Avi Vajpeyi

Contact

+917 715 9580
avi.vajpeyi@gmail.com
avi.vajpeyi

Programming

C/C++ ★★★★★
Obj-C ★★★★☆
Python ★★★★☆
Java/C# ★★★☆☆
Matlab ★★★★☆
Mathmtica ★★★★☆
1 star ~500 lines

Recent Courses

Machine Learning
General Relativity
Computational Physics
Algorithm Analysis
User Interface Design
Prog Languages
Comp Organisation

Non Academic Interests

Rock Climbing
Varsity Track Team
Piano
Taekwondo
Math Modeling
Puerto Rican Salsa
Programming Puzzles

Links

github.com/avivajpeyi
unity.com/avivajpeyi
linkedin.com/in/vajpeyi

Education

08/14–05/18 **B.A. Physics and Computer Science** The College of Wooster
Cumulative GPA: 4.0
Awards: Dean's List, Barry Goldwater Scholarship Honourable Mention, Best Paper Presentation Award: 2017 MCURCSM, 1st Place OH5 Libraries Hackathon, Karl Compton Endowed Scholarship, Donald/Rebecca Curtis Scholarship, Joseph Albertus Culler Prize in Physics, Elias Compton First-Year Prize
Honour Societies: Phi Beta Kappa, Pi Mu Epsilon

Research

08/17–Now **Senior Capstone—Granular Flow with a GPU** The College of Wooster
•Developed a computer simulation of avalanches on a conical bead pile using both central processing units and graphical processing units to increase computational speed on a single desktop computer.
•Improved computational complexity from a previous bead pile simulation from $O(n^2)$ to $O(n^{1.2})$.
•Will present work at March 2018 American Physical Society conference in the form of a PowerPoint presentation.

01/16–Now **Independent Research—Chaotic Scattering** The College of Wooster
• Created an OS X application with Objective-C to study chaotic, non-chaotic and periodic trajectories of particles scattering in regions with hills and valleys, ion-potentials, and 2D sine planes.
• Discovered a new chaotic scattering in systems with valleys in place of hills and studied the fractal patterns present in the system.
• Studied different numerical integration techniques and performed a case study on the Runge-Kutta 4 method and contrasted it with the Euler-Cromer technique.
• Investigated potential uses of the application to study two body systems such as H and Cl bonding.
• Presented this work with a poster at the 2017 Consortium for Computing Sciences in Colleges. Delivered a paper presentation using a 20 minute PowerPoint at the 2017 Midstates Conference For Undergraduate Research in Computer Science and Mathematics, and won the best paper presentation award.

06/17–08/17 **NSF Physics Research—Filtering Gravitational Waves** Sapienza University
• Wrote Matlab scripts to create two dimensional fast Fourier transform filters to enhance the SNR of simulated r-mode gravitational wave signals in the presence of varying levels of white noise and frequency glitches.
• Demonstrated that we can achieve an enhancement in the quality of an r-mode signal using filters that do not match the exact parameters of the signal, contrary to what is required with typical matched filtering methods.
• Developed a convolutional neural network with TensorFlow to perform classification and parameter estimation of the r-mode gravitational wave signals.
• Presented this work with a 15 minute PowerPoint presentation at the Max Planck Institute for Gravitational Physics and with a poster at the 2017 Fall Meeting of the APS Ohio-Region Section.
• Documented work in a research report of 14 pages.

Places Lived

New York City, USA
Kolkata, India
Darjeeling, India
Wooster, OH, USA

Languages

Enlgish ★★★★★
Hindi ★★★★☆

Online Courses

-Unity Game Physics
-Developers Course for Unity

02/17–05/17 **Junior Research—Quantum Memory** The College of Wooster

• Investigated and constructed a theoretical model of how the how the geometric phase of light alters as the polarization states of light evolve.
• Developed Mathematica script to create interference patterns due to the interference of light with and without geometric phase.
• Tested the theoretical model's interference patterns by comparing them with previous predictions for particular cases.
• Presented the work with a 12 minute PowerPoint presentation at the College of Wooster.
• Documented work in a research report of 11 pages.

06/16–08/16 **LIGO Undergrad Research—Binary Black Hole Detection** LIGO Caltech

• Investigated an alternative detection statistic to SNR (the data analysis tool used to detect the first gravitational wave events) known as the 'Bayes Factor' to improve the detection of Binary Black Hole Systems.
• Wrote Python code and edited scripts to calculate the Bayes Factor for noise events in LIGO strain data from the 2015 observation run.
• Presented research findings at LIGO Caltech.
• Documented work in a research report of 22 pages and wrote a research proposal based on this work for the Barry Goldwater scholarship which received a honourable mention.

06/15–06/16 **NSF Physics Research—Avalanching Bead Piles** The College of Wooster

• Analyzed the effect of input energy and cohesive forces on avalanche behaviors with a pile of metallic beads.
• Tracked beads with C++ and Matlab code adapted from a program to track particles.
• Gained understanding and experience in electronic systems, LabVIEW, Mathematica, IgorPro and data analysis.
• Attended the 2015 Material Science and Technology conference to further understand the dynamics of granular matter.
• Presented the research at the March 2016 American Physical Society conference in the form of a poster and at the College of Wooster with a poster and a 10 minute PowerPoint presentation.
• Documented work in a research report of 9 pages.

08/16–02/17 **Software Engineering Assistant—GitKeeper** The College of Wooster

• Developed and tested back-end python scripts for Git-keeper, a system for collecting and automatically running tests on student programming assignments.
• Researched and adapted Git-keeper to better suit user needs.

06/15–06/16 **Sophomore Research—Code Reading** The College of Wooster

• Collected data from peer reviewed articles to analyze code reading patterns in novice programmers.
• Reviewed and reported design strategies for programs to study how individuals can better understand code.
• Created exercises to teach C programming.

Conferences Presented At

March 2016 APS
Spring 2017 CCSCNE
Fall 2017 OSAPS
2017 MCURCSM

TensorFlow Projects

-CNN for GWs
-Emotions in piano music
-Word to Vector for libraries

Robotics Projects

-LED light cube
-Sign language (ASL) interpreter (incomplete)

Teaching and Grading Experience

08/16 - 12/16 **Modern Physics Lab Assistant**
Help students with setting up and running lab experiments. Assist with scientific writing and presentation of data. Present tutorials on software such as LaTeX and data analysis tools such as IgorPRO. Some of the experiments are the Millikan Electron Charge, Einstein Photoelectric Effect and Rutherford Scattering experiments.

08/15 - 12/15 **Experiential Entrepreneurship - Leadership for a Better World**
Support the development of student leadership through the Social Change Model of Leadership Development program.

08/15 - 12/15 **Data Structures and Algorithms Teaching Assistant**
Support the development of software development skills including testing and documentation in OOP, with a focus on C++. Maintained lab and office hours.

08/15 - 12/15 **Computer Science Grader**
Responsible for grading 15 assignments a week in introductory C programming.

08/15 - 12/15 **Center for Diversity and Inclusion - Global Engagement TA**
Responsible for stimulating in-class discussions on a wide range of social and cultural topics and supporting professor in class management.

Projects

03/17–05/17 **Emotion Analysis in AIDuet**
Created a neural network on TensorFlow to classify piano music to happy and sad based on pitches, similar to semantic analysis for text. We collected and labeled piano music data to train and test the neural network. We added this neural network to a copy of Google's AIDuet to report if music played by the user was considered to be happy or sad.

11/16–05/17 **Study of UI in Videogames**
Created an FPS zombie survival game with two other students. Included our own animations, level map and GUI in the game. We have used this game to test how user interface affects user experience and behavior in FPS games and presented our findings in a report for our User Interface and Design class. Plan on publishing the game on Steam.

03/16–04/16 **Depth First Search Maze Solver**
Built a maze using equivalence classes and the Union-Find algorithm. The maze and its path were visualized with GLUT and OpenGL.

09/16–10/16 **Trajectory Calculations for Spacecrafts**
Collaborated on a project to plot rocket trajectories to nearby planets.

03/16 - 06/16 **Simulation of Cancer Growth**
Simulated random walks on the surface of spheres to model cancer growth.

03/16 - 04/16 **Finite Quantum Well Applet**
Created an applet for the time-dependant Schrodinger Wave Equation.

Work Experience

08/15 - Now **Resident Assistant**
Manage a college residence hall of about 30 undergraduate students.

- Enforce campus policies to create a safe, orderly, and enjoyable living environment for the residents.
- Run floor meetings and conduct frequent room drop-ins to discuss developments, events, and concerns to keep students up-to-date on all pertinent information.
- Conduct programs on diversity, chemical abuse, personal development, relationships, security, and academic performance.
- Manage administrative tasks including room condition reports, maintenance requests, incident reports, and the room change process.

08/15 - Now **Scot Lanes**
Manage client access to bowling alley and routine maintenance of lanes.

08/14 - 06/16 **Security and Protective Services**
Support campus security at the school perimeter and its buildings.

Activities & Leadership

08/15 - Now **Varsity Men's Track and Field, D-III**
Compete in short distance sprint events – specifically the 60m and 200m events.

3/17 - 3/17 **OH5 Libraries Newspaper Hackathon**
Created vector representations of newspaper text (ranging from campus newspapers from the 1970's-2010) and provided three dimensional visualization of the vectorized words with TensorFlow embeddings. Using this model we demonstrated how the association of certain words changed with time. For example, initially 'gay' appeared more with 'happy' while later it started appearing with 'liberation'. Our work was ranked 1st place.

10/16 - 10/16 **The University Physics Competition**
Collaborated on a research competition on the best way to send nuclear waste to the sun and the asteroid belt using Objective-C. The program used gravity assists and Kepler's Laws of Planetary motion to help plot the path of the rocket and the planets.

4/16 - 4/16 **OHI\O Hackathon**
Worked on designing an equipment-loaning application for the Ohio State hackathon with three students.

4/16 - 4/16 **President: Table Tennis Club**
Responsible for developing and maintaining the budget for the club, organizing practice sessions for members and hosting an inter-mural tournament at the College of Wooster.

1/15 - 08/16 **Co-Chair : South Asia Committee**
Organized and coordinated social events to engage the college community in South Asian culture, traditions, and current affairs. Responsible for developing student-retention strategies by strengthening the South Asian community at the college.

1/15 - 1/16 **Vice Chair : Student Services, Student Gov.**
Student governing body focused on improving the quality of student life by upholding the rights of students without discrimination of any flavor.

3/15 - 3/15 **Honourable Mention, Math Modeling Competition**
A 96-hour high-pressure international contest for undergraduate student-teams from over 900 institutions. The contest challenged students to clarify, analyze, and propose solutions to open-ended problems. Placed in the top 30% of the contestants and the three-member team was awarded an honorable mention for our paper on the eradication of Ebola.

Honors & Awards

2017 **MCURCSM 2017: Best Paper Presentation** Award
Awarded to the best undergraduate student paper presentation at the 2017 Mid-states Conference For Undergraduate Research in Computer Science and Mathematics.

2017 **NCAA D-III Academic Honor Roll** Award
Awarded to a student-athlete who participates in a National Collegiate Athletic Association (NCAA) sport for their institution and has a GPA of 3.50 or above.

2017 **Dean's List and Scholarship** Scholarship
Placed on the Dean's List the following semesters: Fall 2014, Spring 2015,Fall 2015, Spring 2016, Fall 2016, Spring 2017. Awarded the Dean's Scholarship, an award made to students on the basis of overall academic achievement, extracurricular involvement, leadership, and personal merit.

2017 **OH5 Hackathon 1st Place** Competition
A prize given to my group for our work with the vectorization of the text in newspaper articles.

2017 **Edward Taylor Prize** Recognition
Awarded to the student who has attained the highest academic standing their first and sophomore years.

2016 **Joseph Alberts Culler Prize in Physics** Recognition
This prize recognises excellence in the field of physics. It is awarded to the first or second year student who has attained the highest rank in general college physics.

2016 **Elias Compton Freshman Prize** Recognition
This prize recognises academic excellence in the first-year class. It is awarded to the student who has achieved the highest standing in scholarship during the first year.

2013 **District Science Fair** Competition
Awarded the first prize in the Darjeeling Science Fair demonstrating the physics behind a submarine with a handmade working model.

2012 **Mountaineering Course** Completion
Awarded an 'A' Grade in the Himalayan Mountaineering Institute's course in mountaineering

2012 **Duke of Edinburgh Award** Award
Received the first level award for academic merit, community involvement, social service and leadership skills.

Certifications

02/2013 **National Student Leader**
Certified Student Leader at the National Conference on Student Leadership, Washington, D.C.

December 27, 2017

Avi Vajpeyi