

# 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.
- Multi-task autoencoders for few-shot representation learning.
- Generative models as signal priors for inverse imaging problems.
- Course work in algorithms, machine learning, compilers, distributed systems, deep learning, imaging and deep learning.

## 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

Probabilistic Modeling Lab

Spring 2020

Northeastern University

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

### Teaching Assistant

Algorithms

Spring 2019

Northeastern University

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

### Head Teaching Assistant

Database Design

Fall 2018

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

**Smedemark-Margulies<sup>1</sup>, Niklas**, Langton<sup>1</sup>, 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*.