Equinox: Presentation Script

Every year, over 1.2 million or 25% of students drop out of high school in the United States alone. That’s a student every 26 seconds! Students dropping out of high school has become a huge problem in America which is seldom talked about! Increasing high school graduation rates is essential in the development of a save and innovative society. A high school dropout will earn $200,000 less than a high school graduate over his lifetime and almost a million dollars less than a college graduate. Additionally, In the U.S., high school dropouts commit about 75% of all crimes. It should be our responsibility to set up future citizens for success by ensuring that they graduate high school.

This is where Equinox comes in! Equinox is a cohesive solution designed to identify students who have a high risk of dropping out of high school. School boards can use this tool to identify students who are at risk of not graduating from high school and may benefit from targeted interventions. Equinox provides an efficient and easy to use solution that can be adopted by education departments around the globe!

Let us look at a demo to understand how this system works. The current version of Equinox has two main pages, the overview page and the Student Analysis page. The overview page provides a birds-eye view of the dropout rates in a given state. The metric dropout risk indicates the percentage if students who are at a high risk of dropping out in the given state, it also shows the difference compared to last years figures. As we can see in the example, in the state of Arizona about 9% of students have a high risk of dropping out, and this number is 2% less compared to the previous year’s figures. On the right, you can find a heatmap of the state highlighting the dropout risks in various regions. Education department can use this information to identify regions where problems related to dropouts may be elevated. You can zoom around the map to get a better understanding of the problems at hand. There are clusters of schools with poor dropout performance. On the left you can see a histogram which shows how many students have a particular risk of dropping out. There is a nice gaussian distribution which indicates that most students don’t need to be counselled, but some students on the higher end of the spectrum might need help. Below that you can find an interactive explorer which allows you to identify students who are at a high risk of dropping out. You can adjust this slider to get students with dropout risks over a certain amount. Let’s say 80%. We can now see a list of students who might need mentorship and assistance to help them make it through high school. We can analyze any of these students to get further information. That’s what the Student Analysis page is meant to do. Let’s focus on Amy Bell, since she has the highest risk. We can use her student id to request an analysis from the database.

We simply move to the student analysis page and enter her student id, 700151. This page now gives us even more useful information to work with. We are greeted with basic details like her name student id and risk of dropping out. If we scroll down, we can see additional details. The line plot on the left shows the students historic GPA. Her grades have been on a downward trend which is a powerful indicator for predicting the risk for dropout. The heatmap on the right is like the one we saw in the overview page, but it includes an important addition. It shows the school the student addresses in the form of this dot. We can use this to assess if the student comes from an area where this problem is widespread. This seems to be the case in this example. The histogram below shows the distribution for dropout risks in the state and highlights where the student stands. If we move down, we get some more important information. The dashboard reiterates the student’s risk and tell us about her GPA, race and household income. These factors are extremely important in assessing the risk of a student dropping out. Lastly, on the right we see a histogram of the household incomes around the state. The graph also highlights where the student’s family stands in this regard.

Now that we have seen a demo of the dashboard, why is this so revolutionary and important? The impact Equinox can have is immense, but it is not directly evident at first sight. The implications this piece of software has on society is astonishing. High school dropouts are 3.5 times more likely to be arrested and eight times more likely to be incarcerated than their counterparts who graduate from high school. In a study conducted by John Hopkins university, increasing high school graduation rates by 5% can half the number of violent crimes in a city. We can achieve something with a national investment of a few million dollars that would otherwise take tens of billions of dollars and a huge risk. The importance of this technology lies in its efficiency. Apart from reducing crimes, increasing high school graduation has been proven to result in better financial conditions, healthier living conditions and healthier local economies. It is an investment that gives exponential returns at a very low risk. Equinox can break economic barriers, create social equity and be a driving force for social good.

Next, I would like to talk about some of the technologies I used to make Equinox. I used several technologies behind the scenes to make this project easy to use and powerful. I used Streamlit in the frontend to display the dashboard and connect to the machine learning models in the back. The data I used for the project was collected from the Arizona’s Education Department. The data had quirks like missing values, skewed columns and large ranges. I did some preprocessing to make the data usable. I also dived deep into analyzing the data and created several reports to summarize the results. For the predictor, I tried several different models. Ensembles of tree-based models like Xgboost, Cat Boost and Random Forests gave the best accuracy. I tried creating RNN’s with TensorFlow, but they tended to overfit the relatively small dataset. Using these tuned predictive models, we can generate risk scores for new sets of students.

I believe that Equinox has immense potential and a few steps in the right direction can take it to the next level. The following steps are the improvements I hope to make to Equinox in the coming weeks:

1. Improve accuracy of the ML models by collecting more data and testing additional model architectures.

2. Identify additional factors that contribute to increased dropout rates.

3. Make the UI more streamlined (move from Streamlit to react).

Equinox is currently a fully functional prototype which has the ability to change the very fabric of our society if developed properly. Thank you!