

# Michael Poehlmann, Ph.D.

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<https://mpoehlmann.github.io>

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## EDUCATION

**Ph.D. in Physics**, University of California, Davis  
Designated emphasis in Nuclear Science

Expected Graduation June 2023

**M.S. in Physics**, University of California, Davis

Sept 2018 – Dec 2019

**Honors B.S. in Physics**, University of Minnesota, Twin Cities

Sept 2014 – May 2018

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## SKILLS

**Programming:** Python, C++, SQL, Julia, Bash, Git

**Supervised learning:** decision trees, linear regression

**Unsupervised learning:** K-means clustering, DBSCAN clustering

**Reinforcement learning:** deep Q-networks (DQNs)

**Neural networks:** convolutional neural networks (CNNs)

**Statistical analysis:** Bayesian and frequentist methods

**Physics simulations:** Monte Carlo (MC) simulations, optical simulations, Geant4

**Data visualization:** Matplotlib, Plotly, Dash, Bokeh

**Parallel and distributed computing:** Dask

**Other software tools & packages:** SciKit-Learn, NumPy, SciPy, Pandas, Numba, MySQL, Jupyter Notebook, SolidWorks, ROOT, NI LabVIEW

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## EXPERIENCE

**Graduate Student Researcher**, University of California, Davis

Dec 2018 – present

PI: Prof. Emilija Pantic

- Analyzed DarkSide-50 data to search for dark matter-electron interactions, set world-leading constraints on light dark matter couplings
- Led the development of a Python-based data reconstruction package for the next-generation DarkSide-20k experiment
- Used a convolutional neural network (CNN) to reconstruct event positions from 2D photosensor array data, evaluated CNN performance under conditions of channel saturation and removal
- Wrote a scalable Python package to calculate sensitivity projections for future dark matter searches like DarkSide-20k
- Designed the ARIS-ER experiment to measure the response of liquid argon to low-energy electronic recoils, developed a C++ data acquisition (DAQ) program to digitize and record photosensor waveforms

**Teaching Assistant**, University of California, Davis

Sept 2018 – Dec 2018

- Taught lab and discussion sections for an introductory physics course for non-physics majors (Physics 7A)

**Undergraduate Student Researcher**, University of Minnesota, Twin Cities

Jan 2016 – June 2018

PI: Prof. Priscilla Cushman

- Developed components of the active neutron veto of the SuperCDMS SNOLAB detector
- Fabricated plastic scintillator samples doped with gadolinium and characterized properties

**Undergraduate Student Researcher**, University of Minnesota, Twin Cities

Jan 2017 – June 2017

PI: Prof. Jeremiah Mans

- Measured the trigger efficiency of thin plastic scintillator sheets instrumented with silicon photomultipliers for the LDMX accelerator experiment

**Undergraduate Student Researcher**, University of Minnesota, Twin Cities

Sept 2015 – June 2016

PI: Prof. Martin Greven

- Grew and analyzed Hg1201 crystals to collect data on possible mechanisms behind high-temperature superconductivity

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## PUBLICATIONS

**The DarkSide-20k Collaboration**, "Sensitivity of the DarkSide-20k experiment to low-mass dark matter candidates," manuscript in preparation (2023).

**The DarkSide-50 Collaboration**, "Search for dark matter particle interactions with electron final states with DarkSide-50," Physical Review Letters 130, 101002 (2023). DOI: 10.1103/PhysRevLett.130.101002

**The DarkSide-50 Collaboration**, "Search for low-mass dark matter WIMPs with 12 ton-day exposure of DarkSide-50," Physical Review D 107, 063001 (2023). DOI: 10.1103/PhysRevD.107.063001

**The DarkSide-50 Collaboration**, "Search for dark matter-nucleon interactions via Migdal effect with DarkSide-50," accepted by Physical Review Letters 130, 101001 (2023). DOI: 10.1103/PhysRevLett.130.101001

**The DarkSide-50 Collaboration**, "Search for low mass dark matter in DarkSide-50: the Bayesian network approach," submitted to European Physical Journal C (2023). DOI: 10.48550/arXiv.2302.01830

**The DarkSide-20k Collaboration**, "Study on cosmogenic activation above ground for the DarkSide-20k project," submitted to Astroparticle Physics (2023). DOI: 10.48550/arXiv.2301.12970

**The DarkSide-20k Collaboration**, "Measurement of isotopic separation of argon with the prototype of the cryogenic distillation plant Aria for dark matter searches," submitted to European Physical Journal C (2023). DOI: 10.48550/arXiv.2301.09639

**The DarkSide-20k Collaboration**, "Sensitivity projections for a dual-phase argon TPC optimized for light dark matter searches through the ionization channel," submitted to Physical Review Letters (2023). DOI: 10.48550/arXiv.2209.01177

P.B. Cushman and **D.M. Poehlmann**, "Plastic Scintillator Detectors for Particle Physics," in Plastic Scintillators: Chemistry and Applications (Springer International Publishing, 2021), pp. 541-588. DOI: 10.1007/978-3-030-73488-6\_15

**D.M. Poehlmann**, D. Barker, H. Chagani, P. Cushman, G. Heuermann, A. Medved, H.E. Rogers, and R. Schmitz, "Characterization of gadolinium-loaded plastic scintillator for use as a neutron veto," arXiv:1812.11267 (2018). DOI: 10.48550/arXiv.1812.11267

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## PRESENTATIONS

**D.M. Poehlmann**, "Search for Dark Matter-Electron Interactions with DarkSide-50," Presentation, APS April Conference 2022, Apr 2022.

**D.M. Poehlmann**, "Position reconstruction for DarkSide-20k," Presentation, APS Far West Conference 2021, virtual, Oct 2021.

**D.M. Poehlmann**, "Optical modeling and position reconstruction for DarkSide-20k," Presentation, LIDINE Conference 2021, virtual, Sept 2021.

**D.M. Poehlmann**, "Constraints on sub-GeV dark matter-electron scattering from the DarkSide-50 experiment," Presentation, APS Far West Conference 2020, virtual, Oct 2020.

**D.M. Poehlmann**, "The DarkSide-20k experiment in 10 minutes," Talk, New Perspectives Conference 2020, virtual, July 2020.

**D.M. Poehlmann**, "Argon recoil ionization and scintillation from electron recoils (ARIS-ER)," Poster, APS Far West 2019, Stanford, Nov 2019.

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## AWARDS

<b>Margaret Burbidge Award for Best Experimental Research by a Graduate Student</b> American Physical Society Far West Section	2021
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<b>Honorable Mention, Graduate Research Fellowship Program</b> National Science Foundation	2020
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<b>F. Paul Brady Graduate Fellowship</b> University of California, Davis	2019
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<b>Gold Scholar Award</b> University of Minnesota, Twin Cities	2014 – 2019
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<b>Dean's List, College of Science and Engineering</b> University of Minnesota, Twin Cities	2014 – 2019
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<b>National Merit Scholar</b> National Merit Scholarship Corporation	2014
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