Just-in-Time Intervention

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Meet the Team

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High-Level Motivation

- A key component to our projects success is PREVENTION
  - We want to intervene prior to a students predicted drop out date/ period
- Potential ways to communicate our predictions in the most efficient and effective way
  - Without discouraging the student
  - Without providing the professor with too much of an extra workload
- Two options we're currently considering
  - Pop-up alerts
    - Inspired by Coursera
  - Email correspondence on a specific day

Subteam History

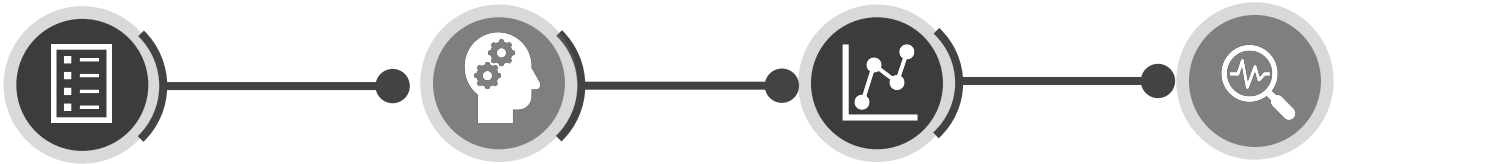
- **Spring 2019 - ‘Research Subteam’ Research Goal**
  - To use various subsets of course data related to performance in a course (ISyE 6501, Introduction to Analytics Modeling), combined with various machine learning/statistical models, to predict final success in the course.
  - Once these models are trained, we will attempt to make conclusions about **particular predictors** of **success** or **failure** in the course.
- **Research Scope**
  - 1 semester of a single class, only for verified students (n ~= 300)
  - Predictions made based on clickstream and assignment data
  - Not too much focus on selecting **only the most important features**

Data Sources

- Clickstream data from edX:
  - Past data utilized:
    - Starts and stops on course videos
    - Clicks on next sections for the course
  - Still determining other possibilities for clickstream data within edX (will be elaborated through data exploration)

- Assignment data:
  - Examining assignment grade data for every week of the course
  - Utilizing lag data (i.e. grade data from 3 weeks ago, 2 weeks ago, and 1 week ago)

Project Flow



Data Cleaning and Exploring

Feature Engineering

Model Training

Parameter Tuning and Model Evaluation

Modeling

Different Aspects of the problem that we can attempt to predict with a model

- **How long until drop out?**
- **Will the student drop out next week?**
  - What is the probability of the student dropping out the next week?
- **At a given moment in time, predicting a students' final grade/success**
  - What is the probability the student will finish the course?

Modeling cont.

- **Machine Learning**
  - Machine learning uses computers to predict unknown object attributes through the recognition of patterns in data.
- **Supervised Learning**
  - We have a lot of various types of data (measured attribute values)
    i. Specifically, each student's data would come in a tuple
  - Using SOME of the data, we can create a function that maps inputs onto outputs
    i. E.g. Quiz performance onto final grade
  - Then using a DIFFERENT subset of the data, we can test our function's accuracy
  - And repeat...

Modeling cont.

Survival Analysis

- Cox Proportional-hazard Model
- Outcome variable of interest is time until a dropout occurs
- To examine how specific factors influence the rate of a dropout happening at a particular week

Data Arrangements

- Use all the past data (excluding the most recent semester) to train our model and test that model using the most recent semester (hence, why it was excluded)
- Use a mix of all data and use an amount of it to create and train the model and then test it using the remainder of the data
- We'll do both data arrangements and see how each one goes and then use that for advancement in the next semester

Next Steps

- Divide team into two sub-subteams
  - MongoDB team - focuses on acquiring and aggregating data from MongoDB clickstream data
  - SQL team - focuses on acquiring and aggregating data from SQL assignment server
- Explore data, engineer potentially helpful attributes from existing attributes
- Develop pipelines to acquire data, transform data, train models, and evaluate success
- Examine whether it is reasonable to predict student success using cross-semester models
- **Long term** - Enable predictions for current semesters of the class.