

Education

- **Harvard University** Cambridge, MA
PhD in Applied Physics; Secondary Field in Computational Science and Engineering (CSE) May 2018
 - Thesis Title: Microbial Evolutionary Dynamics and Transport on Solid and Liquid Substrates
 - * Applied state-of-the-art computational methods and stochastic mathematical models to predict the evolutionary dynamics of microbial colonies coupled to transport (fluid flow, diffusion)
 - * Designed and conducted biological experiments to verify theoretical predictions in molecular & cellular biology lab
 - * Developed expertise to create and solve stochastic ordinary and partial differential equations
 - Wrote proposal and won a \$25,000 student scholarship from Harvard's Institute for Applied Computational Science (IACS). Used funds develop an OpenCL (GPU) powered Lattice Boltzmann fluid mechanics simulator utilizing OpenGL for real-time visualization
 - Won Pierce Fellowship and Department of Energy (DOE) Office of Science Graduate Fellowship: less than 5% acceptance rate for each
 - GPA: 3.95/4.00
- **Case Western Reserve University** Cleveland, OH
Bachelor of Science in Engineering, Engineering Physics May 2012
 - GPA: 4.00/4.00, Summa Cum Laude, Valedictorian. Aerospace Engineering Concentration

Work Experience

- **MITRE** Bedford, MA
Lead Modeling & Simulation Engineer / Analyst April 2021 - Present
Senior Modeling & Simulation Engineer / Analyst August 2018 - April 2021
 - Rapidly developed innovative technical solutions to national security problems utilizing modeling, simulation, engineering, data science, and prototyping skills
 - Utilized state estimation techniques such as Kalman-Filters for space-based tracking of moving objects; wrote whitepapers involving the master equation, defective renewal theory (ruin theory), and continuous-time random walks with anomalous waiting times.
 - Pioneered widespread usage of government physics and agent based probabilistic modeling tool (AFSIM) in conjunction with state-of-the-art computational methods to create system analyses
 - * Founded community of practice for AFSIM and associated tooling; now has 700+ members
 - * Developed popular Git version-controlled repositories with CI/CD docker-based testing of agents and deployment for large team. Presented capabilities and results at national conferences
 - * Utilized HPC to run many probabilistic simulations; analyzed results with Python, Jupyter
 - Led key parts of division's R&D and work programs; utilized modeling and simulation to inform government decisions about dynamic control of (often autonomous) assets across domains to accomplish military objectives
 - * Mentored dozens of staff and led diverse teams of various sizes across classification levels to produce high quality and timely deliverables
 - * Presented results to senior government stakeholders across the DOD and MITRE executive leadership to deliver maximum impact
 - * Proposed and procured over three million dollars in internal research funding to build and deploy a prototype (Django, Postgres, UI/UX) enabling human/simulation interaction for wargames
 - Won 8 awards celebrating impactful delivery of prototypes and analyses that helped inform decisions at the highest levels of the US government

Computational & Analytical Skills

- Over 13 years of experience optimizing programs to run on multiple processors, graphics processing units (GPUs), and supercomputers
- Expert at using Jupyter/IPython Notebooks to explore, visualize, and analyze large tabular datasets and large collections of images
- Experienced at applying stochastic techniques to model and solve high-dimensional problems
- Expert at rapidly creating new M&S software tools to answer novel questions
- Ability to create and calibrate mathematical models to data through core physics training
- Expert knowledge of Applied Mathematics, especially stochastic modeling involving the Master equation, the Fokker-Planck equation (PDEs), and (spatial) stochastic differential equations
- Expert ability to create experiments, models, and numerical simulations to study the transport of mass, momentum, and energy coupled to probabilistic chemical reactions in complex fluids and materials
- **Languages for General Scientific Computing:**
 - Python, Cython, OpenCL, CUDA, C, C++, Java, Mathematica, Matlab
- **Selected Python Packages and Tools:**
 - Jupyter Notebooks, matplotlib, seaborn, colorcet, numpy, scipy, pandas, pandera, scikit-image, pymc3, multiprocessing, Django, pytest, cython, cython_gsl, mako, PyOpenCL, PyCUDA, poetry
- **Selected Software Development Tools:**
 - Docker, CI/CD, GitLab, Git, REST APIs, Flask, FastAPI, Pydantic, JIRA, Nexus Registries, VS Code, PyCharm, Vim
- **Fluid and Solid Mechanics Simulations:**
 - Lattice Boltzmann Method (custom-built code), OpenFOAM, SALOME, gmsh
- **Image Analysis Tools**
 - Python, OpenCL, ImageJ/Fiji
- **Selected Government Software**
 - AFSIM, pymission, SBSS, C2S, milsymbol, DIS

Certifications

- | | |
|--|-------------------------------|
| • Top Secret / SCI Clearance <i>Active</i> | MITRE <i>October 2020</i> |
| • Secret Clearance <i>Active</i> | MITRE <i>October 2019</i> |
| • Engineer in Training (EIT) <i>Active</i> | Ohio <i>September 2012</i> |

Publications

- [1] Bryan T. Weinstein, Maxim O. Lavrentovich, et al. “Genetic Drift and Selection in Many-Allele Range Expansions.” In: *PLOS Computational Biology* 13.12 (Dec. 2017). Article chosen for journal cover photo, e1005866. DOI: 10.1371/journal.pcbi.1005866. URL: <http://dx.plos.org/10.1371/journal.pcbi.1005866>.
- [2] B. T. Weinstein, S. Atis, et al. “Microbial Range Expansions on Liquid Substrates.” In: *Physical Review X* 9.2 (June 2019). Equal first co-author. DOI: 10.1103/physrevx.9.021058. URL: <https://doi.org/10.1103/PhysRevX.9.021058>.
- [3] Severine Atis, Bryan T. Weinstein, et al. *Rocket yeast*. Video. DFD Gallery of Fluid Motion Milton van Dyke Award. Nov. 2021. DOI: 10.1103/physrevfluids.6.110507. URL: <https://doi.org/10.1103/PhysRevFluids.6.110507>.