Final Project

Math 300

Summer 2023

Introduction

A small company named Gower's is growing bamboo shoots to sell. They tell you that they have a data problem that they want to hire you to work on. After being invited to see their operation in person, you visit the company. You are given a tour by a manager and told that every shoot that they grow is roughly consistent in diameter, so on average their shoots weigh about 10kg/m, and the company gets about \$12 per kg that they sell.

After the tour, you meet with the COO. She tells you that they need to switch fertilizer due to their old supplier going out of business. They've conducted a test of two brands: x-grow and y-grow. For each brand, they planted a genetically identical plant in identical conditions with the only difference being the fertilizer. Each plant is supported so that it grows straight up and does not bend. For 60 days total, once per day the height of both plants were recorded by camera-based sensors.

The company wants to hire you to analyze the data they've collected (see files `x_grow.csv` and `y_grow.csv`) to learn what you can and submit a report with your findings. They need to know the answer to at least the following four questions below. You may need to interpret the questions, assuming that they are asked by someone who may not be very technical and instead infer what they might reasonably mean and try to answer it.

Questions

1. Does changing the fertilizer from one to the other seem to make a meaningful difference?

2. How fast did the plants grow on each brand of fertilizer?

3. The shoots have to be a minimum of 3m for us to sell them. How long until we can choose to sell the shoots grown with x-grow? What about y-grow?

4. x-grow costs about $1 per plant and y-grow costs about $1.25 per plant. Which one do you think we should go with?

Extra crdit (worth 20 points): We have space to grow 20,000 plants. How much money will we save over the next 2 months (60 days) if we go with your choice over the other option?

Submission

You may work in teams of up to 3 people on this project, or choose to do it by yourself. You only need to submit one report to Crowdmark, but you need to include all of your group member's names on it if you work in a group.

Your report should include answers to at least questions 1-4 above, and should include some explanation of how you obtained your answers or other justification where necessary - this may entail including some or all of the code you used in the report and or including an explanation of your methods to get each answer.

Rubric

Your final submission will be graded according to the following. There are a total of **150 points** available, plus 20 points extra credit.

Formatting (30%):

Excellent (45 pts) - The design of your paper is well thought out and easy to read.

Above Average (40 pts) - Formatting of the paper enhances readability.

Satisfactory (35 pts) - Formatting is neutral, does not actively help or harm the paper.

Unsatisfactory (20 pts) - The formatting actively makes reading the paper more difficult.

Communication of Ideas (40%):

Excellent (60 pts) - Ideas are conveyed clearly and thoroughly.

Above Average (50 pts) - Some explanations could be better.

Satisfactory (40 pts) - Some ideas may be vague or missing.

Unsatisfactory (20 pts) - It is difficult to understand what is being said.

Calculation (30%):

Excellent (45 pts) - Answers all four questions in a satisfying way for both a technical and nontechnical audience. Demonstrates mastery of multiple numerical methods. Multiple visuals included.

Above Average (40 pts) - Answers all four questions in a way that would satisfy a technical audience. Demonstrates some knowledge of numerical methods. Includes at least one visual.

Satisfactory (35 pts) - Most questions are answered to a degree that would satisfy a technical audience.

Unsatisfactory (20 pts) - One or more questions are left almost entirely unanswered. Explanations would not satisfy a technical audience.