Dowling Wong

Dowling's website | Dowling's Github | dowlingwong@brandeis.edu | pypi package dwong | Academic Blog

Education

Brandeis University May 2024
Bachelor of Science in Physics *PHYS GPA: 3.73/4.00*

- Relevant Coursework: Graduate Mathematical Physics, Differential Geometry, Particle Physics, Data Science and Physics, Graduate Electromagnetic Theory, Graduate Statistical Mechanics, Graduate Quantum Mechanics, Physical Continuum Mechanics, General Relativity, Differential Equation, Advanced Physics Laboratory, Electronic Laboratory

Franklin W. Olin College of Engineering May 2024
Certificate on Electrical & Computer Engineering *ENGR GPA: 3.90/4.00*

- Relevant Coursework: Eclectronic, Fundamental Robotics, Integrated Engineering
- Engineering Skills: Computer Vision, FPGA Development, PCB design&manufacturer, Development Board design&Driver development, Singal Processing

Research

Particle Identification Algorithm | *Brandeis/MIT* Mar 2022 – Present
Advisor: Aram Apyan, Philip Harris

- DNN based Particle ID for DarkQuest proposal
- Pseudo-realtime multi-class tagging system integrated with reconstruction code.
- Collaborate to create a pipeline for data processing and analysis at DarkQuest
- Track Reconstruction with drift chambers, EM-Calorimeter, and hodoscope
- Seed-Kmean Clsutering Algorithm for EM-Calorimeter
- Optimized pypi package dwong integrating pipeline for DarkQuest analysis

Holographic Duality and Entanglement Entropy| *Brandeis* Nov 2022 – Aug 2023
Instructor: Matthew Headrick

- Presentation and notes on Theoretical foundation for black holes and the Penrose singularity theorem
- Learning notes on solutions of Einstein Field Equations, derivation of some basic AdS/CFT correspondece
- Reading and discussion on Tensor Network, and Entanglement Entropy

Experience

Visiting Student | *MIT LNS* Jun 2023– Present
Visiting student to Philip Harris group to conduct further research on NN-based Particle ID and Clustering Algorithm. Learn about DataScience applications in Physics.

Research Assistant, Member of Brandeis HEP | *Brandeis university* May 2022 – Present
Advised by Prof.Aram Apyan. Conducting research on displaced vertexing, track reconstruction, and particle identification for DarkQuest Collaboration.

Student | *Brandeis Quantum and Gravitational Theory Group* Nov 2022 - Aug 2023
Reading papers on Quantum gravity and Tensor Network, derive Bulk-Boundary relationship start from solving Einstein Equation.Join theory group meeting to prepare for senior thesis.

Visiting student | *Fermi National Accelerator Laboratory* Mar 2022 – Present
Member of DarkQuest Collaboration, modify Pythia 8 to modify e1039-core simulation for combining station 2&3 study on displaced vertex.

Experience

Technician | *Brandeis ITS* Sep 2021 - Mar 2022

I provided general computer& software support for the Branedis campus and teaching technology ,performed maintenance work for the network and high performance computing cluster(HPCC). I also helped set up new computers and managed the safe disposal of hard drives containing sensitive information.

Skills

Languages: C/C++, Java, Python, Mathematica, MATLAB, JavaScript, HTML/CSS, LaTeX
Machine Learning Packages: PyTorch, Tensorflow, Keras, hls4ml, SONIC, Tensorflow C API
Editors: Vim, Emacs, nano, VSCode, IntelliJ IDEA, Jupyter Notebook
Technical skills: Git/Github, anaconda, docker, Bash script, ROOT, Pyroot
EECS skills: KiCAD, MricoPython, CircuitPython, LTspice circuit simulation analysis

Talks and Presentations

DarkQuest Collaboration All-Hands-on Workshop, Boston(Talk) Oct 2023
D. Wong, *A.Apyan, W.P.McCormack, P.C.Harris* [Event Link]

Seed-Kmean Clustering, Track/Particle flow reconstruction, Integrating pipeline for data analysis,

Update on Particle ID and Simulation at DarkQuest Collaboration(Talk) Aug 2023
D. Wong *W.P.McCormack* [Event Link]

Performance and technical detail of NN based Particle ID, bench mark of using different frame.

Brandeis SciFest XII(Presentation) Aug 2023
A.Apyan, P.C.Harris, W.P.McCormack, ***D. Wong*** [Event Link]

Physics for Dark Matter, Neural Network based Particle Identification, Cut-based particle discriminator

Presentation on theoretical foundation for Black Holes(Presentation) Nov 2023
D.Wong [Event Link]

Based on Penrose's contribution to 2020 Nobel prize, introduced Einstein field Eqation, Schwarzchild metric, Penrose diagram, singularity and Hawking-Bekenstein Entropy.

Papers in Progress and Learning Notes

DarkQuest Update Paper on Track Reconstruction, Particle ID and SpinQuest Data Paper in progress

Anti-de-Sitter Space and Beyond Learning Notes
[Paper Link]

Particle Identification for Dark Photon Detection Poster
[Paper Link] [Event Link]

Penrose Singularity Theorem and Conformal Structure Learning Notes
[Paper Link] [Event Link]

Summary on Black Hole Entropy and Holographic Correspondence Learning Notes
[Paper Link]

Selected Courses

PHYS 167/107 Particle Phenomenology | *Brandeis University*	SP 2024
8.316 Data Science in Physics | *MIT*	SP 2024
CAS PY 501 Mathematical Physics | *Boston University*	FA 2023
PHYS 91G Introduction to Research Practice | *Brandeis University*	SP 2022
PHYS 99D Senior Research | *Brandeis University*	FA 2023
PHYS 164A First Year Tutorial I | *Brandeis University*	FA 2023
PHYS 163A Statistical Physics and Thermodynamics | *Brandeis University*	FA 2023
PHYS 162B Quantum Mechanics II | *Brandeis University*	SP 2023
PHYS 161A Electromagnetic Theory I | *Brandeis University*	FA 2023
PHYS 111A Physical Continuum Mechanics | *Brandeis University*	SP 2022
PHYS 102A General Relativity | *Brandeis University*	SP 2023
PHYS 39A Advanced Physics Laboratory | *Brandeis University*	FA 2022
PHYS 31A Quantum Theory I | *Brandeis University*	SP 2022
PHYS 31B Quantum Theory II | *Brandeis University*	FA 2022
PHYS 30A Electromagnetism | *Brandeis University*	FA 2021
PHYS 29A Electronics Laboratory I | *Brandeis University*	SP 2022
MATH 102A Introduction to Differential geometry | *Brandeis University*	SP 2023
MATH 37A Differential Equations | *Brandeis University*	SU 2022
COSI 12B Advanced Programming Techniques in Java | *Brandeis University*	SU 2022
ENGR 3390 Fundamentals of Robotics | *Olin College*	SP 2023
ENGR 3430 Eclectronics | *Olin College*	FA 2022
ENGR 2110 Principles of Integrated Engineering | *Olin College*	FA 2022
ENGR3370 Controls | *Olin College*	SP 2024

Electronic&Coding Projects

Pypi package dwong | *Python, C++, PyROOT* Mar 2023 – Present

- Dowling's analysis code for DQ collaboration
- Includes Online multi-class particle tagger, track reconstruction, clustering algorithm, pyroot interface to C++

DQ Dowling | *Jupyter notebook, Python* Mar 2023 – Present

- Dowling's analysis code for DQ collaboration
- Includes clustering, tracking, hodoscope inspection, st23 tracklet and Particle ID under construction.

dwongs | *Python* Jun 2023 – Present

- Self-designed Python package for DarkQuest Collaboration, includes data processing, plotting, machine learning kit, and decay-distance calculator.

DLab | *C, Python, Assembly Language* Sep 2023

- Use Python to do bottom-layer management, I/O&CPU bound multi-threading, and dynamic memory allocation.
- Interface between C and Python, write some classes and function in C for Python code.

My Website | *HTML, CSS, JavaScript* Feb 2023 – Present

- Dowling's website at Brandeis.people
- Pages for academic record and learning notes

PE6502 8bit computer | *Assembly Language, PCB hand soldering* Aug 2023

- PCB design based on MOS 6502 datasheet and Ben Eater website.
- Hand soldering components and testing.

Autopilot Robot Rover | *Computer Vision, Robotic Control System, Matlab, Git* May 2023

- Developed an autopilot with AprilTag, accelerometer and GPS, following trail around Olin Oval. With real-time video sending back and human control system
- Design mechanical structure and electrical system, have low-volt control system and high-volt actuation system.
- Computer Vision for color block and PID control to walk through bridge
- Constructed website to summarize project and share code.

Digital Camera based on RP2040 | *OS development, PCB design and reflow soldering, SPI interface* Dec 2022

- Prototype with Dowling Pi Pico, tested with breadboard
- Wrote a camera operating system using circuitpython and micropython
- PCB designed based on Dowling Pi Pico layout, added camera and SD card slot with IOs and buttons.
- Reflow oven soldering and hand solder fixed

Dowling Pi Pico | *PCB design and soldering, RP 2040* Dec 2022

- Design circuit following RP2040 processor manual, draw scheme for circuit.
- PCB design for layout, replace micro-USB to USB-C port.
- Reflow oven soldering with hand soldering fixed.