Bryan T. Weinstein

Active TS/SCI Clearance

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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
    - Conducted experiments and developed probabilistic models & simulations to investigate microbial colonies' stochastic evolutionary dynamics when coupled to transport (fluid flow, diffusion)
  - *Secondary Field*: Mastered state-of-the-art computational methods used in scientific research and data science; completed advanced applied math and scientific computing courses
  - Heavy emphasis on analytically solving and simulating probabilistic chemical reactions coupled to fluid flow using custom built solvers, and using results to inform my experiments
    - Built custom `OpenFOAM` solver, `stokesBuoyantSoluteFoam`, that showed how a microbial colony could ingest nutrients from a viscous fluid, decreasing its local density, leading to a baroclinic instability. Conducted experiments and confirmed simulated predictions
    - Built an OpenCL GPU powered Lattice Boltzmann fluid mechanics simulator; won $25,000 scholarship from Harvard's Institute for Applied Computational Sciences (IACS). Extended it to simulate multiphase flows coupled to probabilistic chemical reactions.
- **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
  - Engineering Concentration: Aerospace Engineering

Work Experience

- **MITRE** Bedford, MA
  Lead Modeling & Simulation Engineer *April 2021 - Present*
  Senior Modeling & Simulation Engineer *August 2018 - April 2021*
  - Rapidly developed innovative technical solutions to national security problems utilizing modeling, simulation, engineering, data science, and prototyping skills
  - Led key part of division's work program; utilized modeling and simulation to inform government decisions about dynamic control control of 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
  - Pioneered widespread usage of a probabilistic goverment agent-based modeling tool (AFSIM) in conjunction with Python to rapidly create analyses across the company
    - Developed popular Git version-controlled repositories with CI/CD docker-based testing and deployment; large team. Presented capabilities and results at national conferences
    - Utilized HPC to run many probabilistic simulations; analyzed results with Python

* 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 probabilistic simulations to conduct wargames; used prototype to solve directly funded government problems
* Created initial community of practice; now has 700+ members

Selected MITRE Awards

- **Trailblazer Award: Functional Architecture Deployment** December 2023
  - Awarded for demonstrating tenacity over the past five years; led a large team to enable distributed live-virtual-constructive (LVC) experimentation at the classified level through a next-gen command and control (C2) software prototype
- **Catalyst Award: CDAO Data Integration Layer Prototype Demonstration** May 2023
  - Awarded to team that delivered a prototype of an API Gateway to the Chief Data and Artificial Intelligence Office (CDAO) in response to a quick-turn two week request
- **Trailblazer Award: Digital Twin JWICS deployment** May 2022
  - Given to our team for linking our next-gen C2 prototype to a classified dashboard using a series of Open APIs, and demonstrating this capability during MITRE's Research and Technology (R&T) showcase to hundreds of government sponsors
- **Trailblazer Award: Self Forming Kill Chains Analysis** May 2021
  - Recognized the impact of our analysis showing the benefit of novel decision aids at the army tactical level in partnership with OUSD R&E, Army Futures Command, and MIT Lincoln Labs
- **Breakthrough Award: Chief's Challenge Prototype** July 2020
  - Acknowledged our team's work to rapidly create an exemplar JADC2 prototype for the Air Force Secretary of Defense under a tight deadline

Selected Graduate Fellowships and Awards

- **Institute for Applied Computational Science Scholarship** Cambridge, MA
  Graduate Student *September 2016 - September 2017*
  - Wrote proposal and won a $25,000 student scholarship from Harvard's Institute for Applied Computational Science (IACS)
  - Used funds to further develop my IACS capstone: an OpenCL (GPU) powered Lattice Boltzmann fluid mechanics simulator utilizing OpenGL for real-time visualization
- **Department of Energy Office of Science Graduate Fellowship** Washington, D.C.
  Graduate Student *September 2012 - September 2015*
  - Wrote proposal to win a competitive fellowship that supports students pursuing training in areas relevant to Department of Energy (DOE). Selected out of 1,300 applicants; 50 fellowships awarded
  - Attended yearly conferences at National Laboratories; presented posters on my active research, networked with other DOE fellows and government officials
- **Harvard University Pierce Fellow** Cambridge, MA
  Graduate Student *September 2012 - September 2015*
  - Won fellowship awarded to the highest caliber PhD students accepted into Harvard's School of Engineering and Applied Sciences (SEAS). Selected out of 150 students; 8 fellowships awarded

Computational & Analytical Skills

- Over 12 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
- **Selected Government Software**
  - AFSIM, pymission, SBSS, C2S, milsymbol
- **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

Certifications

- **TS/SCI Clearance** — MITRE
  Active — *October 2020*
- **Secret Clearance** — MITRE
  Active — *October 2019*
- **Engineer in Training (EIT)** — Ohio
  Active — *September 2012*
  - Successfully passed Fundamentals of Engineering Exam

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.