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RESEARCH & COLLABORATION PROFILE

KEY WORDS: Neutrino Oscillations | Neutrino Astrophysics | Rare-Event Searches | Detector Technologies



Research Snapshot. Prof. Yang investigates fundamental particles and cosmic phenomena through large-scale experiments in neutrino and dark matter physics. His work spans solar neutrino oscillation measurements with Super-Kamiokande, dark matter searches with XMASS in Japan, axion dark matter exploration at the Institute for Basic Science, and reactor neutrino studies with the RENO experiment. His research combines precision detector operation, advanced data analysis, and interdisciplinary collaboration to probe the nature of neutrinos and the origin of dark matter.

RESEARCH EXPERTISE

- **Neutrino oscillation physics**: precision measurements of neutrino oscillation parameters using solar, atmospheric, reactor, and accelerator neutrinos.
- **Neutrino astrophysics**: studies of solar neutrinos, supernova neutrinos, and other astrophysical neutrino sources using large-scale underground detectors.
- **Dark matter searches**: direct searches for axion and WIMP dark matter candidates using low-background detectors and high-field haloscopes.
- **Particle detector technologies**: development, calibration, and operation of large-scale neutrino and dark matter detectors, photosensors, and associated instrumentation.
- **Data analysis and simulation**: statistical analysis, event reconstruction, detector simulation, and rare-event signal extraction.

RECENT RESEARCH HIGHLIGHTS

- **Joint atmospheric and accelerator neutrino oscillation analysis (Phys. Rev. D 2025):** contributed to the first combined oscillation analysis of Super-Kamiokande atmospheric neutrino and T2K accelerator neutrino data, enhancing sensitivity to neutrino oscillation parameters.
- **Precision neutrino measurements and next-generation reactor experiments (Phys. Rev. D 2025; PTEP 2025-2026):** participated in precision reactor neutrino oscillation measurements with the full RENO dataset and led detector characterization and monitoring studies for the RENE sterile-neutrino program.
- **Neutrino astrophysics with Super-Kamiokande-Gd (2024-2026):** contributed to searches for diffuse supernova neutrinos, failed-supernova neutrino signals, and precision solar-neutrino measurements using gadolinium-enhanced Super-Kamiokande data.

POTENTIAL COLLABORATION

Best-fit collaborator areas: neutrino oscillation | solar & reactor neutrinos | dark matter searches | detector technology & data analysis

- **1. Neutrino oscillation:** collaborative precision measurements using large-scale detectors such as Super-K, Hyper-K, and JSNS², with emphasis on oscillation parameters and new physics searches.
- **2. Solar & reactor neutrinos**: joint studies of neutrino sources and interactions through experiments like RENO and RENE, expanding understanding of neutrino properties.
- **3. Dark matter searches:** cooperative exploration of axion and WIMP candidates via XMASS and IBS Axion Research, integrating complementary expertise in detection methods.
- **4. Detector technology & data analysis:** development of advanced instrumentation, calibration techniques, and computational frameworks for next-generation neutrino and dark matter experiments.

SELECTED RECENT PUBLICATIONS

- **PTEP 2025 (2025) 9, 093C03 —** Reactor Experiment for Neutrinos and Exotics (RENE) for the Sterile Neutrino Search Using Reactor Neutrinos.
- **Phys.Rev.D 111 (2025) 11, 112006 —** Measurement of reactor antineutrino oscillation parameters using the full 3800-day dataset of the RENO experiment
- **Astrophys.J.Lett. 997 (2026) 1, L9 —** First Associated Neutrino Search for a Failed Supernova Candidate with Super-Kamiokande
- **Eur.Phys.J.C 86 (2026) 2, 170 —** Sensitivity of the Hyper-Kamiokande experiment to neutrino oscillation parameters using accelerator neutrinos

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REPRESENTATIVE RESEARCH FIGURES / SCHEMES

