This case study will analyze data generated from student opinionnaires at the conclusion of various semester-long university-level math courses. The courses took place over six terms between August 2015 and May 2018. The course instructor was in all cases the author of this analysis.

The opinionnaire consists of 19 questions. Please see the accompanying data dictionary for the precise questions and response options. The first 16 are multiple choice with the numbers 1-5 representing various text depending on the question. Questions 17-19 are free-response and ask what went well, what needs improvement, and for any other comment, respectively. There are 568 observations (individual surveys completed).

The motivating questions of the analysis are as follows. **1. Successes (or lack thereof) in which specific categories of instruction performance will best predict overall student sentiment at the course's conclusion? 2. Can the ratings in individual areas of performance (e.g. quality of presentation, fairness of examination, preparedness for class) be used to accurately predict students' overall opinion of the instructor?** We will use Question 16 as a proxy for student sentiment. So the goal is to predict the response to Question 16.

Results:

The correlation analysis gives some insight as to the relative importance of the features for predicting the target variable. In particular, to the author's surprise Question 7 "My instructor's methods and materials helped me learn" is significantly more correlated with the target variable than any other feature. It may be that, like Question 16 and unlike the rest, Question 7 is rather general and so they similarly elicit the student's general feelings.

The random forest and neural network models provide greater prediction accuracy than the linear regression model. Random forests and neural networks are by no means "black boxes" as is commonly asserted: we can examine the precise algorithm by which each makes its decisions. However, in practice these algorithms are too complicated to yield insight into feature importance.

In summary: an instructor who is teaching under conditions similar to those in which the data was gathered can exert some influence on student opinions of instruction quality. Students rate an instructor higher when s/he is perceived to teach effectively and examine fairly. These findings are not surprising. What is revealed by the analysis which is not intuitive: the categories of performance which are most important to student opinion of instruction quality are, in decreasing order, Question 7, Question 8 ("Examinations/assignments reflect materials covered in the class."), Question 12 ("My instructor responds to student Questions and concerns in a constructive manner."), and Question 13 ("My instructor speaks clearly and is easily understood."). Preparedness for class and enthusiasm are comparatively less important, and student opinion of required course material is barely relevant.

A product of the analysis is a pair of models each with good prediction accuracy of overall student opinion of instruction quality. Potential applications are: instructors may use this algorithm to decide how shifting efforts between categories of instructional objectives may affect net ratings; administrators at similar institutions may apply the models to ratings data of job applicants to estimate work performance if hired.