Paul Simmerling

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EDUCATION

University of Connecticut   **2017 – 2021**
Physics B.S., Electrical Engineering B.S.E, Math Minor   *Storrs, CT*

RELEVANT EXPERIENCE

Nuclear Physics Research Assistant   **January 2019 – Present**
PI: Professor Kyungseon Joo   *Storrs, CT*
- Designing several deep neural nets such as: a classifier for shared decay channel of the Phi and Lambda particles, and a generative adversarial network for DVEP/DVCS Monte Carlo event generation at the Electron-Ion Collider (EIC).
- Performing simulations of deep inelastic scattering for the Electron-Ion Collider's CORE detector.
- Developing a Geant4 simulation of synchrotron radiation in the EIC to study its effect on the Silicon Vertex Trackers.
- Designed and manufactured PCBs to impedance match the MicroMegas detectors to the SAMPA and VMM ASIC amplifiers.
- Created a physics-based data analysis procedure to detect the phi meson from electron-proton scattering in CLAS12[5].
- Rewrote Java, Python, and C++ codes to be dynamic, parallel, and use the Slurm batch system. Used 90% less CPU time.
- Characterized the single-photon response in the photomultiplier tubes used on the CLAS12 RICH detector with C++ ROOT.

Nuclear Fusion Research Intern (DOE SULI)   **June 2019 – August 2019**
PI: Doctor John Lohr   *San Diego, CA*
- Measured RF leakages from the DC break and other components in the 3.2 MW Top Launch (TL) waveguide and observed how RF power densities changed with injection modes and plasma conditions[1].
- Built a teflon water shield that attenuated the RF leakage from the DC break to protect sensitive equipment.
- Used infrared measurements of the TL beam to characterize the injected Gaussian beam profile[2].
- Tested the polarization dependence on the calibration load which allowed for purchasing a new load.

NOTABLE PROJECTS

Path Planning with Deep Neural Networks | *Python, Keras, ROS, Microcontrollers*   **September 2020 – May 2021**
- Led a team of six multidisciplinary undergraduate students to design an autonomous self-driving car.
- Built a SLAM vehicle that uses encoders, IMU, LIDAR, and computer vision with an Arduino and Raspberry Pi running Robot Operating System (ROS) to drive semi-autonomously[6].
- Used Keras to develop a convolutional neural network for path planning and intelligent object avoidance.

Self-Balancing Inverted Pendulum | *Matlab, Simulink, PID & LQR Controllers*   **March 2020**
- Derived the state-space representation of a motorized cart with freely hanging two-foot-long aluminum rod.
- Designed PID and LQR controllers using the linearized state-space representation to pick up and balance the hanging rod.

TECHNICAL SKILLS

Coding Languages: Python, C/C++, Matlab, Groovy, Java
Data Analysis Tools: ROOT, Geant4, Keras, Scikit-Learn, Numpy, Scipy, Pandas, Matplotlib
Hardware Devices: Oscilloscopes, Multimeters, Bolometers, RF Monitors, Photo-multiplier Tubes, BJTs & FETs, Op-amps
Computer-Aided Design: Altium PCB Designer, OrCAD PSpice & Cadence, Synopsis Sentaurus, COMSOL, Fusion360
Productivity Software: Windows, Linux (Ubuntu, RedHat, Arch), Bash/csh, Robot OS, Slurm, Vim, Git & Github, LaTeX

TEACHING / EXTRACURRICULAR

Undergraduate TA – *ECE 3101: Signals & Systems*   **Spring 2021**
- Led a weekly hour-long discussion section for 40+ 2nd/3rd year EE students, held office hours, and graded exams.

UConn Outing Club – *Gear Manager*   **Fall 2020 – Spring 2021**
- Organized and cataloged the Outing Club's gear locker as well as distributed gear to members and sanitized returned items during the COVID-19 pandemic.
- Guided club trips for members of all experience levels to go hiking, mountaineering, and ice/rock climbing.

UConn Climbing Team – *Member*   **Fall 2018 – Spring 2021**
- Competed in lead, bouldering, and speed collegiate climbing competitions.

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Awards and Accomplishments

- **CLAS Collaboration Member**, *Jefferson National Lab*   November 2021
- **First Place CSE Senior Design**, *University of Connecticut*   May 2021
- **Mirsky Scholarship**, *University of Connecticut*   November 2020
- **Outstanding Poster Award**, *APS Division of Plasma Physics 61st Annual Meeting*   October 2019
- **Second Place Student Presentation Award**, *General Atomics*   August 2019
- **Sigma Pi Sigma Physics Honor Society**, *University of Connecticut*   May 2019
- **STEM Scholar Scholarship**, *University of Connecticut Honors Program*   August 2017
- **Academic Excellence Scholarship**, *University of Connecticut*   August 2017

Posters and Publications

[1] P. W. Simmerling, A. Trujillo, R. Brambila, et al., "Performance Measurements on the ECH/ECCD Top Launch System on the DIII-D Tokamak", in APS Division of Plasma Physics Meeting Abstracts, Vol. 2019, APS Meeting Abstracts (Jan. 2019), JP10.019.

[2] M. Cengher, J. Lohr, P. Simmerling, et al., "Status and Plans for the DIII-D ECH/ECCD System", IEEE Transactions on Plasma Science **48**, 1698–1702 (2020).

[3] W. Valkis, P. Simmerling, A. Trujillo, et al., "Performance of Components of the DIII-D ECCD Top Launch System", in APS Division of Plasma Physics Meeting Abstracts, Vol. 2020, APS Meeting Abstracts (Jan. 2020), JP13.060.

[4] E. L. Isupov, V. D. Burkert, A. A. Golubenko, et al., *Polarized Structure Function $\sigma_{LT'}$ from $\pi^0 p$ Electroproduction Data in the Resonance Region at $0.4\,GeV^2 < Q^2 < 1.0\,GeV^2$*, 2021.

[5] P. Simmerling, "Detecting the Phi Meson in CLAS12", Bachelor's Thesis (University of Connecticut, Oct. 2021).

[6] P. Simmerling, B. Sayers, P. Alcantara Silva, et al., "Path Planning with Deep Neural Networks", Sponsored by Mitsubishi Electric Research Laboratories, Bachelor's Thesis (University of Connecticut, Oct. 2021).