sc. thesis is 5 months full-time). The thesis' have investigated formal languages, Levenhstein transformer, multi task learning, exploration in VQA, bio-/, and cheminformatics; resulting in multiple journal submissions.

Co-Supervisor

Special Courses — *Spring 2019, Fall 2019*

I have supervised 10 special course projects (a special course is 4 months part-time). Similar to M.Sc. thesis, the special courses have investigated topics within deep learning methods and applications.

Course Responsible

Intro Reinforcement Learning — *Spring 2019*

Exercises from Chap 1-13 in Sutton & Barto and Homework 1-2 from UC Berkeley's Deep RL course. 9 Students (M.Sc. and Ph.D.).

Course Co-Responsible

Deep Reinforcement Learning — *Jun. 2019*

Adjusted version of UC Berkeley's Deep RL course, co-supervised with Ass. Prof. T. Herlau. 10 students (M.Sc. and Ph.D.).

Community

Deep Learning Copenhagen *MeetUp*

Founder *Nov. 2018 - PRESENT*

Inspired by Richard Socher's public poster exam in CS224N I convinced Professor Ole Winther to do the same for our 02456 Deep Learning course. With students posters, company sponsored first prize, drinks, and pizza. Given the positive feedback, me and a bioinformatics Ph.D. student started a research lab and kept hosting events for our students. This has resulted in seven events by now, +1.5k participants, and multiple company sponsorships. (Event page `https://www.meetup.com/Deep-Learning-DTU/` student research lab `https://alrojo.github.io`).

Open Source

Google TensorFlow

contrib.seq2seq: #4761, #4686, #4382

TensorFlow tutorial (2k stars): `https://github.com/alrojo/tensorflow-tutorial`

Academic Reviews

2020	**AAAI,** Association for the advancement of artificial intelligence	*Program committee*
2019	**CoNLL,** Computational Natural Language Learning	*Reviewer*
2018	**CoNLL,** Computational Natural Language Learning	*Reviewer*
2017	**NIPS,** Neural Information Processing Systems	*Assisted review*
2017	**ICML,** International Conference on Machine Learning	*Assisted review*

Journal Publications

An introduction to deep learning on biological sequence data: examples and solutions *PUBLISHED*

Bioinformatics (IF: 4.5) Volume 33, Issue 22, Pages 3685-3690, Oxford University Press *2017*

https://academic.oup.com/bioinformatics/article/33/22/3685/4092933

V. Jurtz, A. Johansen, M. Nielsen, J. Armenteros, H. Nielsen, C. Sønderby, O. Winther and S. Sønderby

Conference Publications

Neural arithmetic units *SPOTLIGHT (top 6%)*

International Conference on Learning Representations *2020*

https://openreview.net/forum?id=H1gNOeHKPS

A. Madsen, A. Johansen

Deep recurrent conditional random field for protein secondary structure prediction *ORAL*

ACM Conference on Bioinformatics, Computational Biology, and Health Informatics *2017*

http://delivery.acm.org/10.1145/3110000/3107489/p73-johansen.pdf

A. Johansen, C. Sønderby, S. Sønderby and O. Winther

A deep learning approach to adherence detection for type 2 diabetics *POSTER*

IEEE Engineering in Medicine and Biology Society (EMBC) *2017*

https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=7471776

A. Mohebbi, T. Aradóttir , A. Johansen, H. Bengtsson, M.Fraccaro, M. Mørup

Epileptiform spike detection via convolutional neural networks *POSTER*

IEEE International Conference on Acoustics, Speech and Signal Processing *2016*

https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=8037462

A. Johansen, J. Jin, T. Maszczyk, J. Dauwels, S. Cash and M. Westover

Workshop and Abstract Publications

Measuring arithmetic extrapolation performance *POSTER*

NeurIPS Workshop on Science meets Engineering of Deep Learning *2019*

https://arxiv.org/abs/1910.01888

A. Madsen, A. Johansen

Language modeling for biological sequences — curated datasets and baselines *POSTER*

NeurIPS Workshop on Learning Meaningful Representations of Life *2019*

J. Armenteros, A. Johansen, O. Winther, H. Nielsen

Learning the language of life *ORAL*

Intelligent Systems for Molecular Biology / European Conference on Computational Biology *2019*

https://orbit.dtu.dk/files/193584092/Learning_the_language_of_life_abstract.pdf

J. Armenteros, A. Johansen, O. Winther, H. Nielsen

Learning when to skim and when to read *POSTER*

ACL Workshop on Representation Learning for NLP *2017*

https://arxiv.org/abs/1712.05483

A. Johansen, R. Socher

Neural machine translation with characters and hierarchical encoding *POSTER*

NIPS Recurrent Neural Network Symposium *2016*

https://arxiv.org/abs/1610.06550

A. Johansen, J. Hansen, E. Obeid, C. Sønderby and O. Winther

Current Projects

Autoencoding undirected molecular graphs with neural networks *UNDER REVIEW*

Submitted to Journal of Chemical Information and Modeling (IF: 3.9)

https://alrojo.github.io/media/publications/Molecules/preprint.pdf

J. Olsen, P. Christensen, M. Hansen, A. Johansen

Prediction of GPI-Anchored proteins with pointer neural networks *UNDER REVIEW*

Submitted to PROTEINS: Structure, Function, and Bioinformatics (IF: 2.5)

https://www.biorxiv.org/content/10.1101/838680v1.abstract

M. Gislason, H. Nielsen, J. Armenteros*, A. Johansen* (*equal contribution)

Language modeling for biological sequences — curated datasets and baselines *TO BE SUBMITTED*

To be submitted for Bioinformatics (IF: 4.5) by medio Jan 2020

https://github.com/alrojo/UniLanguage/blob/master/preprint.pdf

J. Armenteros*, A. Johansen*, O. Winther, H. Nielsen (*equal contribution)

Predicting recombinant gene expression with deep learning techniques *TO BE SUBMITTED*

To be submitted for Journal of Biotechnology (IF: 3.1) by medio Jan 2020

H. Martiny, J. Armenteros, A. Johansen, J.Salomon, H. Nielsen

Short term blood glucose prediction based on continuous glucose monitoring data *TO BE SUBMITTED*

To be submitted for IEEE Engineering in Medicine and Biology Society (EMBC) by 1st Jan 2020

A. Mohebbi, A. Johansen, N. Hansen, P. Christensen, M. Jensen, J. Tarp, H. Bengtsson, M. Mørup

Patents

Probability-Based Guider *PENDING*

US Patent App. 15/853,530 *2017*

A. Johansen, B. McCann, J. Bradbury, R. Socher

Deep Neural Network-Based Decision Network *PENDING*

US Patent App. 15/853,570 *2017*

A. Johansen, B. McCann, J. Bradbury, R. Socher

Technical Skills

Programming Python, Matlab, SQL, Java
ML Frameworks PyTorch, TensorFlow, Theano, Lasagne, CUDA
Others Linux, Docker, Vim, IPythonNotebook, Google Colab, Git, Github, AWS S3, AWS EC2, LaTeX