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Dowling Wong

Dowling's website | Dowling's Github | linkedin profile | dowling.wong@cern.ch

Education

Karlsruhe Institute of Technology Oct 2024 - Present

PhD Candidate, Institut für Experimentelle Teilchenphysik

- Simulation and reconstruction of dark matter signatures for the DELight experiment
- Quality control and database management for HGCAL at the CMS experiment, CERN

Brandeis University Aug 2021 - May 2024

Bachelor of Science in Physics *GPA: 3.691/4.00*

- Completion of Master's requirements with electives: Advanced Mathematical Physics, Differential Geometry, Particle Phenomenology, Data Science in Physics

Franklin W. Olin College of Engineering Aug 2022 - May 2024

Certificate in Electrical & Computer Engineering *GPA: 3.92/4.00*

- SLAM with ROS2, Semantic Segmentation, Full-Stack Development, PCB Design, Edge Computation, Signal Processing

Research

Energy reconstruction at the DELight experiment | *KIT* Nov 2024 – present

Advisor: Alexander-von-Humboldt-Prof. Dr. Markus Klute

- Energy reconstruction for world-leading micro magnetic calorimeter with developing a strax-based pulse analysis software helix for DELight experiment
- Configure a Singularity computing infrastructure on the former DARWIN server to support DELight simulation and reconstruction environments.

Service for HGCAL upgrade at CMS, CERN | *KIT* Oct 2024 – present

Advisor: Alexander-von-Humboldt-Prof. Dr. Markus Klute

- Protocol automation and fabrication for the HGCAL baseplate for CMS phase 2 upgrade

Particle Identification at DarkQuest, FermiLab | *Brandeis/MIT* Mar 2022 – Jun 2024

Advisor: Prof. Aram Apyan, Prof. Phil Harris

- DNN based Particle ID for DarkQuest TDR
- Track and particle flow reconstruction with tracker, EM-Calorimeter, and muon chambers
- Seed-KMeans Clustering Algorithm for EM-Calorimeter
- Optimized pypi package dwong pypi package dwong integrating pipeline for DarkQuest particle flow reconstruction

Experience

Visiting Student | *MIT LNS* Jun 2023– Jun 2024

Conducting research in Prof. Phil Harris' group on neural network-based particle identification and clustering at CMS experiment, CERN. Gaining expertise in data science applications in high-energy physics.

Research Assistant, Member of Brandeis HEP | *Brandeis university* May 2022 – Jun 2024

Refining algorithms for displaced vertex reconstruction, track reconstruction using the Kalman filter, and particle identification for the DarkQuest Collaboration.

Visiting student | *Fermi National Accelerator Laboratory* Mar 2022 – Jul 2024

Implemented DAQ at EMCAL on the GEANT4 and Pythia 8 based simulation, add tracklets combining station 2&3 for displaced vertex study.

Technician | *Brandeis ITS* Sep 2021 - Mar 2022

I provided computer hardware& software support for Brandeis faculty, performed maintenance work for the high performance computing cluster(HPCC).

Skills

Languages: C/C++, Java, Python, MATLAB, JavaScript, HTML/CSS, LaTeX, Bash
EE-related skills: Full-stack development, database, KiCAD, MricoPython, CircuitPython, LTspice circuit analysis
Hardware platform: ZYNQ FPGA with AMD Xilinx, Nvidia Jetson, iRobot create 3, raspberry pi, esp32, arduino

Talks and Presentations

DarkQuest Collaboration Workshop at 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,

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

Beyond-standard-model physics for dark matter detection, DNN based Particle Identification, Machine learning based particle discriminator

Electronic&Coding Projects

DLab | *C, Python, Assembly Language* Sep 2023
- Processor architecture-based accelerated computation in python

ROS navigation learning rover | *C++, Python* Sep 2023
- SLAM learning Lidar and Neato D7.
- iRobot create 3 with depth camera for VSLAM implementation.
- Semantic segmentation, kalman filter, point cloud library

PE6502 8bit computer | *Assembly Language, PCB hand soldering* Aug 2023
- PCB design based on MOS 6502 datasheet and Ben Eater website.
- Hardware debugging and hand soldering.

Auto-nav Robot Rover | *Computer Vision, Robotic Control System, Matlab, Git* May 2023
- Autopilot around Olin oval outdoor track with AprilTag, accelerometer and GPS
- YOLO based object recognition, with robotic arm to collect
- Real-time video sending back and human control system

Digital Camera based on RP2040 | *driver/UI development, PCB design and reflow soldering* Dec 2022
- Tensorflow lite digit recognition on rp2040
- PCB designed for rp 2040, integration of camera, power supply and data writing to SD card
- Reflow oven soldering and hand solder fixed

Pypi package dwong | *Python, C++, PyROOT* Mar 2023 – Jul 2024
- PyROOT based particle tagger for simulation post analysis
- Reconstruction algorithms clustering, tracking, muon chamber reconstruction, and Particle ID under construction.
- Includes Online multi-class particle tagger, track reconstruction, clustering algorithm, pyroot interface to C++

Selected Courses

PHYS 167 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 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 | *Brandeis University* SP 2022

MATH 102A Introduction to Differential geometry | *Brandeis University* SP 2023

MATH 37A Differential Equations | *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

ENGR 3599 Special Topics in Computing : Full-Stack Web Development | *Olin College* SP 2024