Keith Pedersen

Resumé

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My doctoral research crafted me into a top-level problem solver and software developer. To understand a complex system theoretically, I often seek empirical clues by standing up small Monte Carlo simulations that probe specific effects in a controlled environment. This tool recently helped me develop a good approximation for state uncertainty that was *fast* enough to be embedded in a large optimization loop.

My first year at Raytheon has been a crash course in sensor fusion, data filtering, collaborative autonomy, optimization, and operational analysis. I have designed command and control algorithms that optimize collaborative sensing and have also developed the MODs framework — an attempt to standardize measures of effectiveness and performance (MOEs/MOPs) so that autonomy can use them as real-time decision aids.

Education

May 2018	**Ph.D (Theoretical Physics)**, *Illinois Institute of Technology*, Chicago, IL.
June 2008	**BA (Chemistry)**, *Carthage College*, Kenosha, WI.

Work experience

April 2019−Present — **Senior System Engineer II**, *Raytheon Intelligence & Space*, El Segundo, CA.
Developed and extended collaborative autonomy algorithms via deterministic, non-heuristic objective functions, with applications in several important sensing domains. Developed the MODs framework to improve and standardize the MOE and MOP available to autonomy.

Feb 2017−April 2019 — **Statistics/Data Consultant**, *Validate Health LLC*, Chicago, IL.
Developed PQRAND to fix a common flaw in random sampling schemes (arXiv:1704.07949). Used Cython to port the C++ library into a Python module with the same API.

Jul 2013−Aug 2018 — **Research Assistant**, *Illinois Institute of Technology*, Chicago, IL.
Developed PowerJets, a framework to study correlated information at particle colliders. My C++/Python library uses a thread pool for maximum speed and "tiled" linear algebra to reduce memory overhead (maximizing use of the CPU cache by localizing access and downsizing intermediate results; see PowerSpectrum.hpp).

Technical expertise

- Multi-sensor fusion (Bayesian synthesis)
- Statistics/Linear Algebra (random sampling)
- Physics (Fourier analysis, LTI systems)
- Calculus (analytic and numerical)
- Estimation (Kalman/EKF/Gauss-Newton)
- Monte Carlo (custom, parallel)
- Numerical stability (machine ϵ, cancellation)
- Data analysis (histograms, models)

Language proficiency

- C++11 (STL) and Java 8 (Apache commons)
- The Wolfram Language / Mathematica
- Linux/GNU/UNIX/Bash/ssh
- Python (Numpy, Scipy) and Cython
- CUDA, SIMD, auto-vectorized SSE
- LaTeX and vector graphics

References (letters available upon request)

2020−Present	**Brad Hamilton**, *Principal Engineering Fellow*, Raytheon Intelligence & Space.
	Brad helped me mature the MODs framework into a robust, useful system.
2019−Present	**Jeff Ridder**, *Engineering Fellow*, Raytheon Intelligence & Space.
	Jeff and I developed several successful algorithms for collaborative autonomy.