

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

- Discriminative models for brain-computer interface and assistive communication, including P300 spelling.
- Variational inference for parameter estimation in network model of COVID-19 spread.
- 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 2021 - Present

Mitsubishi Electric Research Laboratories

Cambridge, MA

- Intelligent Brain-Machine Interface, focused on deep transfer learning for EEG and EMG.

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` `GORpipe` `C` `SQL` `Go` `OCaml`

Libraries: `PyTorch` `NumPy` `Matplotlib` `Jupyter` `Tensorboard` `Scikit-Learn` `Unitest`

Developer Tools: `Git` `Docker` `Travis CI` `AWS` `Vim+ALE` `Linux`

Publications

Smedemark-Margulies, Niklas, Walters, R., Zimmermann, H., Laird, L., Kaushik, N., Caceres, R., & van de Meent, J.-W. (2021). Inference in network-based epidemiological simulations with probabilistic programming. *AI for Public Health Workshop, ICLR*. https://aiforpublichealth.github.io/papers/ICLR-AI4PH_paper_36.pdf

Koçanaoğulları, A., Smedemark-Margulies, N., Akcakaya, M., & Erdoğan, D. (2021). Geometric analysis of uncertainty sampling for dense neural network layer. *IEEE Signal Processing Letters*, 28. <https://doi.org/10.1109/LSP.2021.3072292>

Smedemark-Margulies, Niklas, Park, J. Y., Daniels, M., Yu, R., van de Meent, J.-W., & Hand, P. (2020). Generator surgery for compressed sensing. *Workshop on Deep Learning and Inverse Problems, NeurIPS*. <https://arxiv.org/pdf/2102.11163.pdf>

Smedemark-Margulies*, **Niklas**, Langton*, 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. *Molecular Case Studies*. <http://molecularcasestudies.cshlp.org/content/2/5/a001008.short>

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. *Nature methods*. <https://www.nature.com/articles/nmeth.3000/>

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. *Trends in molecular medicine*. <https://www.sciencedirect.com/science/article/abs/pii/S1471491413002062>

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