Niklas Smedemark-Margulies

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Current

Northeastern University Sept. 2018 – Present

PhD in Computer Science, Probabilistic Modeling Lab. GPA: 3.9 / 4.0 *Boston, MA*

- Variational inference for parameter estimation in network model of COVID-19 spread; ongoing work.
- Multi-task autoencoders for few-shot representation learning; ongoing work.
- Generator Surgery for Compressed Sensing; NeurIPS 2020 Workshop on Deep Learning and Inverse Problems.
- Course work in algorithms, machine learning, compilers, distributed systems, deep learning, and inverse imaging problems.

Education

Harvard Medical School Sept. 2014 – May 2016

MMSc, Immunology. GPA: 3.9 / 4.0.

- Thesis: Next-Generation Roadmap for Patient-Centered Genomics

Amherst College Sep 2009 – May 2013

BA, Neuroscience. GPA: 3.7 / 4.0.

- Senior Research: Tools, Methods, and Applications for Optophysiology in Neuroscience

Work Experience

Software Engineer March 2017 – April 2018

Genuity Science (formerly WuXi NextCODE) *Cambridge, MA*

- Wrote batch and realtime analyses for DNA variant scoring in over 100,000 whole genomes. GORpipe bash
- Designed and implemented ingestion pipelines for germline and somatic exomes. Docker Nextflow Bash
- Created documentation and conducted training for internal developers and external clients.

Software Engineer May 2016 – March 2017

Claritas Genomics *Cambridge, MA*

- Developed pipelines for exome data, and validated results using NIST gold standard datasets. Java GORpipe AWS
- Performed processing and support for production samples. Python

Research Experience

Research Intern June 2019 – August 2019

Q-State Biosciences *Cambridge, MA*

- Increased SNR and achieved nearly 50-fold compression in detection of single-cell activity from fluorescence microscopy video data.
- Corrected for photobleach-induced exponential decay using spline detrending, followed by iterative rank-1 SVD for denoising, and non-negative matrix factorization for signal demixing. MATLAB Python Docker

Research Associate, Data Coordinator May 2015 – May 2016

Timothy Yu Lab, Boston Children's Hospital *Boston, MA*

- Evaluated and curated potential disease-causing variants in clinical cohorts. GORpipe Bash
- Prototyped shared infrastructure for forming cohorts and variant interpretation. AWS GORpipe Bash

Research Fellow May 2013 – May 2014

Adam Cohen Lab, Harvard University *Cambridge, MA*

- Assisted development of voltage-sensitive fluorescent transmembrane protein for high-resolution measurement of activity in electrically active cells.
- Dissected and cultured mouse hippocampal and cortical neurons for functional analysis of protein candidates.

Teaching

Undergraduate Research Mentor Spring 2020
Probabilistic Modeling Lab *Northeastern University*

- Supervised research on graph-based classifiers in the latent space of a deep neural network. PyTorch

Teaching Assistant Spring 2019
Algorithms *Northeastern University*

- Helped create and grade homeworks, held office hours and review sessions. Python

Head Teaching Assistant Fall 2018
Database Design *Northeastern University*

- Created homeworks, held office hours, helped create exams, and helped organize other TAs. SQL Python

Projects

DQN. Summer 2020

- Reimplemented Deep Q-Networks for reinforcement learning in Atari. PyTorch Gym Jupyter Tensorboard

Raft. Fall 2019

- Reimplemented Raft algorithm for distributed consensus in Golang. Golang net/rpc Docker

Neural Topic Models for Lyrics. Spring 2019

- Classified song genre using features produced by neural topic modeling. PyTorch Pandas Gensim NLTK Docker

Technical Skills

Languages: Python MATLAB Julia Bash Go OCaml C SQL GORpipe
Libraries: PyTorch NumPy Matplotlib Jupyter Tensorboard Scikit-Learn Unittest
Developer Tools: Git Docker Travis CI AWS Vim+ALE Linux

Volunteering

Mentor, Big Brothers Big Sisters of MA January 2016 - October 2018

Selected Publications

"Geometric Analysis of Uncertainty Sampling for Dense Neural Network Layer". In: In Review.

Jung Yeon Park[1], **Smedemark-Margulies, Niklas**[1], Max Daniels, et al. "Generator Surgery for Compressed Sensing". In: *Workshop on Deep Learning and Inverse Problems, NeurIPS*. 2020.

Smedemark-Margulies, Niklas[1], Paul[1] Langton, and Huy L Nguyen. *Fair and Useful Cohort Selection*. https://arxiv.org/abs/2009.02207. 2020.

Smedemark-Margulies, Niklas, Catherine A Brownstein, Sigella Vargas, et al. "A novel de novo mutation in ATP1A3 and childhood-onset schizophrenia". In: *Molecular Case Studies* (2016). http://molecularcasestudies.cshlp.org/content/2/5/a001008.short.

Daniel R Hochbaum, Yongxin Zhao, Samouil L Farhi, et al. "All-optical electrophysiology in mammalian neurons using engineered microbial rhodopsins". In: *Nature methods* (2014). https://www.nature.com/articles/nmeth.3000/.

Daria Prilutsky, Nathan P Palmer, **Smedemark-Margulies, Niklas**, et al. "iPSC-derived neurons as a higher-throughput readout for autism: promises and pitfalls". In: *Trends in molecular medicine* (2014). https://www.sciencedirect.com/science/article/abs/pii/S1471491413002062.

Smedemark-Margulies, Niklas and Josef G Trapani. "Tools, methods, and applications for optophysiology in neuroscience". In: *Frontiers in molecular neuroscience* (2013). https://www.frontiersin.org/articles/10.3389/fnmol.2013.00018/full.