Summary

In this article, we adopt an optimal investment strategy which identifies schools,investment amount per school, return on that investment(ROI), and time duration.

The first step is to analyze and process the data the problem provides. It appears a number of ''NULL'' results, which is defined as the lack of properties in some schools rather than missing data. We employ Principal Component Analysis (PCA) to reduce dimensions of big data and get some principal components. Then combining with ROI and funds utilization, weformulate an evaluation model based on [Analytical](http://cn.bing.com/dict/clientsentence?mkt=zh-CN&setLang=zh&form=BDVEHC&ClientVer=BDDTV3.5.0.4311&q=%E5%B1%82%E6%AC%A1%E5%88%86%E6%9E%90) [Hierarchy](http://cn.bing.com/dict/clientsentence?mkt=zh-CN&setLang=zh&form=BDVEHC&ClientVer=BDDTV3.5.0.4311&q=%E5%B1%82%E6%AC%A1%E5%88%86%E6%9E%90) Process (AHP) to obtain the primary list of candidate schools.

We regard ROI as the degree of graduates’ contributions to society. Combining with the data we capture, we define a formula for ROI. We calculate the ROI of every school and get a list. The Texas A & M University-College Station is the first.

We build an investment portfolio optimization model to determine the investment schools and the investment amount per school with [particle](http://cn.bing.com/dict/clientsentence?mkt=zh-CN&setLang=zh&form=BDVEHC&ClientVer=BDDTV3.5.0.4311&q=%E6%B7%B7%E5%90%88%E7%B2%92%E5%AD%90%E7%BE%A4" \t "_blank) [swarm](http://cn.bing.com/dict/clientsentence?mkt=zh-CN&setLang=zh&form=BDVEHC&ClientVer=BDDTV3.5.0.4311&q=%E6%B7%B7%E5%90%88%E7%B2%92%E5%AD%90%E7%BE%A4" \t "_blank) algorithm(PSO). In order to analyze the problem explicitly, we build a basic model. We hypothesis that the time duration for investment of all schools is five years. Then we formulate a multi-objective optimization model. Through the method of PSO, we get the strategy for investment and conclude that the number of schools is 227 and Ohio State University-Main Campus gets the most investment that is 1.1 million.

We extend our basic model with taking the change of time duration into consideration. We divide the time duration into five parts. The time duration of each school decides on its ROI. The relationship amongvariables becomes more complicate. So we build a portfolio investment dynamic model. This model takes all the relation into consideration to increase the reliability of our results. From the results, we findtime duration of the Texas A & M University-College Station is five years. You can see the appendix for the information in detail.

We conduct a sensitivity analysis for our model finding ROI has a good stability to graduates’ income. Furthermore, the [portfolio](http://cn.bing.com/dict/clientsearch?mkt=zh-CN&setLang=zh&form=BDVEHC&ClientVer=BDDTV3.5.0.4311&q=%E5%8A%A8%E6%80%81%E6%8A%95%E8%B5%84%E7%BB%84%E5%90%88%E6%A8%A1%E5%9E%8B) [investment](http://cn.bing.com/dict/clientsearch?mkt=zh-CN&setLang=zh&form=BDVEHC&ClientVer=BDDTV3.5.0.4311&q=%E5%8A%A8%E6%80%81%E6%8A%95%E8%B5%84%E7%BB%84%E5%90%88%E6%A8%A1%E5%9E%8B) [model](http://cn.bing.com/dict/clientsearch?mkt=zh-CN&setLang=zh&form=BDVEHC&ClientVer=BDDTV3.5.0.4311&q=%E5%8A%A8%E6%80%81%E6%8A%95%E8%B5%84%E7%BB%84%E5%90%88%E6%A8%A1%E5%9E%8B) is largely affected by the increasing investment schools, which needs to be improved.

We write a letter to the Chief Financial Officer (CFO) of the Goodgrant Foundation, Mr. Alpha Chiang. It describes our modeling approach and major results.