Zipeng Wang #3909934

Physics 129L HW8 Ex1 Report

Each background pdf has been normalized such that the area under the curve from $mass = 100(GeV)$ to $mass = 200(GeV)$ is 1. Normalization constants are recorded in the code "hw8_ex1.py".

Fit 1: Exponential

In this trial I used the background pdf $e^{-\alpha x}$.

Result: Analyzed by Minos, the fitted value for S is $S = 22.6^{+8.12}_{-7.5}$. The fitted value for B is $B = 177^{+15.1}_{-14.3}$.

In my opinion, this fit is not very reasonable because there is large disagreement between $mass = 180$ and $mass = 200$. It seems that the background is concave down instead of concave up.

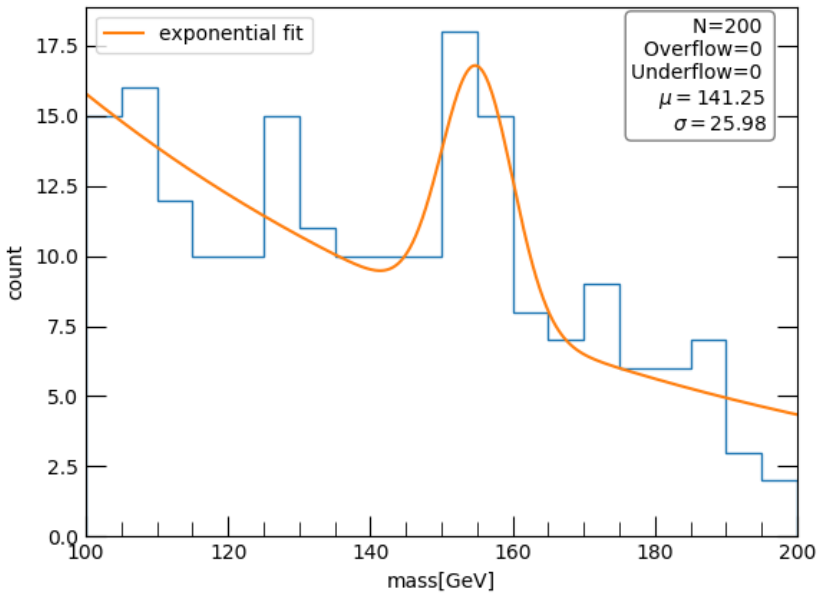

Figure 1: Exponential Fit

Fit 2: Linear

In this trial I used a linear background pdf $-kx + b$.

Result: Analyzed by Minos, the fitted value for S is $S = 20.2^{+7.99}_{-7.39}$. The fitted value for B is $B = 180^{+15.2}_{-14.4}$.

I think this is a good fit since there is no obvious deviation between data and fit, though the underlying physics in this problem might not be as simple as linear. However, based on the information at hand, I think this is a good enough fit.

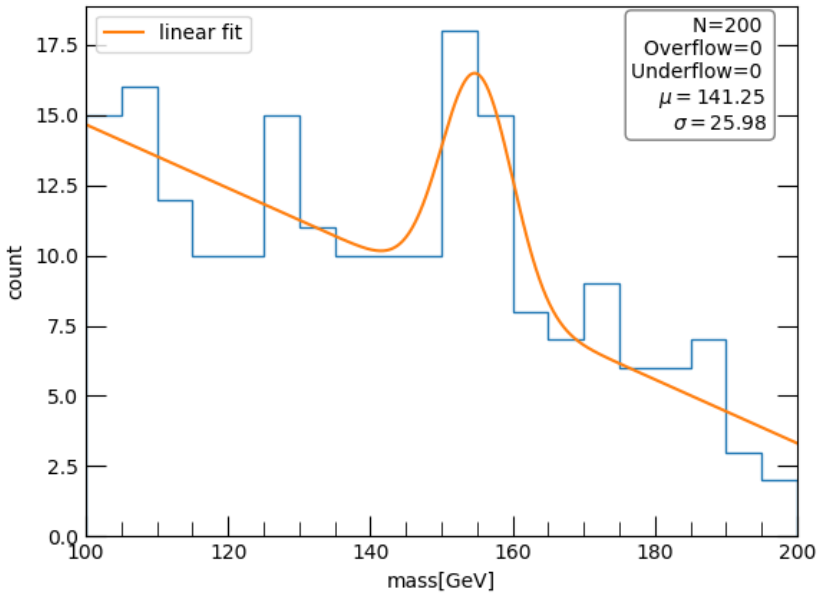

Figure 2: Linear Fit

Fit 3: Quadratic

In this trial I used a quadratic polynomial background pdf $-ax^2 + bx + c$.

Result: Analyzed by Minos, the fitted value for S is $S = 18.6^{+8.81}_{-8.25}$. The fitted value for B is $B = 181^{+15.8}_{-14.9}$.

I think this fit is the best among the three fits I tried. It is the closest to the binned data. Also, any pdf with some curvature can be approximated by a quadratic, so I think this fit shows some general characteristics for all the concave down background pdfs.

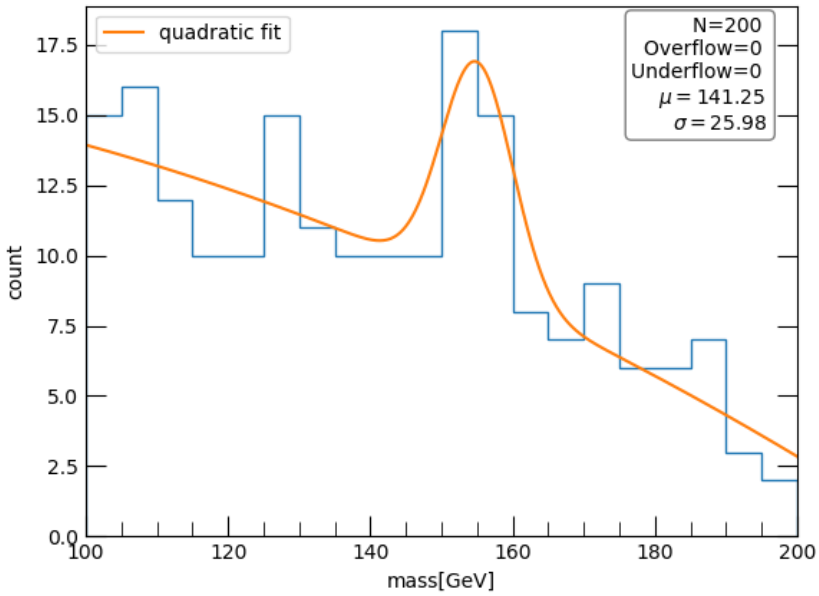

Figure 3: Quadratic Fit

Final Result

Overall, these three different fits gives the value of S ranging from 18.6 to 22.6. Therefore, I estimate that the systematic error here is ± 2.

The value of S is $S = 18.6 \pm 8.52 \pm 2$.