

Juan Montoya Sanchez

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Profile

Enthusiastic Physics student interested in High-Energy Physics (HEP). Hands-on experience in data analysis, software development (C++, Python), and collaborative research in an academic group affiliated with the CMS experiment at CERN. Keen to apply theoretical knowledge to real-world research projects and contribute to cutting-edge scientific discoveries.

Education

Universidad de Antioquia 2019 – Expected 2026.
• Bachelor's degree in Physics GPA: 3.8/5.0

Research experience

Undergraduate Research Assistant, Phenomenology and Fundamental Interactions Group (GFIF) 2024 – Present.

- Collaborate on low- p_T (< 30 GeV) b -jet analyses using C++ in conjunction with the CMS experiment at CERN.

Research Intern, Condensed Matter Group 2023 – Present.

- Conduct research on quantum dots and quantum rings, focusing on their electronic and optical properties under external fields. Co-authored two peer-reviewed publications:
 - **Electronic and optical properties of tetrapod quantum dots under applied electric and magnetic fields**
European Physical Journal Plus, 2024
DOI: 10.1140/epjp/s13360-024-05089-z
 - **Hopf-link GaAs-AlGaAs quantum ring under geometric and external field settings**
Physica E: Low-Dimensional Systems and Nanostructures, 2024
DOI: 10.1016/j.physe.2024.116032

Conferences & Presentations

9th Colombian Meeting on High Energy Physics (COMHEP) Pasto, December 2024.

- Oral Presentation: *Estudio sistemático de la estructura de jets de b y \bar{b} a bajo p_T .*

ICTP Physics Without Frontiers: Colombian Network for High Energy Physics School Ibagué, December 2023.

- Attended a specialized school focused on theoretical and experimental high-energy physics. Participated in workshops and lectures led by renowned international researchers.

Projects

United Nations Datathon 2024 – Sustainable Tourism Analysis *GitHub* Medellín, November 2024.

- Analyzed large tourism datasets to highlight sustainability metrics. Created interactive data visualizations using Python libraries (geopandas, plotly) for global insights.

NASA Space Apps Challenge 2024 – Galactic Problem Solver *GitHub* Medellín, October 2024.

- Awarded the “Galactic Problem Solver” certificate for outstanding participation. Developed innovative data visualization techniques representing climate patterns using Python. Collaborated with a multidisciplinary team to address challenges in space and Earth-related contexts.

Tutoring Experience

Tutor at Tutor.com

November 2024 – Present.

- Provide online math and physics tutoring to students with diverse academic backgrounds. Tailor explanations to different learning styles, enhancing conceptual understanding.