

Mark Jouppi

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Education

University of California, Berkeley

August 2014 – May 2015 (expected)

Master of Engineering (M.Eng.), Electrical Engineering and Computer Science

Selected Coursework: Robotics, Image Manipulation & Computational Photography, Computer Vision, Optimization

University of California, Berkeley

August 2010 – May 2014

Bachelor of Science (B.S.), Electrical Engineering and Computer Science

Selected Coursework: Machine Learning, Artificial Intelligence, Operating Systems & System Programming, Software Engineering, Networking, Databases, Efficient Algorithms & Intractable Problems, Computer Security, Embedded Systems

Experience

UC Berkeley Teleimmersion Lab

August 2014 – present

Graduate Student Researcher; Advisor: Professor Ruzena Bajcsy

- Working on research project for master's degree: *Robotic Manipulation with a Human in the Loop*
- Using Rethink Robotics Baxter Research Robot, a humanoid robot with dual 7 DOF arms. Runs Robot Operating System (ROS); also using MoveIt! for arm planning and OpenCV for vision.
- Developing algorithms to facilitate human-robot collaboration in construction tasks for low cost, low precision robots
- Human teaches robot task motions by moving end effectors; robot learns by demonstration. Training trajectories are normalized with dynamic time warping and then used to parameterize sections of the task by precision required.
- The robot will execute task segments it can complete on its own. When task segments are encountered requiring greater accuracy than the robot has, it calls a human, who positions the end effector under constraints imposed by virtual fixtures.

Google

May 2014 – August 2014

Software Engineering Intern

- Worked in Google Earth Engine, a platform that hosts petabytes of remote sensing and geospatial data, provides many algorithms to run on data, and uses large scale distributed systems to process data at unprecedented scale and speed.
- Implemented distributed region merging image segmentation algorithm; this popular segmentation algorithm starts with every pixel as a unique region, and then iteratively merges regions according to spectral and shape characteristics.
- Fully integrated algorithm with Earth Engine system, now in production code. Will empower researchers who previously had to install expensive segmentation software on their local machines and could only run on smaller satellite images.
- Entire satellite image is split into tiles and distributed across many machines for segmentation. Designed and implemented post-processing algorithm to examine tile borders and resolve inter-tile segment discontinuities as best as possible.
- Performed benchmarking of code, implemented highly optimized version, decreased memory usage and computation time each by over 50%. Also increased readability of code and wrote extensive unit and integration tests.

UC Berkeley Video and Image Processing Lab

September 2013 – May 2014

Research Assistant; Advisor: Professor Avideh Zakhor

- Conducted image based geolocalization research funded by Intelligence Advanced Research Projects Activity (IARPA).
- Developed computer vision and machine learning techniques for automated geolocalization of ground level images using overhead reference data such as high resolution satellite imagery and digital elevation models.
- Designed and implemented algorithms to extract buildings from satellite images for matching to ground level query photos.

Boeing Research & Technology

June 2013 – August 2013

Electronics Prototyping Intern, Electronic Prototyping and Integration Center (EPIC)

- Created system for best onboard processing capability possible given strict size, weight, and power constraints for fleet of small unmanned aerial vehicles (UAVs); integrated system without jeopardizing existing flight systems.
- Designed system and performed trade studies to select best parts including processor, storage, power supply, and batteries.
- Communicated with suppliers to get detailed information and quotes. Worked with procurement to get hardware.
- Investigated, setup, and deployed software including JPEG 2000 Interactive Protocol (JPIP) to enable UAV to act as server for ground station client, sending requested aerial imagery with minimal bandwidth. Also worked with Precision Image Registration, an algorithm for accurate geolocation using onboard reference database of satellite imagery.
- Assisted a separate Phantom Works UAV program by creating networking tools for their team such as a ground control station message interceptor and rewriter tool for testing and debugging.

UC Berkeley Teleimmersion Lab

March 2013 – May 2013

Research Assistant; Advisor: Professor Ruzena Bajcsy

- Developed automated exercise coaching system for elderly patients using Microsoft Kinect.
- Created software to analyze a large database of patient exercise data recorded from Kinect skeletal tracking to produce metrics measuring patient health and improvement over time. Collaborated with Oregon Health & Science University.

NASA Jet Propulsion Laboratory

June 2012 – August 2012

Intern, Human Interfaces Group

- Conducted research to develop more natural, effective robotic control and visualization technology.
- Created software application for zSpace, a system with 3D display, head tracking, and 6 degrees of freedom input, for improved operator awareness and end effector control of All-Terrain Hex-Limbed Extra-Terrestrial Explorer (ATHLETE).
- Integrated inverse kinematics software so operator could control ATHLETE's end effector using the zSpace tracked stylus.
- Drew expertise from diverse group of software engineers, mechanical engineers, human factors specialists, and artists.
- Interviewed mission operations personnel to understand user requirements, conducted lo-fi prototyping, developed software application over several iterations, and conducted user testing with real rover operators, who gave highly positive feedback.

UC Berkeley Cyber Physical Cloud Computing Lab

August 2011 – May 2012

Research Assistant

- Worked on customized autonomous unmanned aerial vehicles (UAV) to provide cloud-based data collection services.
- Helped construct flying wing UAVs and worked on adding functionality to flight software for ArduPilot Mega autopilot.
- Implemented computer vision using ROS and OpenCV for quadrotors to enable autonomous target detection and tracking.

Selected Extracurriculars and Projects

American Institute of Aeronautics and Astronautics - Berkeley Student Chapter

August 2010 – May 2014

Project Lead, Executive Council, Webmaster

- Created and led Berkeley student competition team for national NASA-sponsored teleoperated rover design competition.
- Served as project lead for CubeSat project, an effort to design a small satellite to better understand the lower thermosphere.
- Competed in Raytheon and Cessna sponsored AIAA Design, Build, and Fly competition, created small multipurpose UAV.

Embedded Systems Course Project - Robot Waiter

October 2012 – December 2012

- Created robot waiter system: diners placed orders via laptops at their tables, a chef indicated when orders were ready at a chef station, and the robot determined an optimal path (which is dynamically updated as new or completed orders come in) to pick up orders and deliver them to diners throughout the room.
- Wrote inverse kinematics software so the robot could pick up simulated food objects using its 4DOF robotic arm.
- Indoor localization of the robot was achieved by placing infrared reflective markers on robot and using "OptiTrack" optical motion capture and tracking system cameras mounted around the room.

Microsoft Robotics @ Home Competition

January 2012 – April 2012

- Competed to use Parallax EDDIE robot and Microsoft Robotics Developer Studio for robotics applications in the home.
- Created software to allow robot to autonomously patrol house and use facial recognition to determine if people encountered were just recognized friends and family or potential intruders the home owner should be alerted to.
- Named by Microsoft as one of ten national finalists in the competition, one of only two students to be finalists.

Skills and Qualifications

- Java, Python, C++, C, C#, Ruby, Javascript, SQL, HTML/CSS, Scheme/Lisp, MIPS
- Linux/UNIX, OS X, Windows, VxWorks
- Hadoop, MySQL, Junit, Ant, Eclipse, Ruby on Rails
- Robot Operating System (ROS), OpenCV, MoveIt!, MATLAB, LabVIEW, Unity

Selected Honors and Awards

- *UC Berkeley College of Engineering Fung Fellowship*, \$10,000 merit-based award for noteworthy academic and professional accomplishments, as determined by department faculty nominations
- *UC Berkeley College of Engineering Dean's Honor List*, awarded to top 10% of engineering students per semester
- *Eta Kappa Nu*, electrical engineering honor society, invitation extended to top 25% of UC Berkeley EECS juniors
- *Cal Alumni Association Leadership Award*, merit-based scholarship for innovative leadership, won 2 consecutive years
- *UC Berkeley Engineering LeaderShape Institute*, selected to participate in week-long leadership training camp
- *Microsoft Robotics @ Home Competition*, one of 10 national finalists for security robot with facial recognition project
- *National Siemens Competition in Math, Science, and Technology Semifinalist*, awarded for astrobiology research project, "The Feasibility of Growing *Spinacia oleracea* and *Glycine max* in Lunar and Martian Regolith"

Publications

- Singh, G., Jouppi, M., Zhang, Z., Zakhor, A. "Shadow Based Building Extraction from Single Satellite Image". To appear in *SPIE Electronic Imaging*, February 2015.