Bryan T. Weinstein

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Education

- **Harvard University** Cambridge, MA
  PhD in Applied Physics; Secondary Field in Computational Science and Engineering (CSE) *May 2018*
  - Mastered state-of-the-art computational methods used in scientific research and data science; completed advanced applied math and scientific computing courses
    - 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
  - Wrote two papers: verified my own experimental results with analytical mathematical models and simulations of probabilistic chemical reactions (spatial stochastic differential equations) coupled to transport (fluid flow, diffusion) using custom solvers
  - Won Pierce Fellowship and Department of Energy (DOE) Office of Science Graduate Fellowship: less than 5% acceptance rate for each
- **Harvard University** Cambridge, MA
  S.M. in Applied Physics *November 2014*
  - 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
  - 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) allowing humans to interact with our simulations to conduct wargames; used prototype to solve directly-funded government problems

- Frequently built custom simulations and analytic mathematical models to rapidly answer government questions when existing tools were insufficient
- Won over 8 awards celebrating my rapid and impactful delivery of prototypes and analyses that helped to 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

Certifications

- **Top Secret / SCI Clearance** — MITRE
  Active — *October 2020*
- **Secret Clearance** — MITRE
  Active — *October 2019*
- **Engineer in Training (EIT)** — Ohio
  Active — *September 2012*

Publications

[1] Bryan T. Weinstein, Maxim O. Lavrentovich, et al. "Genetic Drift and Selection in Many-Allelle 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.