Laura Pereira Sanchez

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Linkedin | Github | CERN Gitlab | Publication List

Geneva, Switzerland

About me

PhD in Physics with 6+ years of experience in data analysis. I am driven by the possibility of applying my experience analyzing Big Data from CERN and my knowledge in AI, statistics, data science and software development, to projects that will generate value and have a direct positive impact in society.

Experience

- **Stanford University & SLAC National Laboratory** *Oct 2023 -*
  Postdoctoral Research Fellow - ATLAS Collaboration (CERN) Menlo Park, CA, USA & Geneva, Switzerland
  - Developed AI algorithms to identify key signatures in particle physics collisions.
  - Contributed to building a state of the art tracking particle physics detector.
- **Stockholm University** *September 2018 - August 2023*
  Doctoral Researcher - ATLAS Collaboration (CERN) Stockholm, Sweden
  - Analyzed large datasets from particle physics collisions resulting in 12 scientific articles in peer-reviewed journals and high impact conferences.
  - Coordinated 2 scientific projects over a period of 2 and 4 years overseeing the work of more than 15 people each.
  - Developed frameworks for data visualization, statistical analysis and classification exploiting AI and ML techniques.

Education

- **PhD in Physics** *September 2023 - May 2024*
  Stockholm University Stockholm, Sweden
  - Supervisor: Sara Strandberg
  - Thesis title: The Beauty in Broken Symmetries: *b*-jet identification and searches for Supersymmetry, Dark Matter and multi-Higgs production with the ATLAS experiment
- **Master in Particle Physics, Astrophysics and Cosmology** *September 2017 - July 2018*
  Universitat Autonoma de Barcelona Barcelona, Spain
- **Bachelor in Physics** *September 2013 - July 2017*
  Universitat Autonoma de Barcelona Barcelona, Spain

Projects

- **AI and Machine Learning algorithms** *September 2021 -*
  Tools: JAX, PyTorch, Tensorflow, Keras [ ]
  - Developed and benchmarked AI algorithms leveraging transformers, graph neural networks, deep neural networks and boosted decision trees.
  - Implement state-of-the-art research in auto-differentiable programming to train physics aware neural networks.
  - Process raw datasets for Machine Learning projects (Data engineering).
  - Calibration of AI algorithms to account for the domain shift between simulation and data.
- **Building a particle physics detector** *October 2023 -*
  Tools: MongoDB database, Docker
  - Designed and implemented the database architecture for a new experiment, ensuring robust data handling throughout pre-production and production phases.
  - Collaborated with cross-functional teams to align database functionality with project needs, improving data accessibility and workflow integration.
  - Set up the software required for testing during integration using *Docker* containers.
  - Point of contact between multiple sites and detector sub-systems.
  - Laboratory experience handling sensitive material in the clean room.
- **Statistics and Data Analysis** *September 2018 - October 2023*
  Tools: python, C++, Bash, ROOT, Git
  - Published analyses of complex Big Data from particle physics collisions.
  - Contributed to large scale frameworks developed within the ATLAS collaboration, ranging from statistical and data analysis, applying machine learning algorithms and automating workflows using bash.
  - Applied experience from particle physics to published research in autonomous driving.

SELECTED SCIENTIFC PUBLICATIONS

C=CONFERENCE, J=JOURNAL, S=IN SUBMISSION, T=THESIS

[J.1] ATLAS Collaboration. (2024). **Search for a resonance decaying into a scalar particle and a Higgs boson in the final state with two bottom quarks and two photons in proton-proton collisions at a center of mass energy of 13 TeV with the ATLAS detector**. Manuscript accepted for publication in *Journal of Hight Energy Physics*. arXiv.2404.12915.

[J.2] ATLAS Collaboration (2023). **Calibration of the light-flavour jet mistagging efficiency of the b-tagging algorithms with Z+jets events using 139 fb^{-1} of ATLAS proton-proton collision data at $\sqrt{s}$ = 13 TeV**. In *Eur. Phys. J. C, 83(8), 728.*. DOI: 10.1140/epjc/s10052-023-11736-z

[C.1] A. Khoche, L.Pereira Sanchez et al. (2024). **Towards Long-Range 3D Object Detection for Autonomous Vehicles**. Presented at the *Intelligent Vehicle Symposium (IV) 2024*. arXiv.2310.04800.

TECHICAL SKILLS

- **Programming Languages:** Python, C++, ROOT, Bash/UNIX
- **Database Systems:** Mongo DB
- **Data Visualization:** Pandas, Matplotlib, Seaborn, numpy...
- **AI & Machine Learning:** Keras, JAX, Pytorch, Tensorflow, TMVA
- **Cloud Technologies:** CERN, SLAC
- **DevOps & Version Control:** Gitlab, Github, VSCode, JIRA, CI/CD Pipelines, Unit Testing
- **Statistics:** Hypothesis Testing, Log-likelihoods, Uncertainty Modeling

SOFT SKILLS

- **Leadership:** Served a project owner in a team of 15 physicist in a novel data analysis project during 4 years, from its start until its publication.
- **Coordination:** Liaison between different international and interdisciplinary teams for 2 different projects
- **Supervision:** Supervised master and PhD students from different universities.
- **Team work** Collaborated in different international and interdisciplinary teams of between 4 and 40 people, resulting in more than 10 scientific publications and two hardware implementations.
- **Languages:** Native Spanish and Catalan, Proficient English (C2), Beginner German (B1) and French (A2).
- **Communication:** Presented research to experts (meetings, conferences and journals) and public (outreach events).

HONORS AND AWARDS

- **Postdoctoral Fellow at Stanford University** *May 2023*
  Knut and Allice Wallenberg Foundation - KAW 2022.0358 [🌐]
  ◦ My research proposal "Measuring the shape of the Higgs potential in ATLAS" was funded for up to 4 years.
- **Travel Grants** *2023 / 2021*
  Kinanders, Lydia and Emil, Foundation / Kobbs, Gustaf and Ellen, Scholarship Foundation [🌐]
  ◦ Two independent grants to present research at cutting edge international conferences.
- **69th Lindau Nobel Leaureate Meeting in Physics** *2019*
  Ragnar Söderberg Foundation [🌐]
  ◦ Selected to spend one week discussing with Nobel Laureates and other young scientists about Physics.

CERTIFICATIONS

- **Coursera:** Deep Learning Specialization (4/5) *2021*
- **CERN, HSF and SIDIS:** HEP C++ course *2020*
- **University of Michigan:** Proficiency in English *2014*