Luca Pernie

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Senior Data Scientist

Specialized in: Analytic Modeling, Statistical Methods, Machine Learning Techniques

6+ years of experience as highly skilled, and accomplished Data Scientist working for the European Council for Nuclear Research (CERN). A proven record of analytic modeling, algorithm development, machine learning application, documented and presented in publications and conferences. Extremely skilled at project leadership and collaboration with multi-cultural and multi-disciplinary teams.

Big Data **I** Statistical Analysis **I** Machine Learning **I** Deep Neural Network **I** Competing Priority Management **I** Team Coordination **I** Effective Communication **I** Languages: English, Italian, Spanish

Professional Experience

Postdoctoral Fellow — **Texas A&M University I** College Station, TX **I** 2015 - Present

- Directed all groups and activities (~100 people) related to the data acquisition and data analysis aimed to estimate detector conditions for on-line data-taking, data reconstruction, and data simulation, acting as Alignment, calibration and Database Co-Manager.
- Coordinator (~10 people) and developer of data analysis targeting the search for extremely rare processes hidden in PB of data through deep learning algorithms, and advanced statistical analysis.
- Project coordinator (~10 people) and developer of a multidimensional regression framework to align the muon system, which increased the achieved precision by a factor of 2 from previous year (2017 Achievement Award).
- Promoted communication across all alignment teams as the Detector Performance Group Office's alignment representative.

Notable Accomplishments

- Introduced a parametric deep learning algorithm (that supersede previous BDT algorithm) which adopt a novel parametrization approach that allow to tests several signal hypothesis simultaneously.
- Increased, by a factor of three, the sensitivity to exotic particles by leading the developments of a new algorithm to identify and select displaced muons during the online data-taking.
- Doubled the sensitivity to rare events with multiple neutrinos in the final state by developing and implementing a likelihood-based algorithm to fully reconstruct the event kinematic.
- Removed biases in the muon chamber position measurement by extending the multidimensional regression to all degrees of freedom.
- Developed a new framework to inter-calibrate lead tungstate crystals using neutral pions, integrating a random forest regression to decouple material effects from the detector response.
- Reduced user errors by guiding improvements of web-based services to ease and systematize the administration and display of calibration and alignment measurements (stored in SQL tables).
- Reduced manpower needs and ensured optimal performance in multiple alignment/calibration sub-groups by training and promoting team members, adopting novel technologies and tools to automatize workflows.

Technical Proficiencies

Programming Languages/Notebook	Bash; C++; Python; SQL; Jupyter
Libraries	Pyplot; NumPy; Pandas; Scipy, SciKit; Keras
Machine learning	BDT; Random Forests; Naive Bayes; Regressions; Deep Neural Network
Version Control	GitHub; SVN
Methodologies	Agile (JIRA, Asana)
Software Applications	LaTeX; Microsoft Office (Excel, PowerPoint, and Word) for Macs

Familiar with: Adhoop, Spark

Education

Doctor of Philosophy (Ph.D.), High Energy Physics – Université Libre de Bruxelles | Brussels, Belgium

Master of Science, Particle Physics – Università di Roma La Sapienza | Rome, Italy

Awards

Outstanding Contribution (MUON Project) – CMS Achievement Awards | 2017

Distinguished Postdoctoral Flash Talk – Postdoctoral Research Symposium | Texas A&M University | 2016

One-year Grant (~50K CHF) as CERN-INFN associate (A CERN fellow position) | 2014

Publications & Conferences

400+ publications as a member of CMS Collaborations, and multiple international conferences. Full list available here

Outreach Activities

Organizer – Machine Learning Techniques in Science 3-day seminars for graduate students and postdoctoral researchers

Organizer – High Energy Physics Experiment Cosmology A seminar series for members of the experimental and theory communities, including faculty, postdocs, researchers, graduate and undergraduate students of Texas A&M University

Organizer – A Walk through the Large Hadron Collider Part of the Physics and Engineering Festival at Texas A&M University

Guide of the CMS experiment Tours of the CMS experimental facility in English, Spanish, and Italian