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Qualification: B.E. in Electronics and Communication Engineering (2021- present)
M.Sc. in Physics (2021-present)

Project Title: End-to-End Particle Reconstruction with Vision Transformers for the CMS Experiment

Introduction:

I am excited to submit my proposal for the development of an end-to-end particle reconstruction algorithm for the CMS experiment using Vision Transformers (ViT). As an avid machine learning enthusiast and a computer science student, I believe that this project will be a perfect match for my skills and interests. My goal for this project is to create an efficient and scalable ViT-based algorithm that can be used for particle classification and reconstruction, which will be instrumental in the CMS experiment's data analysis.

Approach:

The proposed approach involves developing a ViT-based algorithm for end-to-end particle reconstruction. To achieve this, I will start by training a transformer-based model using the TensorFlow framework, which is capable of processing large amounts of data efficiently.I could also use PyTorch but I am going to use google cola for gpu anyway and I program on a MacBook and I could not use cuda on it. The trained model will be used for particle classification, with the ability to identify the types of high-energy particles involved in particle collisions. To ensure that the algorithm is robust and accurate, I will use validation set and test sets.

Deliverables:

1. A ViT-based algorithm for end-to-end particle reconstruction
2. Trained machine learning models for particle classification
3. Comprehensive documentation of the algorithm, training, and deployment procedures
4. A suite of test scripts for benchmarking and validation
5. A final report summarising the project, its findings, and potential future work

Timeline:

Day 1-3: Research and planning, including understanding the CMS experiment's goals and data
Day 4-6: Development of the ViT-based algorithm, including transformer-based model training

Day 7-8: Benchmarking and performance testing on GPUs
Day 9-11: Validation and testing of the algorithm on various datasets
Day 12-13: Documentation and final testing
Day 14: Final touches and submission

Duration: Total project length - 350 hours

Qualifications:
I have extensive experience in machine learning and computer vision, having previously worked on projects involving CNNs and transformer-based models. I am also familiar with the TensorFlow framework and have experience in training and deploying machine learning models on GPUs. In addition, I have a strong background in mathematics and physics, which will enable me to better understand the particle collision data generated by the CMS experiment. Furthermore, I am confident in my ability to collaborate effectively and communicate clearly with the CMS organisation throughout the project.

Conclusion:
I am excited about the opportunity to work on this project and contribute to the CMS experiment's data analysis. I am confident in my skills and ability to deliver a high-quality, efficient, and scalable ViT-based algorithm for particle reconstruction. I am committed to meeting the project's requirements, deadlines, and communication expectations, and I am open to feedback and constructive criticism throughout the project. Thank you for considering my proposal.