Siddharth Sule

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Education

PhD in Particle Physics Sep 2022 - Present
The University of Manchester
Supervised by Professor Michael H. Seymour

- Using Monte Carlo Sampling and Object-Oriented Programming to simulate High Energy Particle Collisions, as seen at the Large Hadron Collider at CERN. Packaging the code into a General Purpose Particle Physics Simulation Software, known as *Event Generators*. Junior developer of the open-source event generator *Herwig*.
- Studying the radiative pattern of particles involved in high energy collisions. Focused on accurately simulating the radiation of gluons and quarks in the event generator, known as a *Parton Shower*.

MPhys (Hons) Physics, First Class Sep 2018 - Jun 2022
The University of Manchester

- Modules covered Quantum Field Theory, Gauge Theories and the Standard Model, Gravitation and Early Universe Cosmology.
- Evaluated risks, conducted experiments and analysed data at the university laboratory over three years and attained an average mark of 75%.

Research Experience and Projects

GAPS: a GPU-Amplified Parton Shower Mar 2024 - Present
with Professor Michael H. Seymour | Paper | GitLab

- Innovated the parton shower algorithm to generate emissions for multiple simulated events in parallel on a GPU. Implemented the algorithm as a novel parton shower using CUDA C++. Developed a near-identical CPU-only parton shower using C++ and demonstrated a speed up of 275 times when using the GPU while achieving identical, accurate results.

Masters Project: Statistical Physics in Epidemiology Sep 2021 - Jun 2022
Supervised by Professor Tobias Galla | Master's Dissertation

- Simulated the spread of diseases in different models of communities using Monte Carlo Methods on Complex Networks in Python. Verified the reduction of the number of daily cases due to self-isolation by studying the number of daily infections.
- Applied Bayesian Inference on UK daily cases data to estimate the R Number. Verified the impact of lockdowns and vaccinations on reducing the R number and, in turn, the number of daily cases.

Teaching and Assessment Experience

Associate Fellow of the Higher Education Academy (AFHEA) Jun 2021

Undergraduate Lab Demonstration Feb 2023 - Present
The University of Manchester

- Taught undergraduate students to record measurements and analyse results by fitting mathematical models. Assessed the students' knowledge in a viva-style interview to identify achievements and places for improvement. Taught over a hundred students over the last year.
- Marked undergraduate lab reports, evaluating the student's ability to explain experiments and justify results. Reviewed the report for a scientific writing style using a comprehensive and thorough rubric. Marked over thirty lab reports, across a variety of experiments.

Herwig Event Generator Tutorials
MCnet Summer School, University of Sterling Jun 2025
MCnet Summer School, CERN Jun 2024
Terascale Monte Carlo School, DESY Hamburg Feb 2024

- Introduced the Herwig Event Generator to students and PDRAs in particle physics. Guided the attendees to simulate particle physics collisions and to customise the simulation settings to vary the physics settings and add analyses of interest. After the tutorial, attendees were equipped with the knowledge to simulate Large Hadron Collider Events and compare them to Experiment Data.

Skills Overview

Technical Expertise: Monte Carlo Simulations, GPU Programming and Architecture

Programming Languages: C++, CUDA C++ and Python

Soft Skills: Problem-Solving, Critical Thinking, Adaptability, Collaboration

Extra-Curriculars: Playing the Drums, Climbing

Publications and Preprints

M. H. Seymour and S. Sule, *An algorithm to parallelise parton showers on a GPU*, SciPost Phys. Codebases 33, 2024.