Benjamin A. Cook

60 Garden St. MS 10, Cambridge, MA 02138 • (603) 313-2888

bcook@cfa.harvard.edu • www.cfa.harvard.edu/∼bcook

Education

Harvard University — Cambridge, MA

Ph.D. Astronomy and Astrophysics — Expected 2019

Secondary Field: Computational Science and Engineering

Awards: National Science Foundation Graduate Research Fellow, Certificate of Teaching Excellence (2x)

Relevant Coursework: Extreme Scale Data and Computational Science; Stochastic Methods for Data Analysis, Inference and Optimization; Machine Learning; Data Science; Noise and Data Analysis in Astrophysics

Princeton University — Princeton, NJ

A.B. Astrophysical Sciences, with High Honors — 2014

Awards: Magna cum laude, Sigma Xi Research Honor Society, American Astronomical Society Chambliss Medal

Technical Skills

Programming and Computation: Python, GPU-acceleration with CUDA, Tensorflow, Amazon Web Services, Docker, Bokeh, C, Java, JavaScript, MPI, HTML/CSS, Linux, Git, Make, Google Apps Script

Machine Learning and Statistics: Bayesian inference, neural networks and deep learning, Markov chain Monte Carlo (MCMC), reinforcement learning, collaborative filtering, classification, clustering

Computational Experience

D.E. Shaw & Co. — New York, NY

Quantitative Analysis Intern — Summer 2018

- Designed Tensorflow deep neural network models to predict mortgage prepayment risk
- Trained and evaluated models on database of over 200M records representing 12M loans
- Demonstrated potential of neural networks for identification of treadeable insights and improved predictive power over linear models

Harvard University — Cambridge, MA

Graduate Research Fellow, PhD. Thesis [link] — 2016 – present

- Developed Bayesian inference framework for analyzing galaxy images with nested sampling and MCMC
- Accelerated simulation code by 16x with GPU-acceleration
- Apply models to archived Hubble Space Telescope data and lead public code distribution via GitHub

Graduate Research Fellow, Master's thesis [link] — 2014 – 2016

- Built post-processing pipeline for large ($>$ 10TB) dataset from cosmological simulation of galaxies
- Discovered important consequence of galaxy collisional histories using results from post-processing pipeline
- Published results in 1st-author scientific journal article and presented work at 4 international scientific meetings

Team Member, Graduate course final project (*Extreme Scale Data and Computational Science*) [link] — Spring 2018

- Developed gpu-accelerated, MPI-parallel N-body gravitation code for simulation of galaxies
- Implemented and executed on 587 core, 12 node architecture on Harvard super-computing cluster

Team Member, Graduate course final project (*Machine Learning*) [link] — Spring 2016

- Designed reinforcement learning model (Q-learner) to autonomously play *Flappy Bird*-inspired computer game
- Model surpassed human abilities after 50 games of training

Team Member, Graduate course final project (*Data Science*) [link] — Fall 2015

- Scraped baseball reference websites to compile pitcher-batter matchup database
- Developed collaborative filtering models with team of 4 to predict pitcher-batter match-up success rates

Leadership Experience

ComSciCon National Workshop — Cambridge, MA

Treasurer — 2018 – present

- Managed expenses and revenues totaling over $150k for 10 annual workshops across the country

Member, National Leadership Team — 2016 – present

- Advised in ongoing organizational transition to 501(c)(3) non-profit and raised funds for national workshop

Chair, Local Organizing Committee — 2015 – 2018

- Supervised 12-person team to organize national STEM communication and outreach workshop
- Balanced $80k annual budget and coordinate venue, lodging, travel, and catering for 90 students and 30 panelists
- Directed review process for over 1000 applications each year

Harvard University — Cambridge, MA

Graduate Teaching Fellow — 2015, 2016

- Guided weekly review and homework sessions for groups of 15+ students and led occasional lectures
- Supervised group observational labs and graded problem sets and exams
- Twice awarded Certificate of Teaching Excellence by Bok Center for Teaching and Learning

Banneker Institute — Cambridge, MA

Mentor / Instructor — 2016 – present

- Instruct undergraduate students of color in summer astronomy program
- Advise on graduate school application process and edit application materials

Princeton University Ticketing — Princeton, NJ

Ticketing Manager — 2011 – 2014

- First student employee ever promoted to position of Ticketing Manager
- Supervised team of 12+ employees, coordinated shift schedules, and wrote weekly staff guides
- Compiled weekly updates and quarterly business reports for upper management
- Created and implemented improved training procedures for new employees

Selected Publications (2 of 5)

Cook, B.A., Conroy, C., Pillepich, A., et al. 2016, *ApJ*, 833, 158. [arXiv:1610.00014]

The information content of stellar halos: Stellar population gradients and accretion histories in early-type Illustris galaxies

Cook, B.A., Williams, P.K.G., and Berger, E. 2014, *ApJ*, 785, 10 [arXiv:1310.6758]

Trends in Ultracool Dwarf Magnetism. II. The Inverse Correlation Between X-ray Activity and Rotation as Evidence for a Bimodal Dynamo

Selected Contributed and Public Talks (3 of 6)

.Astronomy 9 – Cape Town, South Africa — November 2017

Tutorial: GPU-acceleration with Python

On the Origin (and Evolution) of Baryonic Galaxy Halos – Galapagos Islands, Ecuador — March 2017

The Information Content of Stellar Halos: Accretion Histories and Stellar Population Gradients in Quiescent Illustris Galaxies

New Hampshire Astronomical Society Meeting – Manchester, NH — May 2016

Growing Galaxies in a Computer with the Illustris Simulated Universe