Roller coaster riding is an extremely popular entertainment among the youngsters. However, the ranking systems of roller coasters are large based on the input of subjective experience and rating instead of quantitative analysis. Therefore, the aim of the model we construct is to provide a reliable model used for the roller coaster-rating based on their properties and objective analysis.

To begin with, we do the data cleaning and interpolation to extract the relevant data. Noisy data are being rectified and some missing data are interpolated. The process simplifies our model by reducing the independent variables and raising the accuracy. We obtained 9 properties of the roller coasters for further analysis. Next, we analysis the data mainly by applying Principal Component Analysis to determine a initial ranking of roller coasters and compare it with the ranking online to see if the result can be taken as training set in the methods that follows.

A model is first constructed with the help of Linear Regression and KNN algorithm. It can be seen that the two models manifest quantitative analysis towards the issue, while the result is not accurate enough, which then brings about the optimization part. The Principal Component Analysis focuses on the most relevant independent variable with continuous data, while the Bayes Distinction has a strong ability to manipulate the discrete data. We also utilizes BP Neural Network to solve the issue, which has the ability construct an optimized model with proper training set and possess high accuracy. Then we employ XG Boosting algorithm to synthesize the three optimized models and produce a more reliable and stable ranking. Ultimately, the sensitivity analysis validates the model's stability and precision, thus making its use in real life viable and reliable.

Advantages of the model we construct are shown in various aspects. The optimized model not only provides the quantitative results based every individual variables, but also successfully provides us with an objective rating of every roller coaster, which is far more persuasive than the solely subjective inputs. Furthermore, our model synthesizes the results from various advanced methods with clear logic chain, which guarantees our model's accuracy as well as stability. It is also flexible with the change of data input and enables the self-studying and self-improving through proper additional training sets, so the model is suitable to be applied under various circumstances.

The ranking of the top roller coasters are compared with the results of other methods. However, the facts that most online results simply take into account the rider's personal experience and only shows the ranking of particular regions instead of on the world's scale make our unique model stands out. Moreover, we demonstrate our concept of the application with the algorithm applied. The application mainly aims to recommend the roller coasters based on the global ranking and individual's preference, as well as constructing a search engine to save the users' time on roller coaster selecting. All of the functions are supported with concrete programming frames, the methods of which include correlation coefficients, Mahalanobis, and BP neuron network. Thus, it can successfully achieve the goal of fulfilling the potential riders' demands.

To conclude, our model proposes a reliable and precise method for the rating of roller coasters based on the objective algorithms. It presents high accuracy, reliability and stability, the features of which make it stands out from other analysis based solely on subjective inputs. The application we conceive can also fulfill the users' various needs and thus possesses high pragmatic value.