1 Naam van Project

Construction of a Likelihood Discriminant for stop searches

2 Experiment

ATLAS

3 Begeleider

Pierfrancesco Butti

4 Beschrijving project

As a consequence of mass hierarchy inversion, the stop quark ($\tilde{t}$), the supersymmetric partner of the top quark (t), could be the lightest particle predicted by Super Symmetry. This property makes the $\tilde{t}$ an extremely interesting particle since, if it exists, its production cross section in LHC would be the highest among all supersymmetric particles and it could be detected by ATLAS experiment. Since for every proton-proton collision different physical processes can take place, e.g. production of $t\bar{t}$ pairs, what makes the $\tilde{t}$ discovery challenging is the correct estimation of all the possible backgrounds when the comparison to the collected data is made. This project will focus on the construction of a Likelihood discriminant that gives to each event a probability to come from a signal or a background process, exploiting a set of highly discriminant variables. Placing an optimized cut on the resulting discriminant distribution can lead to obtain a signal enriched region of phace space. This technique can be adopted for the study of $\tilde{t}$ signals obtained with different supersymmetric models, e.g. gluino mediated stop production or direct stop production, and to set limits on the $\tilde{t}$ production cross section at LHC.

5 Doel

The aim of the project is to build a Likelihood discriminant in order to increase the discovery potential of stop searches. The student will study a set of variables both for signal and background processes, construct a likelihood discriminant using a dedicated tool for HEP searches (TMVA) and optimize the final cut on the resulting distribution in order to define a signal-enriched region. If the number of events found in data in this signal-enriched region is found to be compatible with the expected background, the student will use a tool for limit setting in order to give an upper limit on the $\tilde{t}$ cross section.

Week	Activiteit
19	Introduction to Root. Reading n-tuples. Plotting histograms
20	Study of distributions and comparison between different processes
21	Getting familiar with the analysis code
22	Likelihood Discriminant studies
23	Likelihood Discriminant studies. Presentation
24	Optimization of the cut. Starting setting limits on ($\tilde{t}$)cross section
25	Limits
25	Preparing a presentation on the work done