# My Two-Cents on Interdisciplinary Collaboration

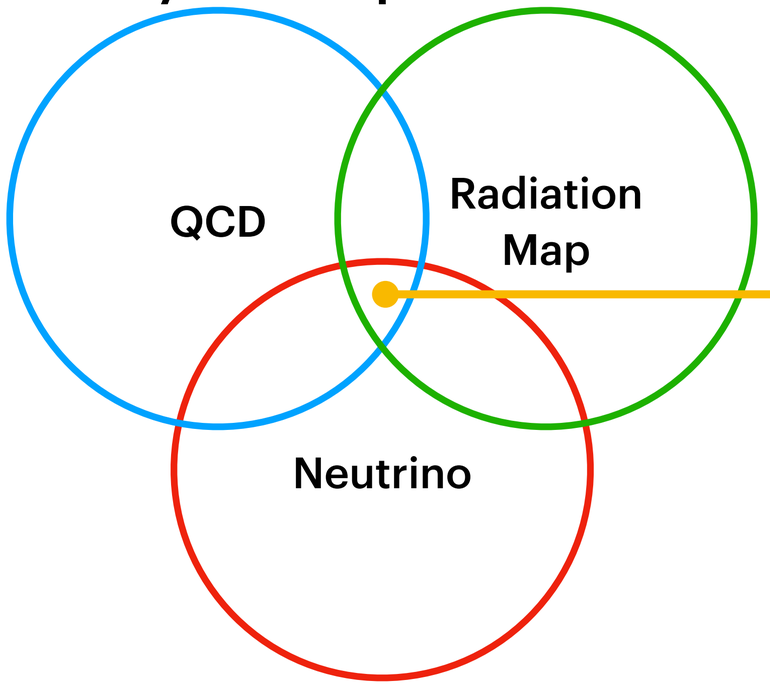
Aobo Li

# Self Introduction

- Aobo Li
- Assistant Professor at UC San Diego
    - Coming from a Physics background
    - Joint Appointment: 50% Halicioglu Data Science Institute (Primary), 50% Physics
    - Research: AI for Rare Event Search (neutrino, dark matter)

# What's the key of interdisciplinary collaboration?

In my opinion, the key is to "speak the same language"



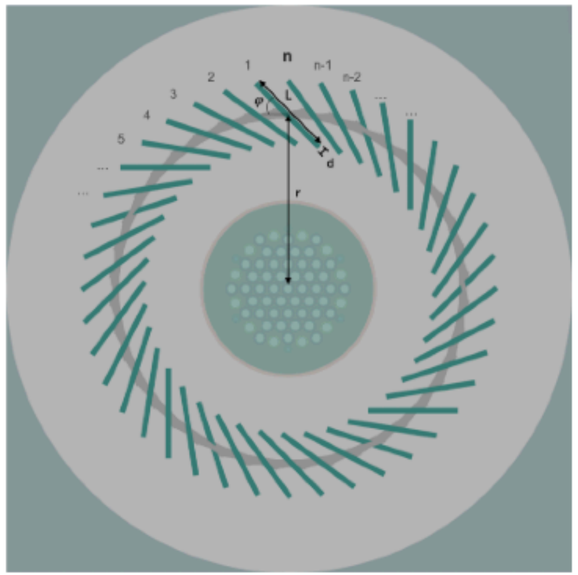

"Translate" the physics problem into mathematical/statistical languages

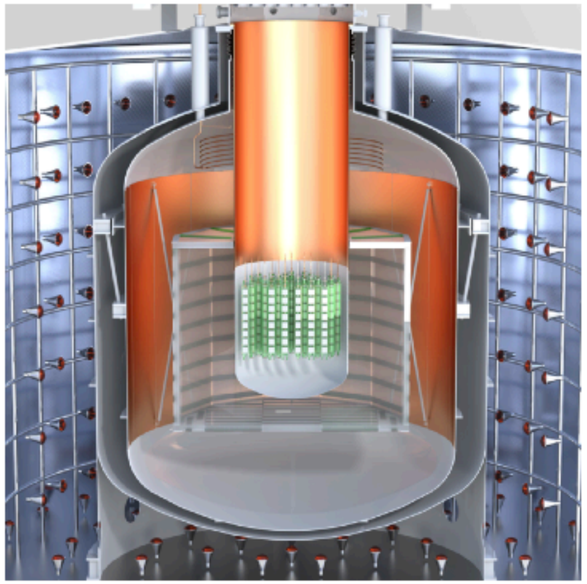
| | $0\nu\beta\beta$ Detector Optimization | $0\nu\beta\beta$ Background & Fit | QGP Collider Monitoring | QGP Analysis | Radiation Map Enhancement | Radiation Map UQ |
|---|---|---|---|---|---|---|
| Bayesian Transfer Learning | | | | ✓ | ✓ | |
| Bayesian Multi-Fidelity Learning | ✓○ | | | ✓ | ✓ | |
| Langevin Monte Carlo | | ✓○ | | ✓ | | ✓○ |
| Bayesian Manifold Learning | ○ | | | ○ | | |
| Bayesian Optimization | ○ | | | | | ○ |
| Boundary-Informed Surrogates | ○ | | | ○ | | |
| Bayesian Image Change Detection | | | ○ | | | |

✓: BUQ Phase 1 ○: BUQ Phase 2

RESuM, ICLR 2025

# An Example...



Design Parameter $\theta$

Neutron-specific Parameter (Energy, Position, Momentum) $\phi$

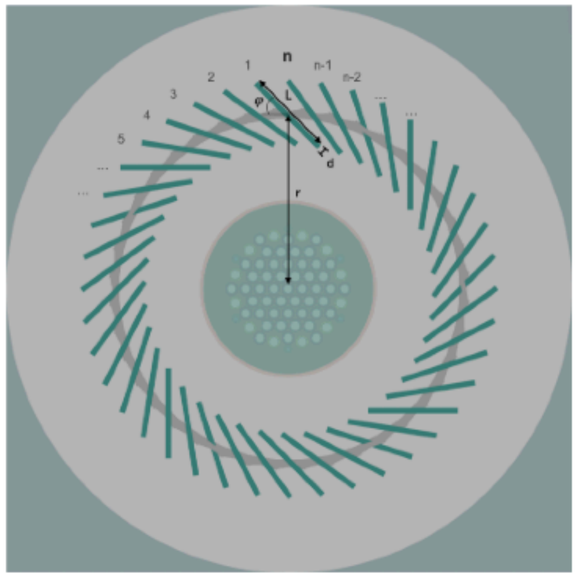
N neutron simulated, m entered the detector $y = m/N$

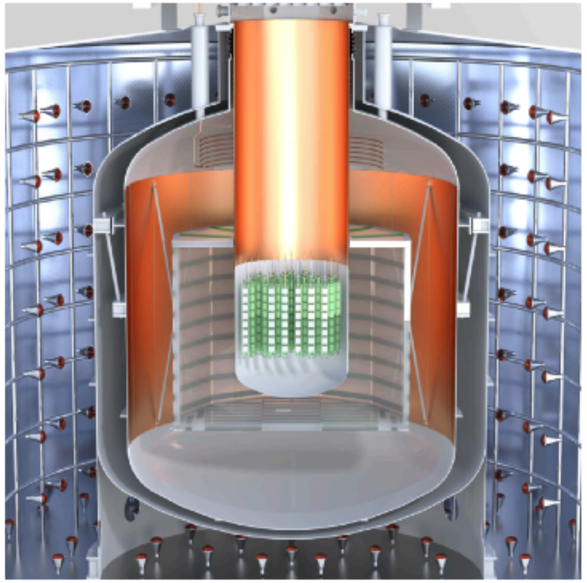
RESuM, ICLR 2025

# An Example...

RESOLVE, Submitted to NeurIPS 2025

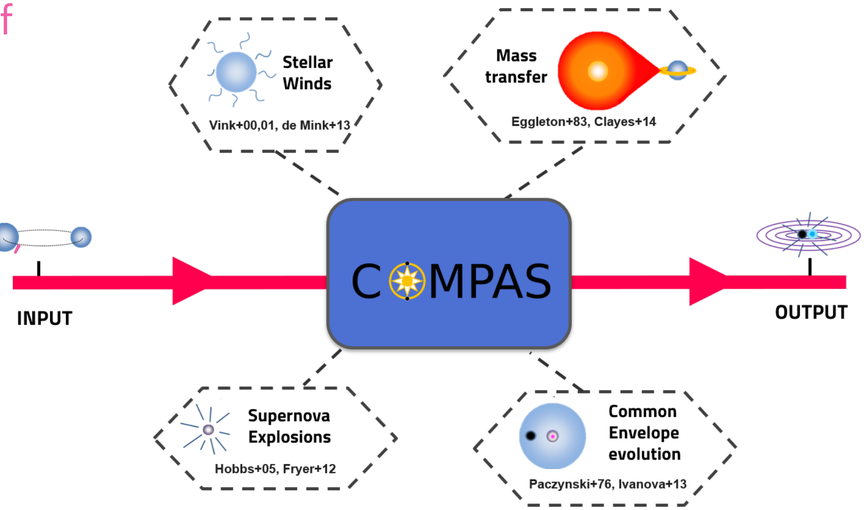
Shuetz, Migala, Boesky, Poon, Borekgaarden, Li



Design Parameter $\theta$

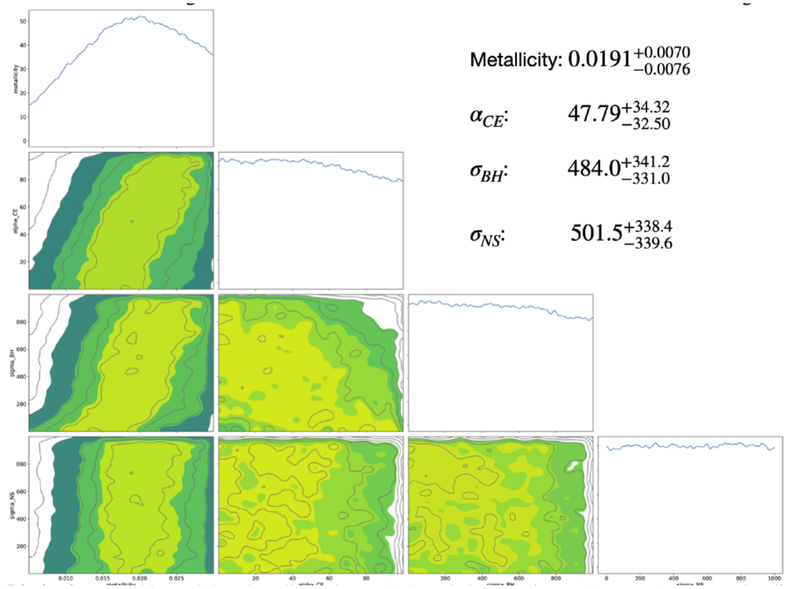
BBH Parameter of interest (metalicity, envelope efficiency, BH kick, NS kick)




Plot credit: A. Shuetz

Neutron-specific Parameter (Energy, Position, Momentum) $\phi$

Other 26 parameters that are not interesting




N neutron simulated, m entered the detector

$$y = m/N$$

N Binaries simulated, m merger happened

# A few questions that could help "translating" the problem

- If you want to build a model, what would be the **input** and **output**?
- What's the challenge we need to deal with in **input data**?
  - e.g. domain shift, long tail distribution, multimodal datasets
- What **additional functionalities** that we want our model to have?
  - Incorporating additional prior info with Bayesian methods
  - Uncertainty quantification
  - Active Learning

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| Bayesian Optimization | ○ | | | | | ○ |
| Boundary-Informed Surrogates | ○ | | | ○ | | |
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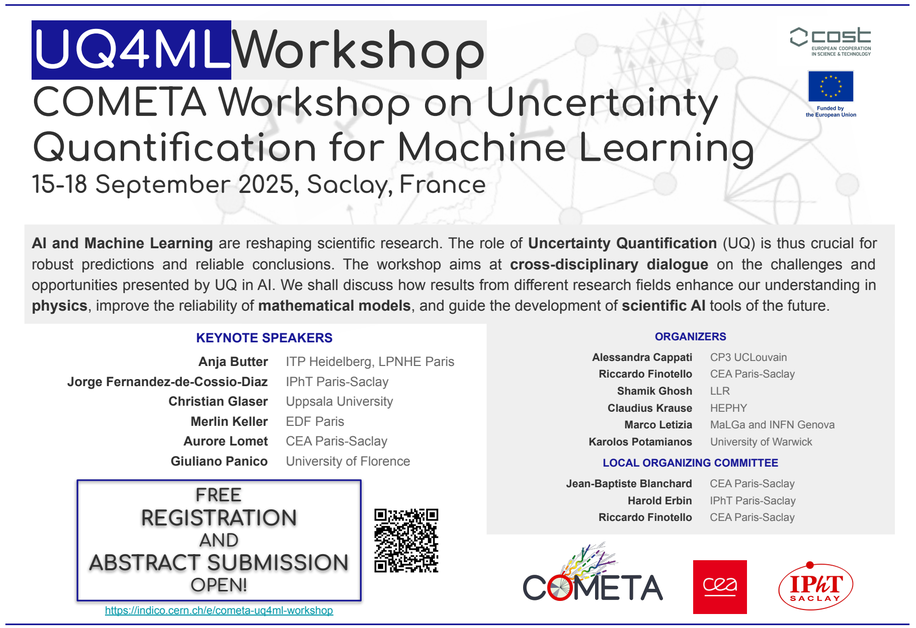
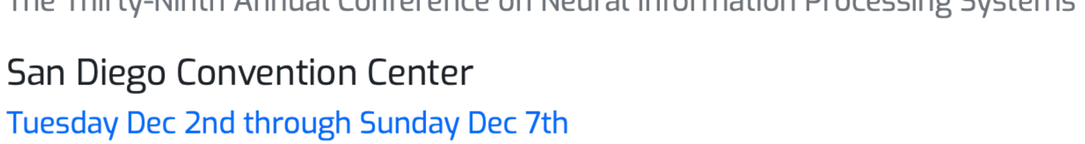
# Making Conference/Workshop Presence

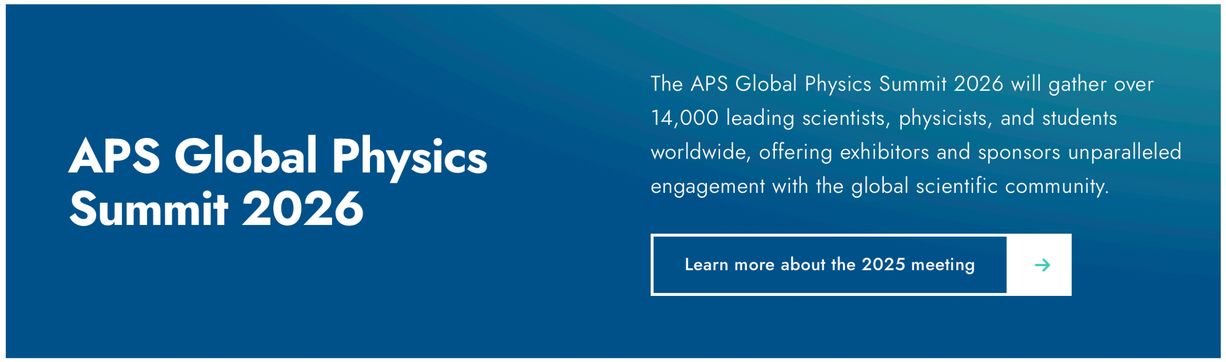
- Making presence at conferences/ workshop
  - Separately with many contributed talks
  - Give a joint invited talk to cover all the works
  - Workshop has a deadline which will push us
- Upcoming workshops:
  - **UQ4ML** (credit: Raymond Ehlers)
  - **NeurIPS 2025** at San Diego
    - It has a **machine learning for physical science (ML4PS)** workshop
  - **DNP 2025** at Chicago
    - Final ddl for submission got extended to July 18th.



# Making Conference/Workshop Presence

- **APS Global Summit 2026** at Denver
  - I was elected this week as Program Committee co-chair of Group of Data Science
  - Organize the April Meeting part of GDS
  - Could potentially secure 1-2 invited talk for our group
- **Organizing our own workshops:**
  - 2026 0vbb AI summer school discussed among neutrino PIs
  - All major AI conferences (NeurIPS/ICLR/ICML) are open to workshop proposal submissions
    - Can be competitive
    - We could potentially aim to host a “Bayesian for Science” workshop in 2026/2027




Join us March 15-20, 2026, at the Colorado Convention Center, Denver, CO.

## ICLR 2025 - Call for Workshops

**List of accepted workshops at ICLR 2025:** https://openreview.net/group?id=ICLR.cc/2025/Workshop_Proposals

Following the ICLR 2025 main conference, **two days** of in-person workshops on a variety of current topics will be held on **April 27 and 28, 2025** in **Singapore.** We invite researchers interested in chairing a workshop to submit proposals. Workshop organizers have several responsibilities, including coordinating workshop participation and content, publicizing and providing the program in a timely manner, and moderating the program throughout the workshop.

## Goal of ICLR Workshops

Workshops provide an informal, cutting edge venue for discussion of works in progress and future directions. Good workshops have helped to crystallize common problems, explicitly contrast competing frameworks, and clarify essential questions for a subfield or application area. Workshops are a structured means of bringing together people with common interests to form communities. Good workshops should include some form of community building.

*Each workshop* is a *single-day, in-person event*, split into morning and afternoon sessions, with free time between the sessions for individual exchange. Workshop topics should include, but are not limited to, the following:

- Deep learning / representations learning for scientific discovery
- Theoretical foundations of deep learning
- Fairness in machine learning, transparency, governance and inclusion
- Implementation issues, parallelization, software platforms, hardware
- Learning in low-resource settings
- Optimization for representation learning
- Privacy in deep learning
- Robustness and adversarial learning
- Uncertainty in representation learning
- Generative AI and large language models
- Important Applications in vision, audio, speech, multilingual contexts , robotics, neuroscience, healthcare, climate change, agriculture, pandemic response, societal and policy impact, or any other field, as well as any other topic relevant to an appreciable fraction of the ICLR community.

Detailed descriptions of previous workshops may be found in last year's online schedule (https://blog.iclr.cc/2024/01/08/announcing-the-accepted-workshops-at-iclr-2024/). Workshop schedules should encourage lively debates, stimulate the production of new ideas and foster discussion of important issues. Every group considering submitting a workshop proposal should read the **Guidance for ICLR Workshop Proposals 2025**, which describes important considerations for hosting workshops, includes templates of previous successful proposals, details the selection criteria and process, describes what is considered a conflict of interest, and includes other frequently asked questions.