

Project 2: Assessment plan

This document describes the assessment plan for the course on Introduction to Probability and Statistics for Civil Engineering. The learning objectives of my class state that at the end of the course students will be able to:

1. Interpret, formulate, and solve problems involving elementary combinatorics, probability distribution, and inferential statistics
2. Conduct basic descriptive and inferential statistical analysis of data using a software program such as R
3. Identify and demonstrate the use of probability and statistical methods for applications in civil engineering

Since the structure of my course is mathematical, most of the assessment techniques would require students to solve the problems and validate that they understand the concept. The following subsections describe the types of assessment I plan to employ in my class.

Types of Assessment

Homework and Exams

Homework and exams are a good way to evaluate the ability to interpret, formulate, and solve the problems. They are more individualistic and provide a broad assessment of students' understanding. They also have historically proven to be a good way of assessment. This is the reason why they were selected.

I plan to provide 8 homework spread throughout the semester, and conduct two midterm exams and one final exam. The content of each exam will be:

1. Exam 1: Covers descriptive statistics and discrete probability distributions
2. Exam 2: Covers continuous probability distributions and basics of inferential statistics
3. Final Exam: This exam will be cumulative but will stress more on the details of inferential statistics

Each of my homework and exam questions will contain word problems, some of which will be geared towards civil engineering applications.

Problem recognition tasks

This assessment will assign different examples of practical use of probability distributions in civil engineering applications to the students and will require students to recognize and identify the type of problem that the example presents. This technique is selected because it will introduce students to different applications and will encourage them to apply what they have learnt to those applications.

This will be an in-class assessment towards the end of the course (ideally 2-3 weeks before the finals) by which students would have developed enough conceptual background of different techniques in probability and statistics to identify their applications. One complete lecture would be devoted to this activity. Students will be asked to work in groups; each group assigned a

different application. After 15 minutes of group discussion, the class will get together for further discussions. This assessment technique will assess the performance against the third learning objective. Based on the responses and feedback in class, the last homework will be designed to consist of questions of similar nature with varying levels of difficulty.

Group projects

Students' abilities for using statistical software R will be assessed through group projects. Some of the lab sessions will be geared towards training in R which includes data handling, calculating inferential statistics, using appropriate probability distributions, and deriving inferential statistics. This technique is selected because it will encourage collaborative learning and will help them get familiar with the use of statistical software R.

These skills will be tested by assigning students access to different real-world datasets. Each group will be asked to evaluate the following:

- Describe the data using descriptive statistics and visual plots
- Identify the distribution of particular variables and evaluate and interpret the probabilities of the variable being equal to a certain value
- Derive inferential statistics and perform particular hypothesis tests

This assessment technique will test the ability of students to use available software tools on real world data and will give them an exposure to different applications of probability and statistics in civil engineering. This will be a graded assessment comprising of 10-15% of the total grade. The students will also do peer evaluation and get periodic feedbacks to ensure that the learning is uniform and well done across the groups.

Self-evaluation survey after each midterm

This informal assessment technique will comprise of students reflecting on their learning and answering multiple choice questions indicating their level of knowledge against the learning objectives of the course. The material covered before each exam will be organized as modules and students will rate how well they believe they can solve a problem in each module. The students will also answer reflective questions like what did they learn from this exam and how will they approach preparing for an exam/assignment differently in the future. The survey will be put up online after each exam and students will have a week to fill it out. The survey will count for 5 points towards their next homework grade which will enforce that students have a motivation to fill it out.

This technique is selected because self-reflection will encourage students to take a step back and get a holistic picture of how they approach their learning. It serves an important component of metacognition. The survey results will be a good indicator of the level of perception of students' learning by the students against the detailed learning objectives of the class. It will provide a subjective evidence for the ability of students to interpret, formulate and solve problems in descriptive and inferential statistics.

Summary

The mapping of different assessment techniques against the learning objectives of this course can be summarized in Table 1. As shown in the table, the techniques have varying range of formality, varying range of material covered by the assessment (formative/summative), and

varying time commitment required from the instructor. As the course will progress, I will continue to refine my assessment techniques from the feedback received in class.

Table 1 Summary of assessment techniques

Assessment technique	Learning objective covered	Formative/Summative	Formal or Informal	Time and effort required on instructor's end
Homework/Exam	Primarily 1; 2 and 3 partially	Formative and Summative	Formal	Medium
Problem recognition tasks	3	Summative	Informal	High
Group project	Primarily 2; 1 and 3 partially	Summative	Formal	Medium
Self-reflection surveys	Primarily 1; 2 and 3 partially	Formative	Informal	Low