

# Rea Thornberry

PhD student in Experimental Particle Physics, ATLAS Experiment  
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## OBJECTIVE

Experimental physicist studying Higgs boson pair production with the ATLAS detector, focusing on statistical analysis and machine learning for data interpretation.

## RESEARCH EXPERIENCE

- **Run 3 HH→ML Analysis** 2025-Present
  - Investigating new multilepton final states, including  $3\ell+1\tau$ , with machine learning techniques such as GNNs and transformers to enhance sensitivity, and serving as co-editor of internal note.
- **HH→ML HL-LHC Projections** 2024-2025
  - Led the HH→ML projection for HL-LHC, supervised a master's student, and served as an editor of the ATLAS public note.
- **Run 2 HH Combination** 2024
  - Included multilepton analysis in statistical combination of all ATLAS non-resonant HH results from Run 2.
- **Run 2 HH→ML Analysis** 2022-2024
  - Combined nine multilepton channels to set limits on the HH signal strength and constrain  $\kappa_\lambda$  and  $\kappa_{2V}$ .
- **Electron Isolation** 2022-2023
  - Developed an  $\eta$ -dependent parameterized pileup correction for neutral-charge components of isolation.
- **LAr Shifter** 2023-Present
  - Monitored and ensured stable performance of the Liquid Argon Calorimeter during ATLAS data-taking.

## EDUCATION

- **Southern Methodist University** 2020 - Present
  - Ph.D. in Physics*
  - Expected graduation December 2025.
  - *Searches for Higgs Boson Pair Production in Final States with Leptons, Taus, and Photons with the ATLAS Detector.*
- **Southern Methodist University** 2020 - 2022
  - M.Sc. in Physics*
- **Texas A&M University** 2016 - 2020
  - B.Sc. in Physics, with minors in Mathematics and Computer Science.*

## SELECTED PUBLICATIONS

J=JOURNAL, P=PUBLIC NOTE, C=CONFERENCE, I=INTERNAL



- [P.1] ATLAS Collaboration. (2025). Highlights of the HL-LHC physics projections by ATLAS and CMS. CERN, [ATL-PHYS-PUB-2025-018](#).
- [P.2] ATLAS Collaboration. (2025). Projected sensitivity of searches for Higgs boson pair production in final states with light leptons, taus, and photons with the ATLAS detector at the HL-LHC. CERN, [ATL-PHYS-PUB-2025-004](#).
- [I.1] ATLAS Collaboration (2025). Search for non-resonant Higgs boson pair production with multiple lepton final states using the full Run 2 and partial Run 3 pp collision data recorded by the ATLAS detector. CERN, ATL-HIGP-2024-41. (in preparation)
- [J.1] ATLAS Collaboration. (2024). Search for non-resonant Higgs boson pair production in final states with leptons, taus, and photons in pp collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector. *Journal of High Energy Physics*, 08, 164.
- [J.2] ATLAS Collaboration. (2024). Combination of searches for Higgs boson pair production in pp collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector. *Physical Review Letters*, 133, 101801.
- [I.2] **Thornberry R.**, Domínguez L., Leney K., Deiana A. (2023). A parameterized pile-up correction for neutral particle flow isolation. CERN, ATL-COM-PHYS-2023-790
- [J.3] **Thornberry, R.**, Frohaug G., LaFontaine C., Tallman B., Behne A., Sellers S., Salder M., Allen R. (2021). Present and potential future experimental evidence supporting a multicomponent dark matter scenario. *European Physical Journal Special Topics*, 230(4), 1121–1130.
- [J.4] **Thornberry, R.**, Throm M., Frohaug G., Killough J., Blend D., Erickson M., Sun B., Bays B., Allen R. (2021). Experimental signatures of a new dark matter WIMP. *Europhysics Letters*, 134(4), 49001.
- [J.5] Throm, M., **Thornberry R.**, Killough J., Sun B., Abdulla G., Allen R. (2019). Two natural scenarios for dark matter particles coexisting with supersymmetry. *Modern Physics Letters A*, 34(2), 1930001.

## SELECTED PRESENTATIONS

T=TALK, P=POSTER

- [T.1] **ATLAS Di-Higgs workshop 2025** "Recap of HL-LHC HH projections (resonant, non-resonant, combination with CMS)"
- [T.2] **ATLAS NRML Workshop** "Kappa interpretations in NRML analyses."
- [P.1] **Higgs Pairs 2025** "Projected sensitivity of searches for Higgs boson pair production in final states with leptons, taus, and photons at the HL-LHC with the ATLAS detector."
- [P.2] **LHCC Week 2024, CERN** "Search for Higgs Boson Pairs with Multi-lepton Final States in pp collisions at  $\sqrt{s} = 13$  TeV with the ATLAS Detector."
- [P.3] **ATLAS Week February 2025, CERN** "Projected sensitivity of searches for Higgs boson pair production in final states with leptons, taus, and photons at the HL-LHC with the ATLAS detector."
- [P.4] **ATLAS Week October 2024, CERN** "Search for Higgs Boson Pairs with Multi-lepton Final States in pp collisions at  $\sqrt{s} = 13$  TeV with the ATLAS Detector."
- [T.3] **2023 EGamma Workshop** "Particle-Flow Based Isolation: An Overview"
- [P.5] **ATLAS Week October 2023, CERN** "Improving Electron Isolation: A parameterized pile-up correction for the neutral particle flow isolation for electrons"
- [T.4] **2019 Joint Fall Meeting of the Texas Sections of APS, AAPT, and Zone 13 of the SPS** "A multicomponent dark matter scenario with two stable WIMPs consistent with Planck observations." Proceedings in *Bulletin of the American Physical Society*, 64(18).
- [T.5] **2018 Joint Fall Meeting of the Texas Sections of APS, AAPT, and Zone 13 of the SPS** "Searching for dark matter with liquid noble gas detectors (including the LZ and Xenon experiments), and the potential for observing a new WIMP candidate below 125 GeV." Proceedings in *Bulletin of the American Physical Society*, 63(18).

## OUTREACH

- **CERN Courier Meeting Report for Higgs Pairs** July/August 2025  
*CERN Courier* 
  - Authored a meeting report summarizing highlights of the Higgs Pairs 2025 conference for an upcoming issue of the CERN Courier.
- **ATLAS Briefing & CERN Bulletin Article** 2024  
*ATLAS Collaboration, CERN* 
  - Invited by the collaboration to co-author the public-facing ATLAS physics briefing "ATLAS dives deeper into di-Higgs", summarizing the recent di-Higgs combination results.
  - Collaborated with the CERN communications team to adapt the article for broader audiences, with versions published on the CERN Bulletin and [home.cern](https://home.cern).
- **Discover, Enjoy, and Explore Physics and Engineering Festival** 2016 - 2020  
*Texas A&M University*
  - Collaborated with peers and faculty from the Physics & Astronomy and Engineering Departments to research, design, and fabricate interactive science demonstration experiments.
  - Presented these exhibits at festivals, shows, and other outreach programs.

## HONORS AND AWARDS

- **Breakthrough Prize in Fundamental Physics** April 2025  
*ATLAS & CMS Collaborations*
  - Awarded to all scientific members for their contributions to the discovery and measurement of the Higgs boson during LHC Run 2.
- **Graduate Student Travel Grant** April 2025  
*Southern Methodist University*
  - Supported travel to present an invited talk at the ATLAS NRML workshop.
- **The Charles W. Tittle Starting Line Award** August 2020  
*Southern Methodist University*

## SCHOOLS AND TRAINING

- **CERN-Fermilab Hadron Collider Physics Summer School (HCP2025)** August 2025  
*CERN, Switzerland*
  - Selected participant in two week intensive program on LHC physics, including lectures on QCD, Higgs, flavor, and beyond the Standard Model.

## COMMITTEES

- **Fast Machine Learning for Science Workshop** 2022  
*Organizing Committee Member*