Henry Kvinge

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Date of Resume: January 2019

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PROFESSIONAL EXPERIENCES

- **Postdoctoral fellow**, *June 2017-Present*
  Pattern Analysis Lab, Colorado State University
  - Collaborated with industrial partner Physical Sciences Inc. to develop innovative single pixel cameras for low-cost hyperspectral and LIDAR imaging.
    - Developed and implemented compressive sensing algorithms for fast ($\times$100 from prior baseline), GPU-based reconstruction of images from a small number of samples.
    - Tested these algorithms on the Fabry Perot multispectral data set, Johns Hopkins hyperspectral data set, and depth images collected from a Swiss Ranger LIDAR imager.
    - Designed a stable data pipeline taking noisy CS samples to reconstructed and post-processed images.
    - Produced a software package in C++/CUDA to run these algorithms on a device in the field which was delivered ahead of schedule and well-below reconstruction timing specifications.
    - Gave monthly (remote) slide-deck presentations to a team of scientists and engineers at Physical Sciences Inc. on algorithm development progress.
  - Discovered a new class of light-weight *secant-based* dimensionality reduction algorithms for fast extraction of information from very high-dimensional data sets.
  - Discovered a new dimension-driven statistic, the κ-profile, for understanding the state of large, changing data-sets.
  - Taught and mentored undergraduate and graduate students seeking to enter data science.
- **Consultant** (unpaid), *September 2018-Present*
  Clapp Virtual Reality Lab, Colorado State University
  - Devised image processing algorithms to remove distracting artifacts from VR environments.
  - Introduced new algorithms to make virtual environments more informative to healthcare professionals.
- **Project participant** *July 2016*
  Revon Systems, Inc.
  - Built a machine learning model to predict physician triage decisions for asthma patients as part of a math-to-industry bootcamp capstone project.

EDUCATION

University of California, Davis (June 2017) GPA: 4.00
PhD, Mathematics

University of Washington, Seattle (March 2010) GPA: 3.90
BS, Mathematics, BA, Biochemistry
Magna Cum Laude

TECHNICAL SKILLS

Languages: Python, C++, CUDA, Matlab, Git, LaTeX, Microsoft Office.
Technical tools: Machine learning, deep learning, dimensionality reduction, data visualization, anomaly detection, image processing, compressive sensing, GPU-computing, hyperspectral imaging, virtual reality.

SELECTED PUBLICATIONS AND PREPRINTS

- Henry Kvinge and Elin Farnell, ***Rare geometries: revealing rare categories via dimension-driven statistics***, submitted to ICML 2019.
- Henry Kvinge and Mark Blumstein, ***Letting symmetry guide visualization: multidimensional scaling on groups***, submitted CVPR 2019, arXiv:1812.03362 (2018).
- Henry Kvinge, Elin Farnell, Michael Kirby, and Chris Peterson, ***More chemical detection through less sampling: amplifying chemical signals in hyperspectral data cubes through compressive sensing***, to appear in Proceedings of SPIE: Defense + Commercial Sensing, 2019.
- Henry Kvinge, Elin Farnell, Michael Kirby, and Chris Peterson, ***Monitoring the shape of weather, soundscapes, and dynamical systems: a new statistic for dimension-driven data analysis on large data sets***, to appear in Proceedings of the IEEE International Conference on Big Data, Seattle 2018. arXiv:1810.11562
- Henry Kvinge, Elin Farnell, Michael Kirby and Chris Peterson, ***A GPU-Oriented Algorithm Design for Secant-Based Dimensionality Reduction***, 2018 17th International Symposium on Parallel and Distributed Computing (ISPDC), Geneva, Switzerland, 2018, pp. 69-76. doi: 10.1109/ISPDC2018.2018.00019. arXiv:1807.03425
- Elin Farnell, Henry Kvinge, Michael Kirby and Chris Peterson, ***Endmember Extraction on the Grassmannian***, 2018 IEEE Data Science Workshop (DSW), Lausanne, Switzerland, 2018, pp. 71-75. doi: 10.1109/DSW.2018.8439109. arXiv:1807.01401

OTHER EXPERIENCES

Commercial fisherman, Bristol Bay, AK (1999-2015): Worked as a deckhand on the commercial salmon fishing vessel *Anny Joy* for 6 weeks each summer.
Associate instructor, UC Davis (2015-2016): Prepared and delivered lectures, wrote exams, and assigned grades for *Calculus for Biology and Medicine* and *Combinatorics*.
Assistant language teacher, Izuhara High School (2010-2011): Created and implemented lesson plans for English language courses on Tsushima Island, Japan.

Volunteer

Mentor (2013-2016): Women in Science and Engineering Mentoring Program at UC Davis.
Mentor (2011-2016): STEM Café, a tutoring center at UC Davis that serves women and other underrepresented groups in math.