Niklas Smedemark-Margulies

https://nik-sm.github.io | https://github.com/nik-sm | niklas.sm@gmail.com

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.
- Multi-task autoencoders for few-shot representation learning.
- Training generative models as signal priors for inverse imaging 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

Kocanaogullari, A., **Smedemark-Margulies, Niklas**, Akcakaya, M., & Erdogmus, D. (Submitted). Geometric analysis of uncertainty sampling for dense neural network layer.

Park[1], J. Y., **Smedemark-Margulies[1], Niklas**, Daniels, M., Yu, R., van de Meent, J.-W., & Hand, P. (2020). Generator surgery for compressed sensing.

Smedemark-Margulies[1], Niklas, Langton[1], P., & Nguyen, H. L. (2020). Fair and useful cohort selection [https://arxiv.org/abs/2009.02207].

Smedemark-Margulies, Niklas, Brownstein, C. A., Vargas, S., Tembulkar, S. K., Towne, M. C., Shi, J., Gonzalez-Cuevas, E., Liu, K. X., Bilguvar, K., Kleiman, R. J., et al. (2016). A novel *de novo* mutation in atp1a3 and childhood-onset schizophrenia [http://molecularcasestudies.cshlp.org/content/2/5/a001008.short]. *Molecular Case Studies*.

Hochbaum, D. R., Zhao, Y., Farhi, S. L., Klapoetke, N., Werley, C. A., Kapoor, V., Zou, P., Kralj, J. M., Maclaurin, D., **Smedemark-Margulies, Niklas**, Saulnier, J. L., Boulting, G. L., Straub, C., Cho, Y. K., Melkonian, M., Wong, G. K.-S., Harrison, D. J., Murthy, V. N., Sabatiny, B. L., ... Cohen, A. E. (2014). All-optical electrophysiology in mammalian neurons using engineered microbial rhodopsins [https://www.nature.com/articles/nmeth.3000/]. *Nature methods*.

Prilutsky, D., Palmer, N. P., **Smedemark-Margulies, Niklas**, Schlaeger, T. M., Margulies, D. M., & Kohane, I. S. (2014). Ipsc-derived neurons as a higher-throughput readout for autism: Promises and pitfalls [https://www.sciencedirect.com/science/article/abs/pii/S1471491413002062]. *Trends in molecular medicine*.

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