UNDERSTANDING MOOCS: EVALUATING STUDENT RETENTION AND PERFORMANCE

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What is a “MOOC”? 

- Massive
- Open
- Online
- Course
- Accessible user data
Enduring Problems with MOOCs

- High initial enrollment
  - Easy entry
  - Low cost
  - Convenient and flexible

- Low completion rates
  - No significant motivating factors
  - No consequences
Purpose

- Original purpose:
  - Predict student “drop-outs”
  - Inform course administrators/professors/teachers of potential drop-outs

- Requires isolating and understanding relevant factors regarding student interactions with MOOCs

- Modified purpose:
  - Define and evaluate types of students involved in MOOCs through clustering
Statistics in Medicine

- Administered by Stanford, summer of 2014

- Goals of curriculum:
  - *Evaluating aggregate medical data*
  - *Perform basic statistical inference and tests (with R)*
  - *Critically interpret statistics in medical studies*
Grading and Recognition

- Final grade breakdown:
  - Homework (45%)
    - 6 graded homeworks, lowest dropped
  - Quizzes (10%)
    - 54 quizzes of varying weight
  - Final Exam (45%)
    - 26 questions, one is dropped

- Statement of Accomplishment (60% final grade)
- Statement of Accomplishment with Distinction (90% final grade)
Given Datasets

- **Event Extract**
  - Resource accesses and course interactions

- **Activity Grade**
  - Grades of submitted assignments

- **Weekly Effort**
  - Across the 11 weeks of the course, student reported “effort”
    - Defined by the amount of time spent on the MOOC platform

- Time series and video-interaction data was considered unreliable according to documentation
Student Intersection Across Datasets

- 13136 students across all three datasets
  - *All but 6 are included in event extract*
- 3331 students reported effort, but submitted no grades
- Clues to possible clusters

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**Event Extract (13130)**

- 5462
- 5
- 0

**Activity Grade (4337)**

- 4332
- 0
- 6

**Weekly Effort (7669)**
Activity Grade

- 4337 of 13136 students attempted at least one graded assignment
- 671 received Statement of Accomplishment
- 560 received Statement of Accomplishment with Distinction
Activity Grade

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Activity Grade

- Confirms low motivation to complete course, even among those who took initiative to submit assignments
Weekly Effort

- Students spent varying numbers of weeks engaged with the course
Comparing Weekly Effort with Final Grades

- More weeks of engagement does not correlate with higher grades
  - Indicates that students can receive good or bad grades, regardless of how long they work on the course
  - Exception of 11-week group
Comparing Weekly Effort with Final Grades

- Concerning number of students with 0 effort, yet high grades
  - *Could be errors in how effort is recorded*
- As effort increases, less students tend to have higher grades
Feature Extraction

- **Event Extract**
  - *Number of unique resources*
  - *Total number of resource accesses*

- **Activity Grade**
  - *HW 1-6*
  - *Overall quiz grade*
  - *Final Exam Grade*
  - *Total number of attempted submissions*

- **Weekly Effort**
  - *Number of weeks effort was reported*
  - *Total effort sum*
K-Means Clustering

- Standardized features and attempted K-means clustering
- High inertias, indicating no distinct clusters
- Clustering proved to be poor
  - placed 4142 of 4144 students in a single cluster with $k=3$
Discussion

- Poor clustering may be attributable to exclusion of any student that did not exist in all three data sets.
- This reveals a tradeoff between including the data of as many students as possible for analysis versus evaluating a data set rich in feature information.
Discussion

- Effort was not correlated with better grades
- Students received varying grades regardless of how many weeks they stayed engaged with the course
- Students who never attempted at least one graded assignment were omitted from clustering

- The extracted features are not indicative of differentiating MOOC students
Limitations

- Time-series and video viewing/interaction data was unusable according to data set’s documentation
  - *Could have shed crucial information in differentiating students when attempting clustering*

- Weekly effort data proved questionable
Future Work and Applications

- Could attempt to cluster students within each data set
  - *Each data set individually would yield too few features for any meaningful analysis*

- This research may be applicable in differentiating students that will complete a MOOC
  - *Yet to develop potential to predict student retention rates*