Pranava Teja Surukuchi

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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

Appointments

2019 – Present **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

Research Projects

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

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

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

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

2014 – Present **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 - Present 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 - Present Graduate student at Yale University
Prototyping, design, and data analysis for the CUPID muon veto system

Ridge Liu 2020 - Present 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

- 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

- APS DNP 2022 - **Session Chair**
- APS DNP Conference Experience for Undergraduates 2022 - **Mentor**
- Snowmass 2021 Neutrino Oscillations (NF02) - **White Paper Editor**
- 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

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

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

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

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

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

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

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

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

[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

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

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

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

[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 volume 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

[10] Calibration strategy of the PROSPECT-II detector with external and intrinsic sources
PROSPECT Collaboration, arXiv:2211.09582

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

[8] White Paper on Light Sterile Neutrino Searches and Related Phenomenology
Snowmass 2021 Neutrino Frontier, arXiv:2203.07323

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

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

[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

Technical Skills

Programming Languages	C, C++, ROOT, Bash, Java, LaTeX Mathematica, Python, mySQL, PostgreSQL, Geant4
Platforms	Linux, Mac OSX, Microsoft Windows
Tools and Technologies	AutoCAD Inventor, Microsoft Office, Additive manufacturing techniques

Other Work Experience

2012 - 2015	**IT Manager** TechNews, student-run newspaper at Illinois Institute of Technology, Chicago, IL, USA
2012 - 2014	**Help Desk Assistant** Office of Technical Services, Illinois Institute of Technology, Chicago, IL, USA
2010 - 2011	**Assistant Systems Engineer** Tata Consultancy Services, Mumbai, India

Languages

English	Full professional proficiency
Hindi	Native proficiency
Telugu	Native proficiency

References available upon request