

BRIAN K. PLANCHER

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EDUCATION

HARVARD UNIVERSITY: Cambridge, MA

AUG 2016 – PRESENT

- PhD Candidate in Engineering Sciences: Electrical Engineering with a focus in Robotics; GPA: 3.9/4.0
Research focused on developing and implementing algorithms for realtime model predictive control for complex high dimensional robots by exploiting both the mathematical structure of algorithms and the design of computational platforms
Advisors: Vijay Janapa Reddi and Scott Kuindersma.
- MEng in Engineering Sciences: Electrical Engineering with a focus in Robotics; GPA: 3.9/4.0 MAY 2018
Thesis: “Parallel and Constrained Differential Dynamic Programming for Model Predictive Control”
Advisor: Scott Kuindersma

MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT): Cambridge, MA

AUG 2015 – JUNE 2016

- Advanced Study Non-Degree Student; GPA: 5.0/5.0

HARVARD UNIVERSITY: Cambridge, MA

AUG 2009 – MAY 2013

- B.A. Magna Cum Laude in Computer Science with a Minor in Economics; GPA: 3.9/4.0
Thesis: “Hacking the White House: Election Fraud in the Digital Age”
Advisor: Greg Morrisett

AWARDS AND RECOGNITION

- The Derek Bok Center Teaching Certificate DEC 2019
Certificate given for recognition of commitment to improving one’s teaching through enrollment in Bok Center teaching courses (Foundations of Teaching in STEM, Problems and P-Sets: Creating and Teaching Questions in STEM, Teaching and the Job Market), filmed teaching pedagogy reviews, and development of teaching materials
- The Derek Bok Center Distinction in Teaching Award FALL 2017,18,19
Award given for achieving above a 4.5/5.0 in course evaluations
- National Science Foundation Graduate Research Fellowship (NSF GRFP) APR 2018

TEACHING EXPERIENCE

edX Inc: Cambridge, MA – *Teaching Staff Lead*

SUMMER 2020 – PRESENT

- For the HarvardX Professional Certificate in [Tiny Machine Learning \(TinyML\) MOOC](#)
- Over 5,000 students enrolled since the September launch
- Co-designed a free, hands-on, project-based professional certificate taught through three 5-week courses at the intersection of machine learning and embedded systems that specifically requires no prerequisites outside of basic programming
- Managed the 9-person course staff to ensure that content was created, reviewed, and produced in a timely manner
- Led and managed external relations for the course team coordinating with edX, Google, and Arduino
- Co-designed course materials including short video lectures, readings, code walkthroughs, assessments, and discussion forums

HARVARD UNIVERSITY: Cambridge, MA – *Head Teaching Fellow (Head TA)*

FALL 2020

- For CS 249r: Special Topics in Edge Computing: Tiny Machine Learning (TinyML)
- Co-designed a new 40 student course at the intersection of machine learning and embedded systems
- Designed and gave lectures for the introduction to machine learning section of the course
- Co-developed hands-on project-based assignments training TinyML models with Google Colab and deploying on Arduinos
- Mentored student teams pursuing research-based final projects

HARVARD UNIVERSITY: Cambridge, MA – *Head Teaching Fellow (Head TA)*

FALL 2019

- For CS 249r: Special Topics in Edge Computing: Autonomous Machines
- Co-designed a new 45 student course at the intersection of robotics and computer architecture / embedded systems
- Served as the robotics instructor: designed and gave lectures for the robotics section of the course
- Co-developed course assignments and course infrastructure/tools (e.g., the online paper discussion forum)
- Mentored student teams pursuing research-based final projects

- For CS 182: Introduction to Artificial Intelligence
- Managed a team of 11 teaching fellows supporting the 150 student course to ensure sections and office hours were held, exams and homework assignments were graded, and student questions on the online forum were answered.
- Designed and gave two lectures: “Introduction to Robotics and Path Planning I/II” and the related assignment/exam questions
- Co-Designed and gave a new set of weekly recitations that mapped the weekly course content to cross-cutting course themes
- Co-developed course coding and written (theoretical) assignments, and developed course infrastructure/tools (e.g., autograders)
- Mentored student teams pursuing research-based final projects

- For Harvard’s 15 student section of MIT’s MAS.863: How to Make Almost Anything
- Gave recitations: “Introduction to Embedded Programming”, “Introduction to PCB Design”
- Held office hours, led introductory sessions for course software, aided students in lab work, machine usage, and project design

- For the RACECAR Mini Grand Prix Challenge: a hands-on, intensive, residential, project-based, free to attend, 4-week program for high school students interested in studying STEM
- Worked with 9-12 teams of 4-6 students to teach programming concepts and robotic algorithm design through the completion of fast autonomous navigation tasks using 1/10 scale racecars using Python/ROS
- Co-designed weekly challenges to ensure all teams developed the technical skills needed for the final race
- Co-designed and co-built the final race track spanning an entire ice hockey rink

- For Math 1a (Fall) and 1b (Spring): Introduction to Calculus I and II and Introduction to Differential Equations
- Taught a weekly breakout section, staffed the Math Question Center to aid students in problem sets, and graded problem sets

JOURNAL PAPERS

- [In Preparation] A. Fishberg, **B. Plancher**, J. Connor, I. Verner, J. Grimm, and S. Karaman, “Scaling for diversity, inclusion, and belonging: a case study of a project-based, collaborative, algorithmic robotics program for high school students,” in *International Journal of STEM Education*, 2021.
- [Under Review] **B. Plancher**, S. M. Neuman, T. Bourgeat, S. Kuindersma, S. Devadas, V. Janapa Reddi, “Accelerating Robot Dynamics Gradients: Hardware-Software Co-Design on a CPU, GPU, and FPGA,” in *IEEE Robotics and Automation Letters*, 2021.
- [Under Review] B. Boroujerdian, H. Genc, S. Krishnan, P. Bardienus, B. Duisterhof, **B. Plancher**, K. Mansoorshahi, M. Almeida, A. Faust, V. Janapa Reddi. “The Role of Compute in Autonomous Aerial Vehicles.” in *IEEE Transactions on Computers*, 2020.

CONFERENCE PAPERS

- [In Preparation] **B. Plancher** and Z. Manchester, “GPU-MPC: Accelerating Model Predictive Control with a GPU Based Sparse Augmented Lagrangian Conjugate Gradient Solver.” in *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Prague, Czech Republic, 2021.
- [In Preparation] **B. Plancher**, S. M. Neuman, and V. Janapa Reddi, “RBD-GPU: GPU Accelerated Rigid Body Dynamics for Real Time Model Predictive Control,” in *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Prague, Czech Republic, 2021.
- [In Preparation] L. Grossman, **B. Plancher**, V. Janapa Reddi, and S. Kuindersma, “Reinforcement Learning to Enable Robust Model Predictive Control for Complex Robots,” in *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Prague, Czech Republic, 2021.
- [Under Review] 4th (author names hidden to respect the double-blind review process), “RoboRun: A Robot Runtime to Exploit Spatial Heterogeneity,” in *The Design Automation Conference (DAC)*, Virtual, 2021.
- S. M. Neuman, **B. Plancher**, T. Bourgeat, T. Tambe, S. Devadas, V. Janapa Reddi, “Robomorphic Computing: A Design Methodology for Domain-Specific Accelerators Parameterized by Robot Morphology,” in *ACM International Conference on Architecture Support for Programming Languages and Operating Systems (ASPLOS)*, Virtual, 2021.
- **B. Plancher**, C. Brumaar, I. Brumar, L. Pentecost, S. Rama, D. Brooks, “Application of Approximate Matrix Multiplication to Neural Networks and Distributed SLAM,” in *IEEE High Performance Extreme Computing Conference (HPEC)*, Waltham, MA, September 2019.
- **B. Plancher** and S. Kuindersma, “A Performance Analysis of Parallel Differential Dynamic Programming on a GPU,” in the *Workshop on the Algorithmic Foundations in Robotics (WAFR)*, Merida, Mexico, December 2018.

- **B. Plancher**, Z. Manchester, and S. Kuindersma, “Constrained Unscented Dynamic Programming,” in IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Vancouver, Canada, September 2017.
- S. Karaman, A. Anders, M. Boulet, J. Connor, K. Gregson, W. Guerra, O. Guldner, M. Mohamoud, **Brian Plancher**, R. Shin, and J. Vivilecchia, “Project-based, collaborative, algorithmic robotics for high school students: Programming self-driving race cars at MIT,” in IEEE Integrated STEM Education Conference (ISEC), Princeton, NJ, March, 2017.

POSTERS, WORKSHOPS, ABSTRACTS, AND OTHER

- **B. Plancher** and S. Kuindersma, “Realtime Model Predictive Control using Parallel DDP on a GPU,” in the workshop Toward Online Optimal Control of Dynamic Robots at the International Conference on Robotics and Automation (ICRA), Montreal, Canada, May 2019.
- **B. Plancher**, “Parallel and Constrained Differential Dynamic Programming for Model Predictive Control,” Harvard University, MEng Thesis, May 2018.
- **B. Plancher**, “Hacking the White House: Election Fraud in the Digital Age,” Harvard University, Undergraduate Thesis, March 2013.

INVITED TALKS AND SEMINARS

- “Custom Accelerator Chips (ASICs) for Robotics / Autonomous Systems,” Pillar VC, Boston, MA, April 2020.
- “Accelerating Real Time Model Predictive Control,” Optimus Ride, Boston, MA, October 2019.
- “GPU Acceleration for Robotics,” DUT/MIT Formula Student Driverless, Cambridge, MA, November 2018.

ADVISING

UNDERGRADUATE THESES

- Lev Jacob Grossman: Highest Honors MAY 2020
Reinforcement Learning to Enable Robust Robotic Model Predictive Control
- John Alex Keszler: Honors MAY 2019
FPGA Acceleration of Motion Planning Algorithms For Robotics Applications

MENTOR

- Try AI: “A program designed to introduce early undergraduate students, particularly those identifying as women, Black, Latinx, and/or Indigenous, to research in Artificial Intelligence” FALL 2020

PROFESSIONAL SERVICE

Reviewer:

- IEEE Robotics and Automation Letters (RAL)
- 2021 IEEE International Conference on Robotics and Automation (ICRA)
- 2020 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
- 2018 IEEE Integrated STEM Education Conference (ISEC)

Judge:

- 2020 Harvard Women in STEM ENVISION Proposal-Writing Competition

Member:

- IEEE Robotics and Automation Society (IEEE-RAS)
- IEEE-RAS Technical Committee on Model-Based Optimization for Robotics

ADDITIONAL PROFESSIONAL EXPERIENCE

- McKINSEY & COMPANY:** Boston, MA – *Business Analyst* AUG 2013 - JULY 2015
- Offered promotion to senior associate (designation reserved for top ~5% of business analyst class)
 - On multiple projects, played “junior engagement manager” role, project managing newer business analysts
 - Led product development strategy for a software product, interfacing between multiple engineering teams and management at the business unit and corporate levels for a prime defense contractor
 - Analyzed the value chain, market dynamics, and entry strategy for a new product for a high-tech materials manufacturer
 - Led business case and market entry strategy development for a novel aircraft for a major aerospace manufacturer
 - Designed a network deployment and capital planning strategy for a national wireless carrier

- Facilitated a culture transformation for a Fortune 500 company including a simultaneous worldwide conference with events in the United States, Western Europe and Singapore
- Designed a comprehensive economic development and revitalization strategy for a rural area of the United States
- Performed the strategic due diligence that led to a successful large (>\$10Bn) deal between Fortune 500 companies

UNITED STATES DEPARTMENT OF DEFENSE: Fort Meade, MD – *Cryptologic Access Program* MAY 2012 - AUG 2012

- Led an internal consulting project on the use of Cloud-based solutions by developing a Map-Reduce Analytic backed GUI prototype and researching and presenting findings on possible use cases to division management
- Helped lead weekly meetings to coordinate a 15 person development team and ensure code reuse and efficient production
- Designed and built generic and reusable widgets in EXT-JS and the Ozone Widget Framework in order to aid leadership in analyzing current operational metrics and improve operational efficiency and oversight

US GREEN DATA: Cambridge, MA – *Senior Software Engineer*

SEPT 2011 - MAY 2012

- Managed the tech team consisting of 4 Harvard Students and 4 professional web developers to ensure collaboration and production as lead web designer and developer in a Django / jQuery environment
- Evaluated the web development direction, product line and client requirements with the CEO and other company leaders
- Worked with the consulting team to create data models to improve data analysis efficiency and maximize client savings
- Provided system administrator function to maintain and improve the web architecture, security and design

REFERENCES

Vijay Janapa Reddi

Associate Professor of Electrical Engineering, John A. Paulson School of Engineering, Harvard University
vj@eecs.harvard.edu

Scott Kuindersma

Research Scientist Boston Dynamics, Former Assistant Professor at Harvard University
scottk@seas.harvard.edu

Zachary Manchester

Assistant Professor at the Robotics Institute, Carnegie Mellon University
zacm@cmu.edu

Greg Morrisett

Jack and Rilla Neafsey Dean and Vice Provost of Cornell Tech, Cornell University
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