

# LLNL Status and Plans

UC-EIC Consortium Meeting

Monday July 18, 2022



# Who we are

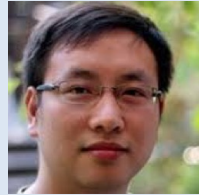
## Heavy-ion Experiment



*Ron Soltz*  
*NACS DDL-ST*  
*DOE-NP POC*



*Aaron Angerami*  
*Staff*



*Qipeng Hu*  
*Postdoc*

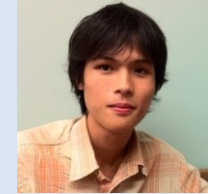


*Dhanush Hangal*  
*Postdoc*

## Heavy-ion Theory

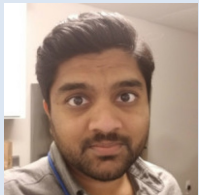


*Ramona Vogt*  
*Staff*



*Vincent Cheung*  
*Postdoc*

## Collaborators



*Piyush Karande*  
*Staff*  
*Data Science*



*Bishoy Dongwi*  
*Postdoc*  
*Nuclear Physics*

## Students

*UC-EIC Traineeship undergraduate  
students (with UC Riverside)*



*Luis Garabito*



*Jiajun Huang*



# Experimental activities and plans

## Experimental Collaborations

- ATLAS
  - Working Group Convener (Angerami)
  - Trigger Coordinator (Hu)
  - Jet Sub-convener (Hangal)
- sPHENIX
- Jetscape
  - Deputy Spokesperson (Soltz)

## Interests and Expertise

- Physics:
  - Jet quenching
  - Heavy flavor and quarkonia
  - UPCs and photoproduction
- Technical:
  - Software and computing
  - Jet reconstruction and calibration
  - Application of ML methods

## EIC Topics

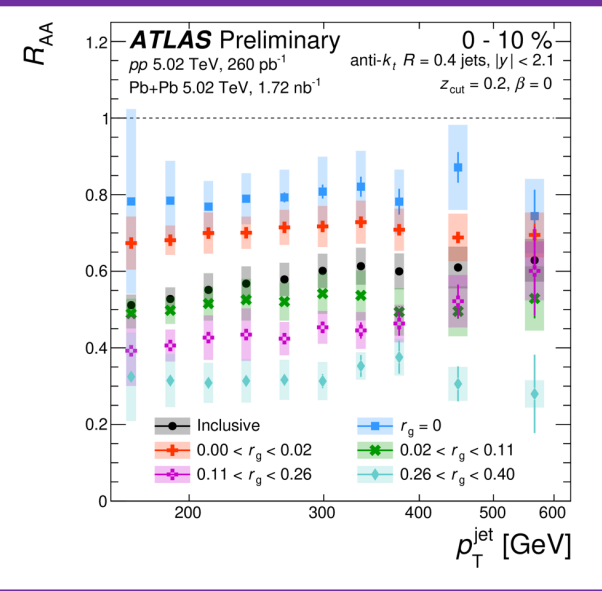
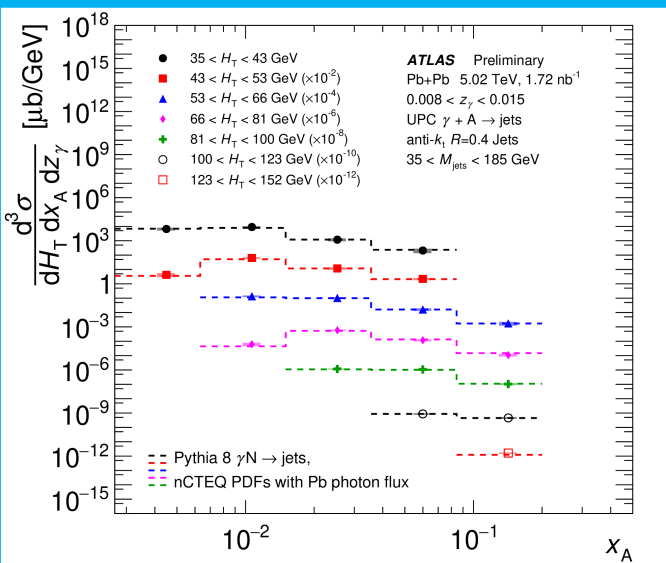
- AI-assisted detector design: project w/ LBL and UCR
- Photoproduction and diffraction with emphasis on complementarity to LHC program
- ML-enabled reconstruction and analysis improvements



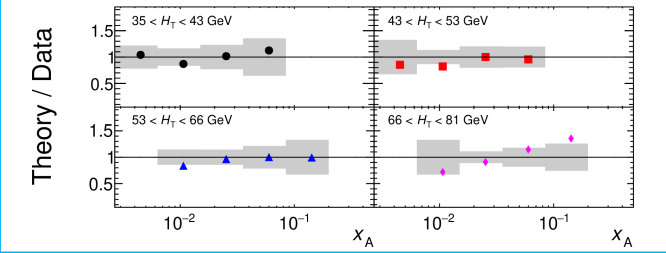
# Experimental activities and plans

## Interests and Expertise

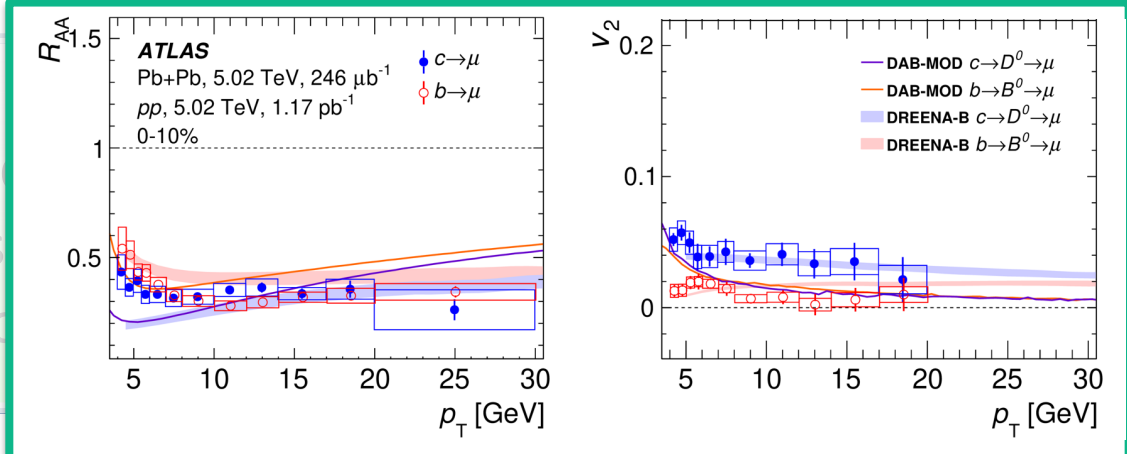
- **Physics:**
  - Jet quenching
  - Heavy flavor and quarkonia
  - UPCs and photoproduction
- **Technical:**
  - Software and computing
  - Jet reconstruction and calibration
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*R<sub>AA</sub> for jets with different opening angles (r<sub>g</sub>)*  
 ATLAS-CONF-2022-026



*Jet cross sections in UPCs as a function of hard-scattering kinematics: (x<sub>A</sub>, H<sub>T</sub>) ↔ (x, Q<sup>2</sup>)*  
 ATLAS-CONF-2022-021



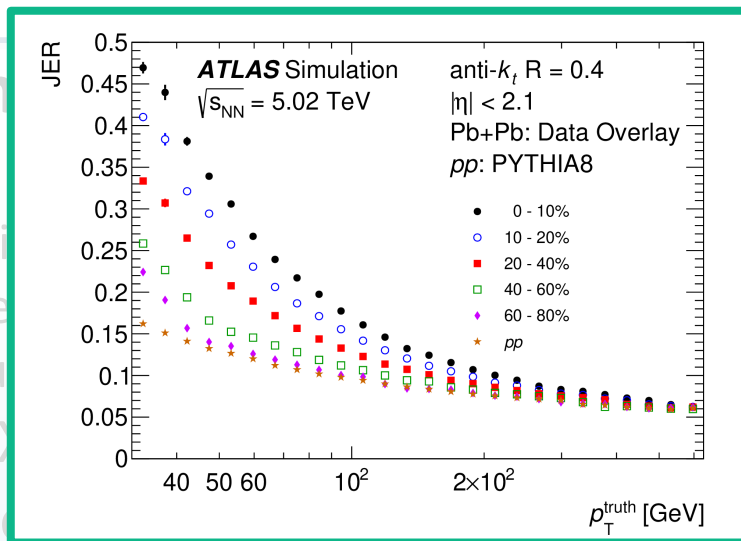
*R<sub>AA</sub> and v<sub>2</sub> for charm and bottom using muons*  
 Phys. Lett. B 829 (2022) 137077



# Experimental activities and plans

## Experimental activities

- ATLAS
  - Working
  - Trigger
  - Jet Su
- sPHENIX
- Jetscape
  - Deput



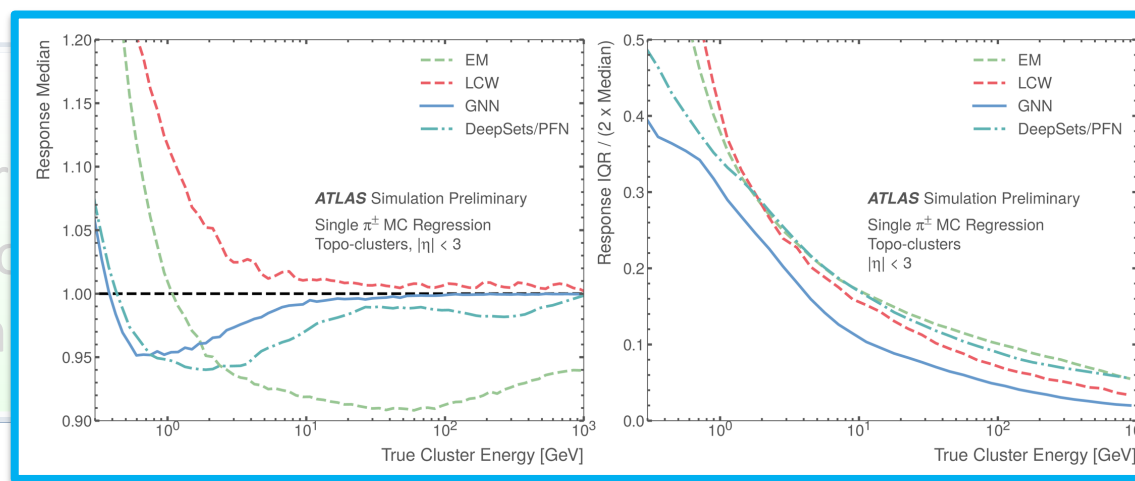
Jet energy resolution in different centralities  
[arXiv:2205.00682](https://arxiv.org/abs/2205.00682)

## Interests and Expertise

- Physics:
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  - UPCs and photoproduction
- Technical:
  - Software and computing
  - Jet reconstruction and calibration
  - Application of ML methods



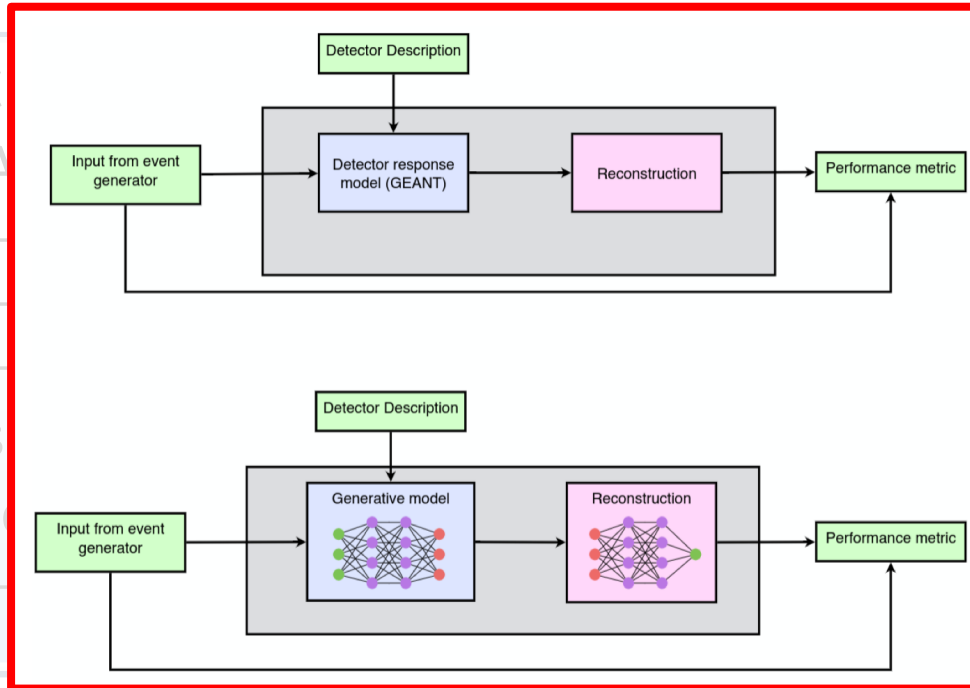
'El Capitan'  
 New exascale system at LLNL expected 2023



Energy scale and resolution for single pions using point-cloud methods

[ATLAS-CONF-2022-026](#)

# Experimental activities and plans



## Interests and Expertise

- Physics:
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  - UPCs and photoproduction
- Technical:
  - Software and computing

*Replacing traditional simulation studies (top) with co-optimized generative model and DNN-based reconstruction (bottom)  
Applied to hadronic calorimetry at EIC*

## EIC Topics

- **AI-assisted detector design: project w/ LBL and UCR**
- **Photoproduction and diffraction with emphasis on complementarity to LHC program**
- **ML-enabled reconstruction and analysis improvements**

*Just beginning these studies now and have room for interested students*

# Theory-Experiment Collaborations

- LDRD: The Incredible Shrinking Proton (FY21-FY22)
  - Study fluctuations of proton Fock state through specific processes, especially intrinsic charm/bottom, which are “small”
  - Used to debunk claims of an all- $b$  tetraquark state from the  $A_N$ DY experiment
- LDRD: Do Tetraquarks exist? Understanding the nature of the mysterious X(3872) (proposed, FY23-FY24)

