

# BRIAN K. PLANCHER

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## EDUCATION

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**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

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- 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 2017,18,19,20  
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

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**edX Inc:** Cambridge, MA – *Teaching Staff Lead* SUMMER 2020 – PRESENT

- For the HarvardX Professional Certificate in [Tiny Machine Learning \(TinyML\) MOOC](#)
- Co-designed a free, hands-on, project-based professional certificate taught through three 6-week courses on the EdX platform covering the emerging field of Tiny Machine Learning (deploying machine learning onto microcontrollers for machine learning at the extreme edge) with the aim of democratizing access to this developing field
- Over 35,000 students from over 160 countries enrolled as of March 2021 since the three courses launched in September 2020, December 2020, and February 2021 respectively
- Served as the laboratory instructor both co-designing hands-on exercises as well as recording video walkthroughs
- Managed the 10-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

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

FALL 2017,18

- 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

**MIT / HARVARD UNIVERSITY:** Cambridge, MA – *Teaching Assistant*

FALL 2017,18,19

- 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

**MIT LINCOLN LABORATORIES BEAVER WORKS:** Cambridge, MA – *Associate Instructor* SUMMER 2016,17,18,19

- 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

**HARVARD UNIVERSITY:** Cambridge, MA – *Course Assistant*

FALL 2010, SPRING 2011

- 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

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- [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.”
- [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, 2021.
- **B. Plancher**, S. M. Neuman, T. Bourgeat, S. Kuindersma, S. Devadas, V. Janapa Reddi, “Accelerating Robot Dynamics Gradients on a CPU, GPU, and FPGA,” in IEEE Robotics and Automation Letters (RA-L), 2021.

## CONFERENCE PAPERS

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- [In Preparation] **B. Plancher**, S. M. Neuman, R. Ghosal, and V. Janapa Reddi, “RBD-GPU: GPU Accelerated Rigid Body Dynamics for Real Time Model Predictive Control.”
- [In Preparation] **B. Plancher** and Z. Manchester, “GPU-MPC: Accelerating Model Predictive Control with a GPU Conjugate Gradient Solver.”
- [In Preparation] L. Grossman, **B. Plancher**, V. Janapa Reddi, and S. Kuindersma, “Reinforcement Learning to Enable Robust Model Predictive Control for Complex Robots.”
- B. Boroujerdian, R. Ghosal, J. Cruz, **B. Plancher**, and V. Janapa Reddi, “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

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- **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

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- “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

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### 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

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### 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:

- 2021 Harvard i3: The Harvard College Innovation Challenge
- 2020 Harvard Women in STEM ENVISION Proposal-Writing Competition

### Member:

- 2020-2021 Harvard SEAS DIB Post-Bachelorette Program Working Group
- IEEE Robotics and Automation Society (IEEE-RAS)
- IEEE-RAS Technical Committee on Model-Based Optimization for Robotics

## ADDITIONAL PROFESSIONAL EXPERIENCE

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### 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

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**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  
greg.morrisett@cornell.edu