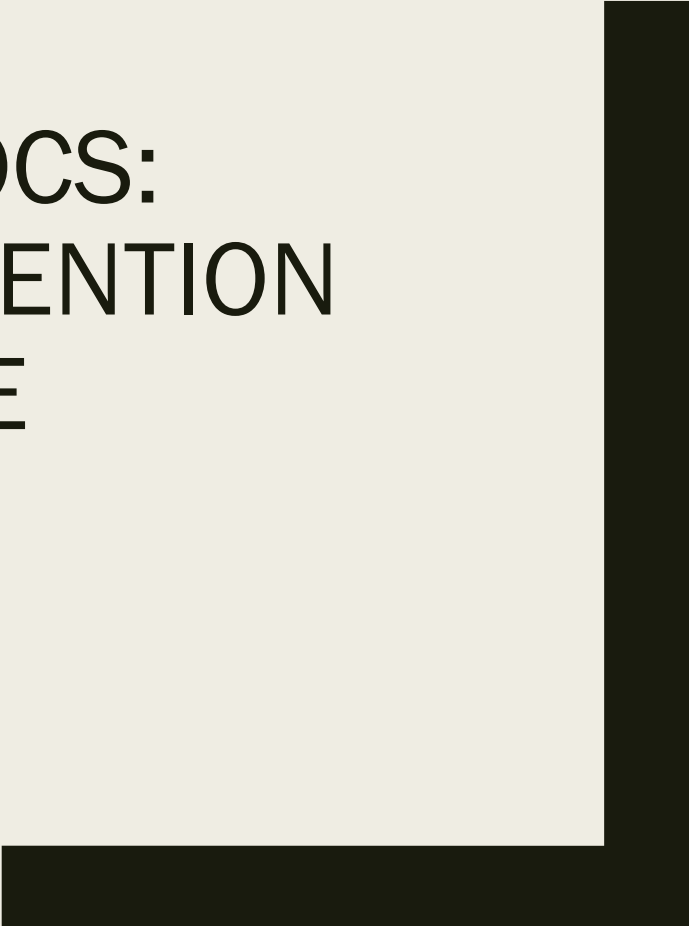




UNDERSTANDING MOOCS: EVALUATING STUDENT RETENTION AND PERFORMANCE

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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

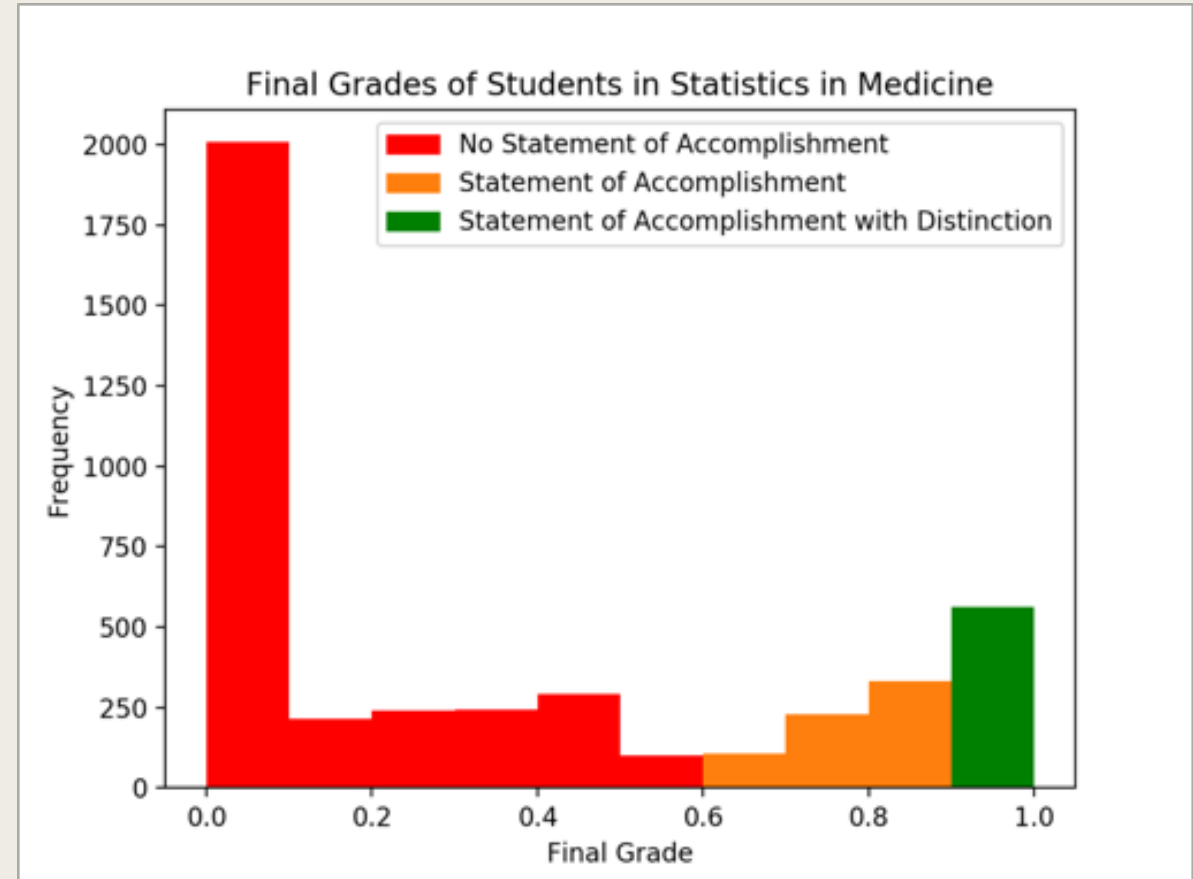
Student Intersection Across Datasets

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



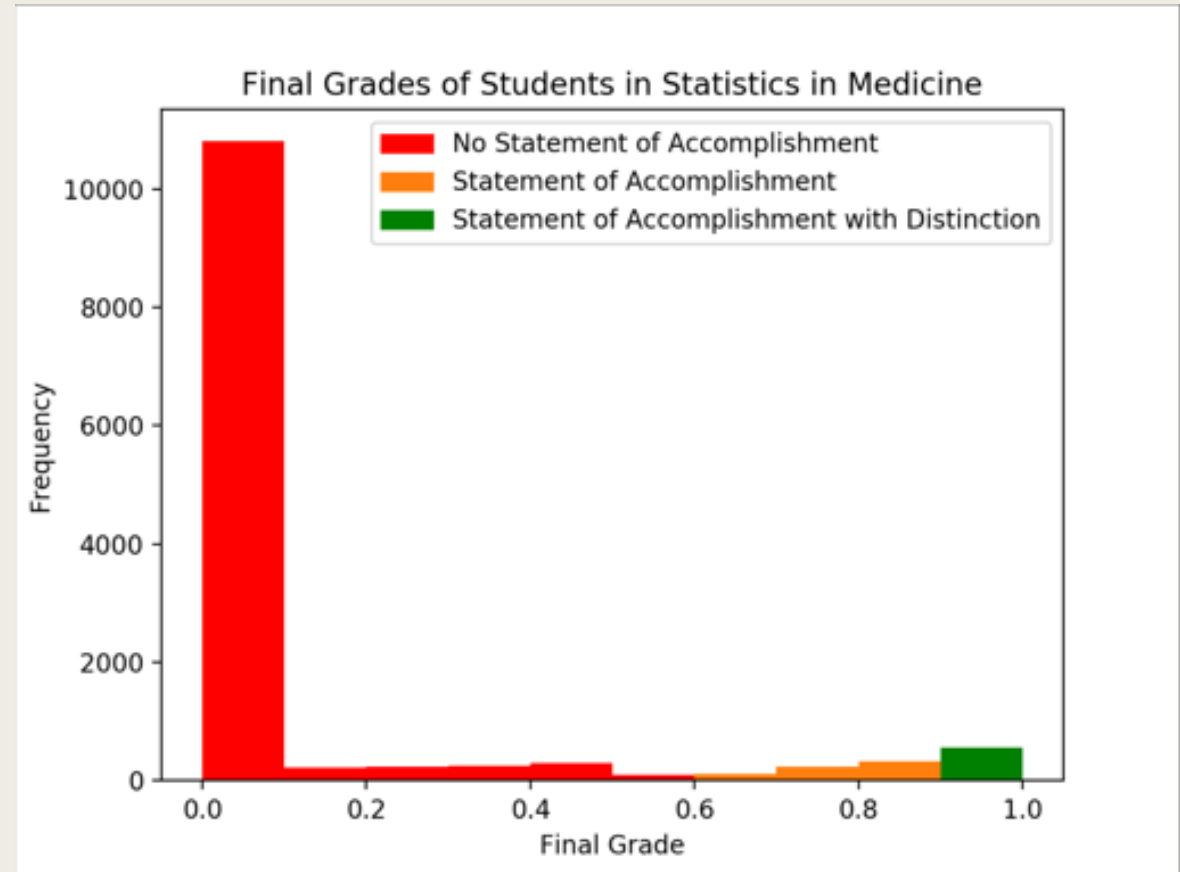
Activity Grade

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



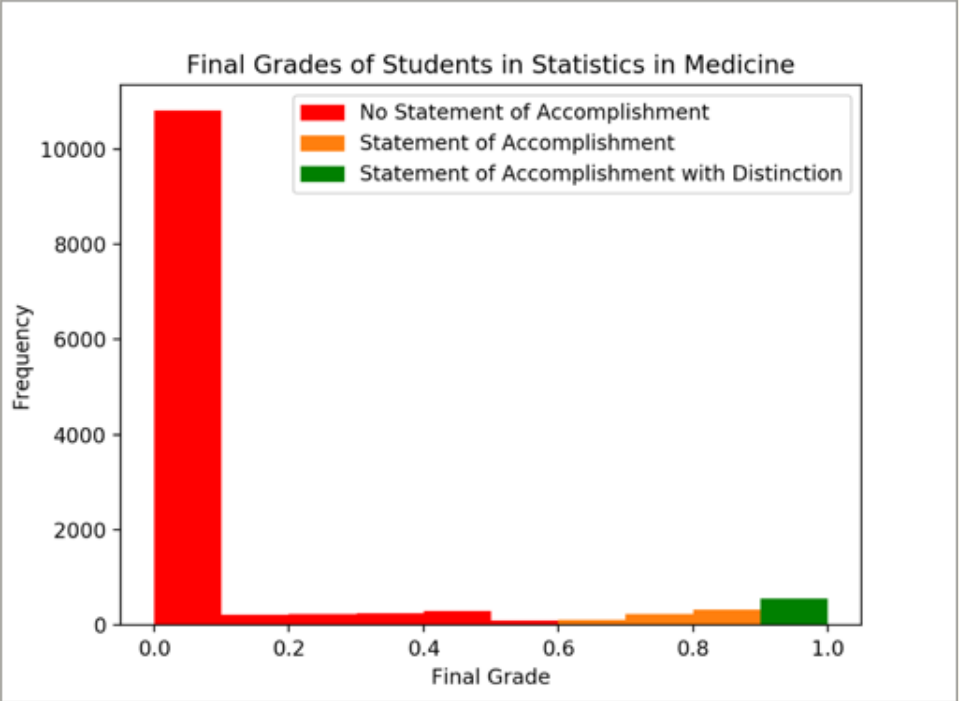
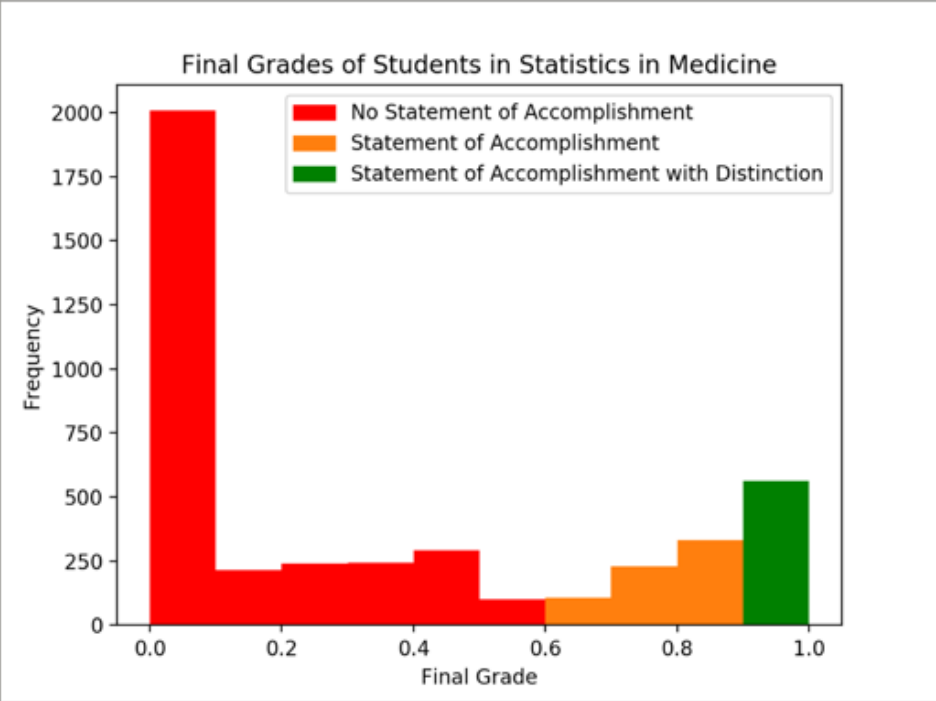
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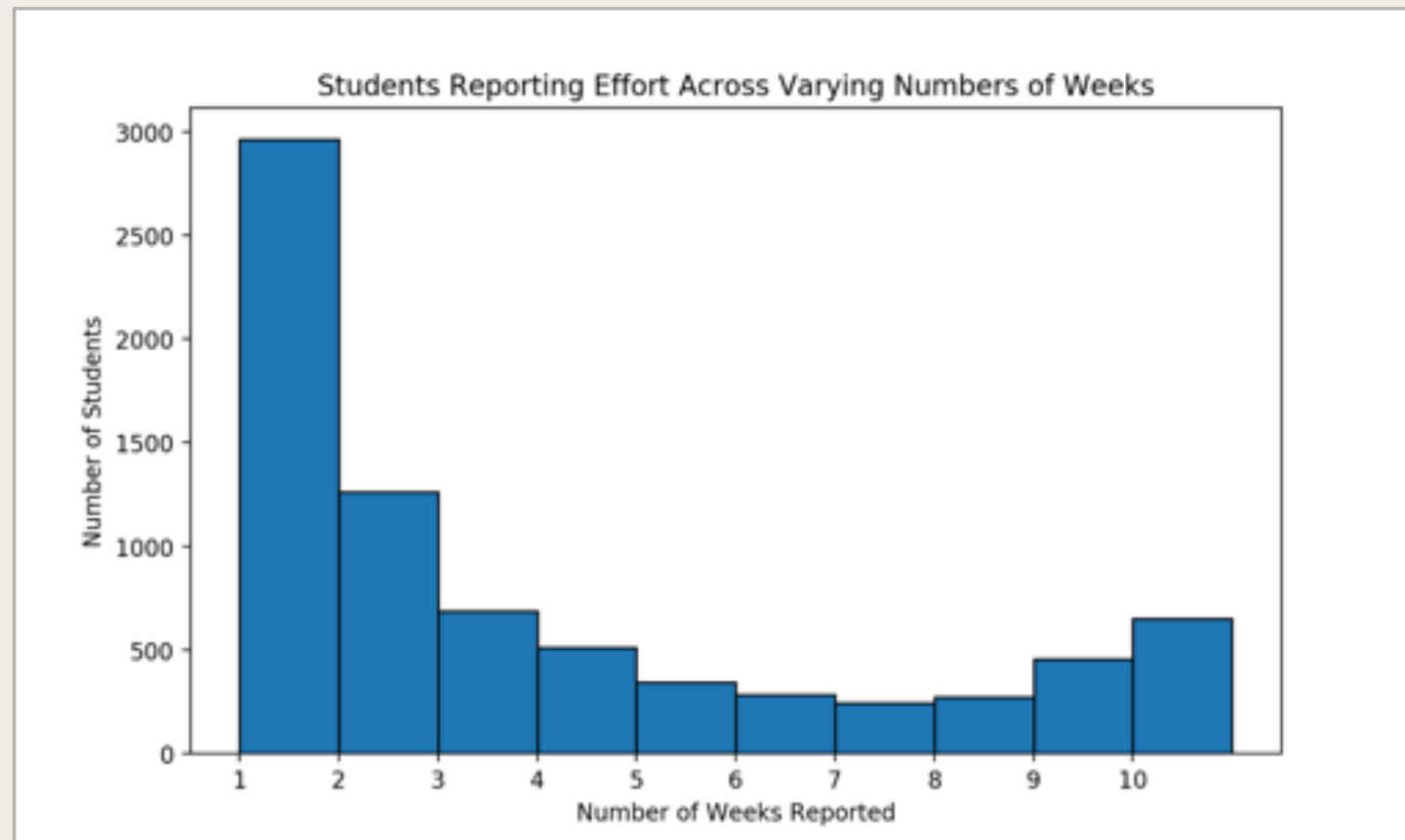
Activity Grade

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



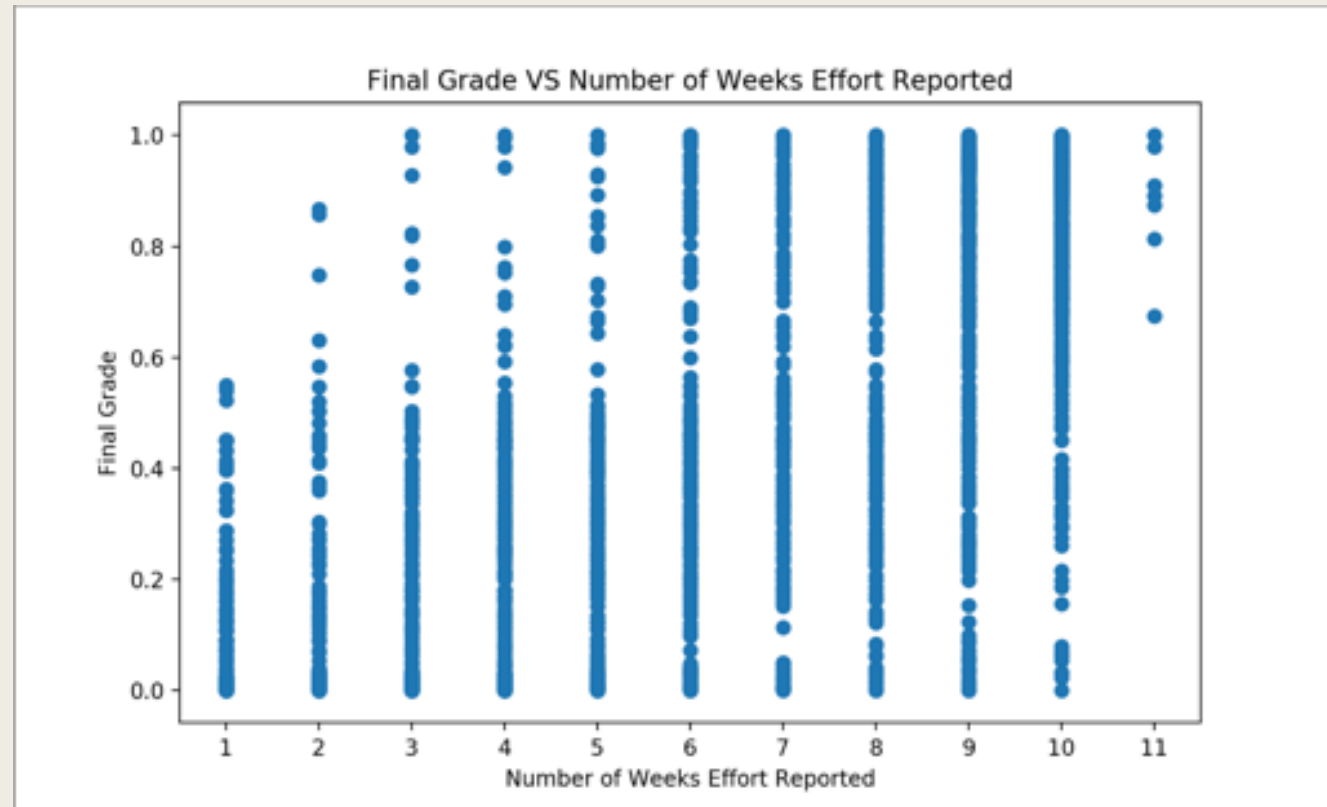
Weekly Effort

- Students spent varying numbers of weeks engaged with the course



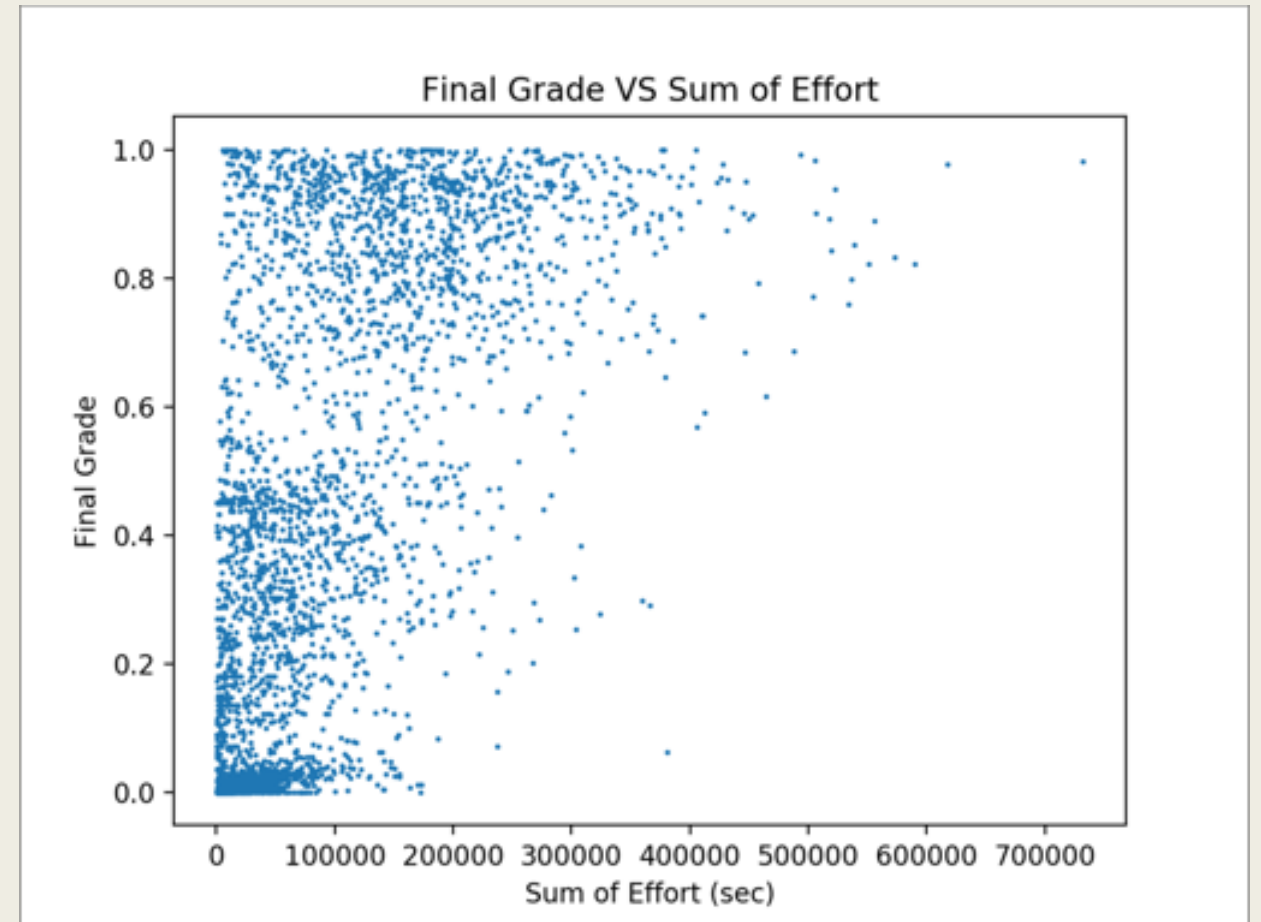
Comparing Weekly Effort with Final Grades

- 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

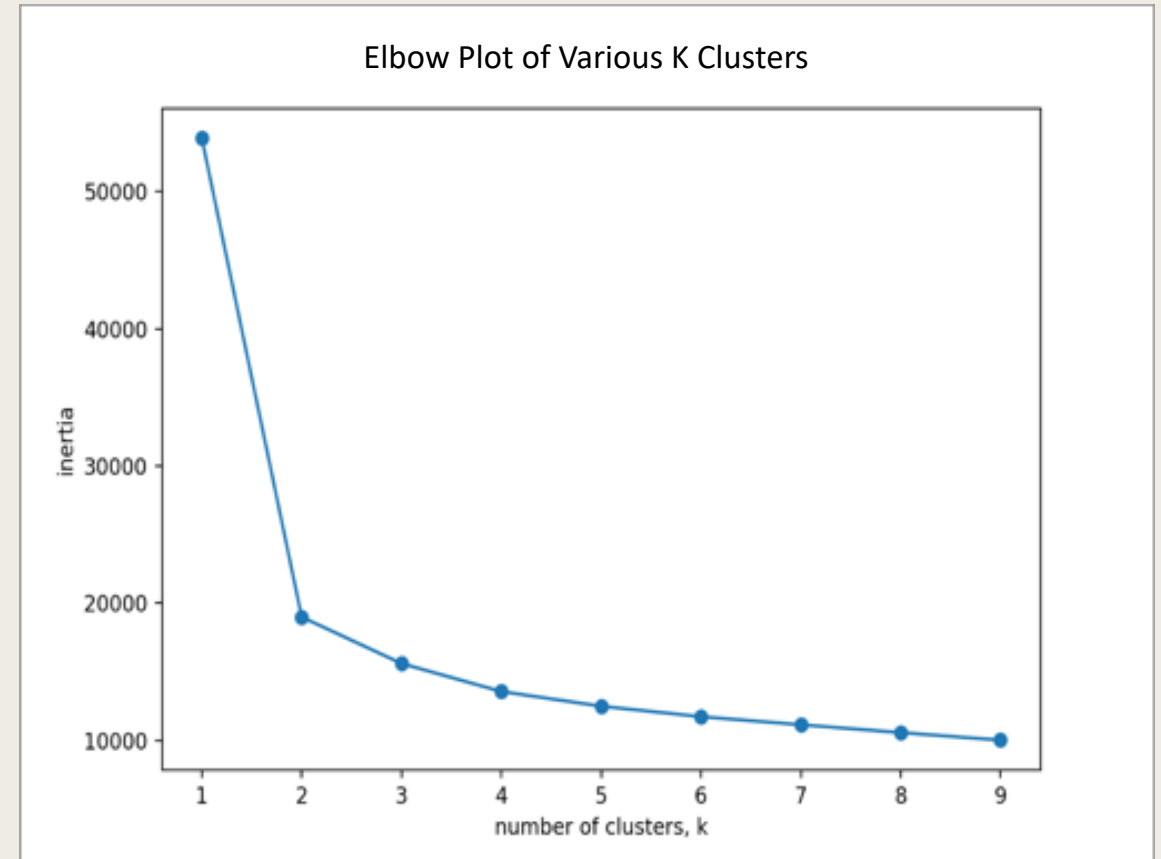


Feature Extraction

- **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 $k=3$*



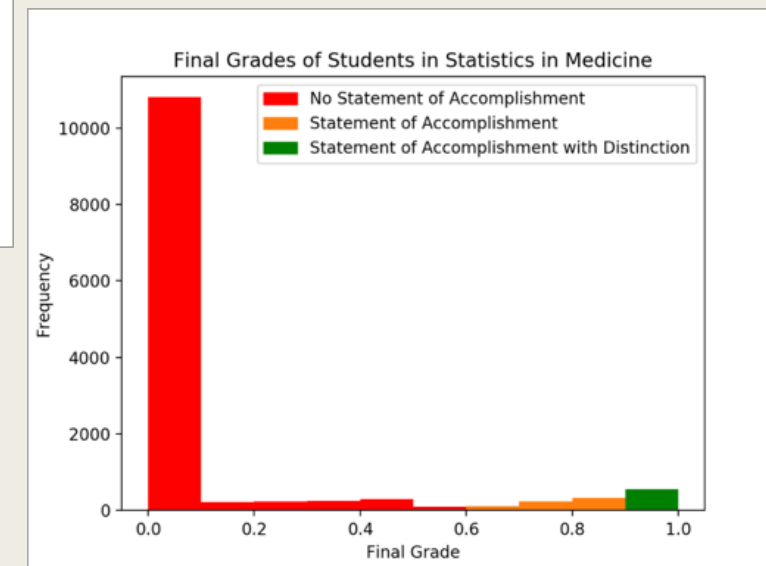
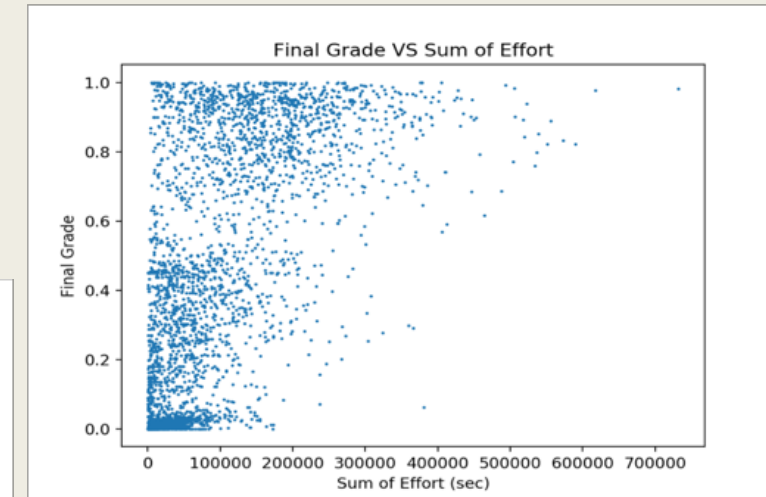
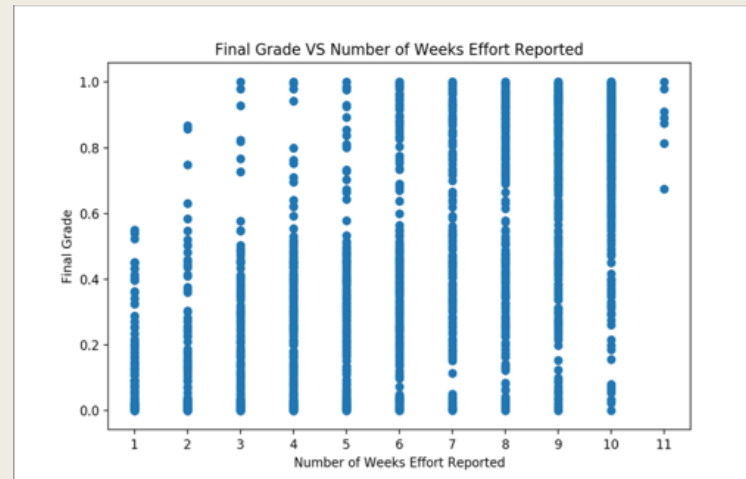
Discussion

- 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*