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Acceleration of multivariate analysis techniques in TMVA using GPUs

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Multivariate classification methods based on machine learning techniques are commonly used for data analysis at the LHC in order to look for signatures of new physics beyond the standard model. A large variety of these classification techniques are contained in the Toolkit for Multivariate Analysis (TMVA) which enables training, testing, performance evaluation and application of the chosen methods.

As data continues to be successfully collected at the LHC at record rates the sample size processed by TMVA is expected to grow by orders of magnitude. However, it is known that some classification techniques are likely to be process bound as the sample size is significantly increased. Other input factors - such as the number of classifier variables defined for a given method - can also lead to an appreciable increase in overall execution time.

A feasibility study into the acceleration of multivariate analysis techniques using Graphics Processing Units (GPUs) will be presented. The MLP-based Artificial Neural Network method has been chosen as a focus for investigation. The challenges faced when refactoring the existing codebase to the CUDA programming language will be considered as well as determining how possible performance improvements can be integrated and extended to other classification techniques in the TMVA framework.

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Session Classification: Event Processing

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