Pranava Teja Surukuchi

Department of Physics and Astronomy
University of Pittsburgh
417 Allen Hall
3941 O'Hara St
Pittsburgh, PA 15260

Email: surukuchi@pitt.edu
Website: surukuchi.com

Appointments

2023 – Present **Assistant Professor of Physics**
University of Pittsburgh, Pittsburgh, PA, USA

2019 – 2023 **Postdoctoral Research Associate**
Yale University, Wright Laboratory, New Haven, CT, USA
Advisor: Dr. Karsten Heeger

2014 – 2019 **Research Assistant**
Illinois Institute of Technology, Chicago, IL, USA
Advisor: Dr. Bryce Littlejohn

Education

2014 – 2019 **Ph.D., Physics**
Illinois Institute of Technology, Chicago, IL, USA
Thesis Title: Search for Sterile Neutrino Oscillations with the PROSPECT Experiment

2012 – 2013 **M.S., Physics**
Illinois Institute of Technology, Chicago, IL, USA

2006 – 2010 **B.Tech., Mechanical Engineering**
Jawaharlal Nehru Technological University, Hyderabad, India

Research Projects

2019 – Present **Project 8** *(neutrino mass measurement experiment)*

- ***Chair*** of Phase-III antenna array design working group (June 2020 – Present)
- Coordinated the fabrication, assembly, commissioning, and data taking of the antenna array CRES demonstrator
- ***Coordinator*** of Phase-III position, track, and event reconstruction group (Oct 2020 – Present)
- Developed simulations and signal reconstruction for antenna array radiation detection
- ***Early Career Representative*** to the science board (Jan 2020 – Jan 2022)

2019 – Present **CUORE and CUPID** *(neutrinoless double beta decay experiments)*

- Coordinated the design of the muon veto system for the CUORE/CUPID experiment
- Coordinating the data production and high-level analyses for the upcoming search for $0\nu\beta\beta$
- ***WBS lead*** on acoustic and vibration sensors for the CUPID experiment
- Coordinated and performed efficiency estimations for two $0\nu\beta\beta$ search campaigns
- CUORE Vetting Board member (Nov 2019 - Nov 2021)

2014 – 2023 **PROSPECT** *(Reactor oscillation and spectrum experiment)*

- ***Convener*** of oscillation working group (2017-2019)
- ***Lead*** of design, fabrication, QA, and assembly of the target segmentation system
- ***Developer*** of PROSPECT's official sterile neutrino search framework
- Performed PROSPECT's first oscillation search for eV-scale sterile neutrinos
- Member of PROSPECT analysis coordination group (2017-2019)

Teaching and Mentoring

2022 **Coordinator of the Mentorship Committee**
Yale Postdoctoral Association

2021 **PHYS 530/BBS 879: Theory and Practice of Scientific Teaching**
Poorvu Center for Teaching and Learning, Yale University, New Haven, CT, USA

2021 **Mentorship Training Program for Postdocs**
Yale Postdoctoral Affairs, Yale University, New Haven, CT, USA

2014 **Teaching Assistant**
Department of Physics, Illinois Institute of Technology, Chicago, IL, USA

2013 - 2016 **Graduate Scholar (Tutor)**
Academic Resource Center, Illinois Institute of Technology, Chicago, IL, USA

2012 **Program Instructor**
Chicago Public Schools, Chicago, IL, USA

Students Mentored

Iris Ponce	2020 - 2023	Graduate student at Yale University *Development of simulations and DAQ for the CUPID muon veto system* *Efficiency estimation for CUORE's search for $0\nu\beta\beta$*
Samantha Pagan	2019 - 2023	Graduate student at Yale University *Prototyping, design, and data analysis for the CUPID muon veto system*
Ridge Liu	2020 - 2023	Graduate student at Yale University *Correlation analysis between CUORE detectors and auxiliary devices* *Efficiency estimation for CUORE's search for $0\nu\beta\beta$*
Caitlin Gainey	2019 - 2021	Undergraduate student at Yale University *Development of Geant4 simulations for the CUPID muon veto system*
Gabe Hoshino	2020 - 2021	Now at the University of Chicago *Development of Geant4 simulations for the CUPID muon veto system*
Yonas Gebre	2016 - 2018	Now at the University of Colorado, Boulder *Examine the prospects for measuring individual isotopic fluxes*
Trent Rayford	Summer 2022	Pursuing Associate Degree at Manchester Community College *Designing a test stand to characterize antennas for the Project 8 experiment*

Outreach

- CUPID collaboration - **Outreach Coordinator** (2022–Present)
- Yale Physics Olympics 2019 - **Executive Member**
- Academy of Urban School Leadership 7^{th} annual STEAM fair 2018 - **Judge**
- International Conference on High Energy Physics 2016 - **Outreach Volunteer**
- Math Club, Illinois Institute of Technology - **Vice President** (2012-2013)
- IIT High School Math Competition - **Executive Member** (2013, 2012)
- Skyway Enrichment Program - **Program Developer** (2012)

Synergistic Activities and Service

- Snowmass 2021 White Paper on Light Sterile Neutrino Searches and Related Phenomenology - **Editor**
- APS DNP 2022 - **Session Chair**
- APS DNP Conference Experience for Undergraduates 2022 - **Mentor**
- Snowmass 2021 Neutrino Properties (NF05) - **Early Career Liaison**
- Nuclear Particle and Astrophysics Seminar Series - **Organizer** (2020–2021)

- Snowmass 2021 Early Career Long-Term Organization - **Team Leader** (2020)
- APS DNP Conference Experience for Undergraduates 2020 - **Chair**
- APS DNP Conference Experience for Undergraduates 2020 - **Mentor**
- APS DNP Conference Experience for Undergraduates 2019 - **Mentor**
- Chicago Area STEM Exhibition 2018 - **Judge**
- Chicago Area Undergraduate Research Symposium 2017 - **Judge**

Awards and Recognition

2017 **2017 APS April meeting Travel Grant**
Awarded to support travel to APS April meeting to present research work

2016, 2015 **IIT Annual BCPS poster presentation award**
First(2016), second(2015) prize for presenting a research poster at the Annual Biology, Chemistry, and Physics poster session

2015 **Faculty nominated member to Sigma Pi Sigma**

Invited Seminars and Talks

[19] CUORE, CUPID, and the Nature of Neutrinos
Particle and Astrophysics Seminar, Harvard University, Cambridge, Nov 1, 2023

[18] Unlocking the Mass of Neutrinos
Joint Pitt-CMU Physics Colloquium, University of Pittsburgh, Pittsburgh, Feb 27, 2023

[17] Unlocking the Mass of Neutrinos
Oak Ridge National Laboratory Seminar, Oak Ridge National Laboratory, Oak Ridge, Feb 15, 2023

[16] Unlocking the Mass of Neutrinos
Physics Colloquium, Drexel University, Philadelphia, Jan 19, 2023

[15] Beta Decays as Probes of Sterile Neutrinos
Snowmass 2021 Community Summer Study Workshop, University of Washington, June 17–26, 2022

[14] Status of Searches for Sterile Neutrinos with Reactor and Radioactive Sources
Snowmass 2021 Community Summer Study Workshop, University of Washington, June 17–26, 2022

[13] Search for $0\nu\beta\beta$ with CUPID
CoSSURF 2022, South Dakota School of Mines & Technology, May 11–13, 2022

[12] Latest Results from the CUORE Experiment
CoSSURF 2022, South Dakota School of Mines & Technology, May 11–13, 2022

[11] Measurement of Neutrino Mass with Project 8
Fermi National Laboratory Neutrino Seminar, March 24, 2022

[10] Direct Measurement of Neutrino Mass with Project 8 Experiment
Fundamental Physics Directorate seminars, SLAC, Remote seminar, Nov 30, 2021

[9] Latest Status on the Search for Sterile Neutrinos
40^{th} International Symposium on Physics in Collision (PIC 2020), Aachen, Germany, Sep 14 – 17, 2021

[8] Latest Results from the CUORE Experiment
20^{th} Lomonosov Conference on Elementary Particle Physics, Moscow, Russia, Aug 19 – 25, 2021

[7] Near Future Reactor Antineutrino Inputs to Nuclear Data
Nuclear Data for Reactor Antineutrino Measurements Workshop, Brookhaven National Laboratory, June 2021

[6] Latest Results from the CUORE Experiment
Nuclear, Particle, and Astrophysics Seminar, Yale University, May 19, 2021

[5] Direct Measurement of Neutrino Mass with the Project 8 Experiment
Kavli Institute for Cosmological Physics Seminar Series, University of Chicago, Feb 25, 2021

[4] CUORE, CUPID, and the Nature of Neutrino Mass
Brookhaven National Laboratory Seminar, June 18, 2020

[3] First search for short-baseline neutrino oscillations at HFIR with PROSPECT
Fermilab Joint Experimental-Theoretical Physics Seminar, Fermilab, Batavia, IL, USA, Aug, 2018

[2] Prospects for Sterile Neutrino Searches at Reactors (Invited)
Nu Horizons VII, Harish Chandra Research Institute, Allahabad, India, Feb 22, 2018

[1] PROSPECT: A Precision Reactor Oscillation and Spectrum Experiment
Indian Institute of Technology, Hyderabad, India, Feb 19, 2016

Conferences and Presentations

[20] Antenna Arrays for Cyclotron Radiation Emission Spectroscopy in Project 8
APS DNP Conference, New Orleans, Louisiana, USA, Oct 30, 2022

[19] Physics Opportunities Beyond the Neutrino Mass Measurement with Project 8
Neutrino 2022, Seoul, South Korea, May 30–June 4, 2022

[18] Physics Opportunities Beyond the Neutrino Mass Measurement with Project 8
APS April Meeting, New York, USA, Apr 9–12, 2022

[17] Physics Potential of the PROSPECT-II Experiment
Workshop on New Physics Opportunities at Neutrino Experiments, University of Pittsburgh, PA, Feb 2022

[16] Latest Results from the CUORE Experiment in Search for $0\nu\beta\beta$
APS DNP Conference, Oct 12, 2021

[15] Event Reconstruction in the Project 8 Free Space CRES Demonstrator
APS April Meeting, remote conference, Apr 19, 2021

[14] Analysis Techniques for Background Reduction and Event Identification in the Search for $0\nu\beta\beta$ with CUORE
APS DNP Conference, Oct 30, 2020

[13] Simulation and Signal Extraction for the Project 8 Free Space CRES Demonstrator
Neutrino 2020, Fermilab, June 22 – July 2, 2020

[12] Modeling Transmitting Antennas to Simulate Phase-III of the Project 8 Experiment
APS DNP Conference, Arlington, Virginia, USA, Oct 16, 2019

[11] Measurement of Reactor Antineutrino Spectrum from ^{235}U using PROSPECT
APS DPF Conference, Northeastern University, Boston, MA, USA, Aug 8, 2019

[10] Searching for Sterile Neutrino Oscillations with the PROSPECT Experiment (Poster)
51st Annual Users Meeting, Fermilab, Batavia, IL, USA, Jun 20, 2018

[9] Prospects for Improved Understanding of Isotopic Reactor Antineutrino Fluxes
5th Annual PIKIO Conference, University of Illinois Urbana-Champaign, Urbana, IL, USA, Mar 17, 2018

[8] Design of the PROSPECT Experiment (Poster)
International Neutrino Summer School, Chicago, IL, USA, Aug 16, 2017

[7] PROSPECT: Precision Reactor Oscillation and Spectrum Experiment
APS DPF Conference, Fermilab, Chicago, IL, USA, Aug 8, 2017

[6] Sterile Neutrino Search with the PROSPECT Experiment
New Perspectives Conference, Fermilab, Chicago, IL, USA, Jun 6, 2017

[5] A Precision Reactor Oscillation and Spectrum Experiment
IPA 2017, Chicago, IL, USA, May 9, 2017

[4] Sterile Neutrino Search with the PROSPECT Experiment
APS April Meeting, Washington DC, USA, Jan 28, 2017

[3] Design of the PROSPECT Experiment (Poster)
International Conference on High Energy Physics, Chicago, IL, USA, Aug 6, 2016

[2] Background and Detector Response Studies for PROSPECT Experiment
Prairie Section American Physical Society Meeting, Notre Dame University, South Bend, IN, USA, Nov 2015

[1] PROSPECT: A Precision Reactor Oscillation and Spectrum Experiment
New Perspectives Conference, Fermilab, Chicago, IL, USA, Jun 8, 2015

Significant Refereed Publications

(Publications where I made significant contributions)

[11] Exploring Current Constraints on Antineutrino Production by ^{241}Pu and Paths Towards the Precision Reactor Flux Era
Yoshi Fujikake, Bryce Littlejohn , Ohana B. Rodrigues , Pranava Teja Surukuchi
Phys. Rev. D 107, 092010 (2023)
Contribution: Corresponding author; performed data analysis and contributed to the writing

[10] Search for Majorana neutrinos exploiting millikelvin cryogenics with CUORE
CUORE Collaboration, Nature (2022) 604, pages 53–58
Contribution: Mentored a team of students to perform efficiency analysis crucial for $0\nu\beta\beta$ search

[9] CUORE Opens the Door to Tonne-scale Cryogenics Experiments
CUORE Collaboration, PPNP (2021) 103902
Contribution: Primary co-author and coordinator of the manuscript

[8] Improved Limit on Neutrinoless Double-Beta Decay in 130Te with CUORE
CUORE Collaboration, Phys. Rev. Letter. 124, 122501 (2020)
Contribution: Performed efficiency analysis crucial for $0\nu\beta\beta$ search

[7] Diagnosing the Reactor Antineutrino Anomaly with Global Antineutrino Flux Data
C. Giunti , Y.F. Li, B.R. Littlejohn, P.T. Surukuchi, Phys. Rev. D 99, 073005 (2019)
Contribution: Analyzer of the global neutrino data

[6] Measurement of the Antineutrino Spectrum from ^{235}U Fission at HFIR with PROSPECT
PROSPECT Collaboration, Phys. Rev. Lett. 122, 251801 (2019)
Contribution: Performed secondary cross-checks and interpretation of the results

[5] A Low Mass Optical Grid for the PROSPECT Reactor Antineutrino Detector
PROSPECT Collaboration, JINST 14, P04014 (2019)
Contribution: Instrumentation lead and primary co-author of the paper

[4] The PROSPECT Reactor Antineutrino Experiment
PROSPECT Collaboration, Nuclear Inst. and Methods in Physics Research, A (2018), Pages 287-309
Contribution: Performed sensitivity estimation and contributed to the writing of the manuscript

[3] First search for short-baseline neutrino oscillations at HFIR with PROSPECT
PROSPECT Collaboration, Phys. Rev. Lett. 121 251802 (2018)
Contribution: Led design, fabrication, QA, and assembly of the target segmentation system. Furthermore coordinated and performed the search for sterile neutrinos which was the basis for my Ph.D., thesis.

[2] Prospects for improved understanding of isotopic reactor antineutrino fluxes
Y.Gebre, B. R. Littlejohn, P. T. Surukuchi, Phys. Rev. D 97, 013003 (2017)
Contribution: Primary analyzer and corresponding author

[1] The PROSPECT Physics Program
PROSPECT Collaboration, J. Phys. G: Nucl. Part. Phys. 43 113001 (2016)
Contribution: Performed sensitivity studies and contributed to the writing of the manuscript

Other Refereed Publications

[28] Twelve-crystal prototype of Li_2MoO_4 scintillating bolometers for CUPID and CROSS experiments
CUPID Collaboration, JINST, 18, P06018 (2023)

[27] A first test of CUPID prototypal light detectors with NTD-Ge sensors in a pulse-tube cryostat
CUPID Collaboration, JINST, 18, P06033 (2023)

[26] Final Measurement of the ^{235}U Antineutrino Energy Spectrum with the PROSPECT-I Detector at HFIR
PROSPECT and STEREO Collaborations, Phys. Rev. Lett., 128 (2021), 081802

[25] SYNCA: A Synthetic Cyclotron Antenna for the Project 8 Collaboration
Project 8 Collaboration, JINST 18, P01034 (2023)

[24] Tritium Beta Spectrum Measurement and Neutrino Mass Limit from Cyclotron Radiation Emission Spectroscopy
Project 8 Collaboration, Phys. Rev. Lett., 131 (2023), 102502

[23] Calibration strategy of the PROSPECT-II detector with external and intrinsic sources
PROSPECT Collaboration, JINST 18, P06010 (2023)

[22] An Energy-dependent Electro-thermal Response Model of CUORE Cryogenic Calorimeter
CUORE Collaboration, JINST 17, P11023 (2022)

[21] New direct limit on neutrinoless double beta decay half-life of ^{128}Te with CUORE
CUORE Collaboration, Phys. Rev. Lett., 129 (2022), 222501

[20] Search for Neutrinoless β^+EC Decay of ^{120}Te with CUORE
CUORE Collaboration, Phys. Rev. C., 105 (2022), 065504

[19] Optimization of the first CUPID detector module
CUPID Collaboration, Eur. Phys. J. C 82, 810 (2022)

[18] Viterbi decoding of CRES signals in Project 8
Project 8 Collaboration, J. Phys. G 24 053013

[17] PROSPECT-II Physics Opportunities
PROSPECT Collaboration, J. Phys. G 49 070501

[16] Joint Measurement of the ^{235}U Antineutrino Spectrum by PROSPECT and STEREO
PROSPECT and STEREO Collaborations, Phys. Rev. Lett., 128 (2021), 081802

[15] Joint Determination of Reactor Antineutrino Spectra from ^{235}U and ^{239}Pu Fission by Daya Bay and PROSPECT
Daya Bay and PROSPECT Collaborations, Phys. Rev. Lett., 128 (2021), 081801

[14] Bayesian Analysis of a Future Beta Decay Experiment's Sensitivity to Neutrino Mass Scale and Ordering
Project 8 Collaboratiion, Phys.Rev.C., 103 (2021) 6, 065501

[13] Measurement of the $2\nu\beta\beta$ Decay Half-Life of ^{130}Te with CUORE
CUORE Collaboration, Phys.Rev.Lett., 126 (2021) 17, 171801

[12] Search for Double-Beta Decay of ^{130}Te to the 0^+ States of ^{130}Xe with CUORE
CUORE Collaboration, Eur. Phys. J. C 81 (2021) 567

[11] Characterization of cubic $Li_2^{100}MoO_4$ crystals for the CUPID experiment
CUPID Collaboration, Eur. Phys. J. C 81 (2021) 2, 104

[10] **A CUPID $Li_2^{100}MoO_4$ scintillating bolometer tested in the CROSS underground facility**
CUPID Collaboration, JINST 16, P02037 (2021)

[9] **A novel technique for the study of pile-up events in cryogenic bolometers**
CUPID Collaboration, Phys. Rev. C., 104, 015501 (2021)

[8] **Limits on Sub-GeV Dark Matter from the PROSPECT Reactor Antineutrino Experiment**
PROSPECT Collaboration, Phys.Rev.D., 104 (2021) 1, 012009

[7] **Improved Short-Baseline Neutrino Oscillation Search and Energy Spectrum Measurement with the PROSPECT Experiment at HFIR**
PROSPECT Collaboration, Phys. Rev. D., 103, 032001 (2021)

[6] **Nonfuel antineutrino contributions in the ORNL High Flux Isotope Reactor**
PROSPECT Collaboration, Phys.Rev.C., 101 (2020)

[5] **The Radioactive Source Calibration System of the PROSPECT Reactor Antineutrino Detector**
PROSPECT Collaboration, Nuclear Inst. and Methods in Physics Research, A (2019), 162465

[4] **Lithium-loaded Liquid Scintillator Production for the PROSPECT experiment**
PROSPECT Collaboration, JINST 14, P03026 (2019)

[3] **Performance of a segmented ^{6}Li-loaded liquid scintillator detector for the PROSPECT experiment**
PROSPECT Collaboration, JINST 13, P06023 (2018)

[2] **Background radiation measurements at high power research reactors**
PROSPECT Collaboration, Nuclear Inst. and Methods in Physics Research, A (2016), pp. 401-419

[1] **Light collection and pulse-shape discrimination in elongated scintillator cells for the PROSPECT reactor antineutrino experiment**
PROSPECT Collaboration, JINST 10, P11004 (2015)

Proposals, Reports, Preprints, and Proceedings

[14] **Real-time Signal Detection for Cyclotron Radiation Emission Spectroscopy Measurements using Antenna Arrays**
Project 8 Collaboration, arXiv:2310.02112

[13] **Fundamental Symmetries, Neutrons, and Neutrinos (FSNN): Whitepaper for the 2023 NSAC Long Range Plan**
arXiv:2304.03451

[12] **Cyclotron Radiation Emission Spectroscopy of Electrons from Tritium Beta Decay and ^{83m}Kr Internal Conversion**
Project 8 Collaboration, arXiv:2303.12055

[11] **Neutrinoless Double Beta Decay**
community-driven document prepared for Nuclear Science Advisory Committee Long Range Plan, arXiv:2303.11099

[10] **Toward CUPID-1T**
CUPID Collaboration, arXiv:2203.08386

[9] **The Project 8 Neutrino Mass Experiment**
Project 8 Collaboration, arXiv:2203.07349

[8] **High Energy Physics Opportunities Using Reactor Antineutrinos**
Snowmass 2021 Neutrino Frontier, arXiv:2203.07214

[7] **White Paper on Light Sterile Neutrino Searches and Related Phenomenology**
Snowmass 2021 Neutrino Frontier, arXiv:2203.07323 (accepted by J. Phys. G)

[6] **Physics Opportunities with PROSPECT-II**
PROSPECT Collaboration, arXiv:2202.12343

[5] **Note on arXiv:2005.05301, 'Preparation of the Neutrino-4 experiment on search for sterile neutrino and the obtained results of measurements'**
PROSPECT Collaboration and STEREO Collaboration, arXiv:2006.13147

[4]**Measurement of the Reactor Antineutrino Spectrum from ^{235}U Fission using PROSPECT**
in Meeting of the Division of Particles and Fields of the American Physical Society 2019, arXiv:1910.04924

[3] **CUPID pre-CDR**
CUPID Collaboration, arXiv:1907.09376

[2]**Design of the PROSPECT Experiment**
In 38^{th} International Conference on High Energy Physics 2016, PoS., 10.22323/1.282.0938

[1] **PROSPECT - A Precision Reactor Oscillation and Spectrum Experiment at Short Baselines**
PROSPECT Collaboration, arXiv:1309.7647

References available upon request