

# 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 chemical reactions modeled as spatial stochastic differential 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 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 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 government 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

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|--|-------------------------------|
| • <b>TS/SCI Clearance</b><br><i>Active</i>   | MITRE<br><i>October 2020</i>  |
| • <b>Secret Clearance</b><br><i>Active</i>   | MITRE<br><i>October 2019</i>  |
| • <b>Engineer in Training (EIT)</b><br><i>Active</i><br>– Successfully passed Fundamentals of Engineering Exam | Ohio<br><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>.