VE 414 Project

20 points

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1 Instructions

1.1 Format

Each of you need to be in one and only one 3-member team for the project. The project will be graded according to the following three aspects:

1. Oral Presentation of your work (8 Pt: 4 Pt from peer review, 4 Pt from instructor)
2. A Poster report of your work (6 Pt)
3. Accuracy and efficiency of your algorithm (6 Pt)

Each of those three aspects has an equal weight. Each member of the same team will receive the same project mark. Note: I will give you **1 bonus point** if your team has members from different majors/ grades.

1.2 Timeline

The poster is due on Sunday of the exam week (12/19). Please submit the poster and your code by 12/19 via canvas. The oral presentation will be scheduled on the last week before final (12/6 - 12/10). Each team will have 15 minute to present the work. (13 min for the presentation, 2 min for Q&A)

1.3 Expectation

Your method should have its roots in Bayesian analysis. However, your method does not need to be something that we have covered in class. It is expected that you read academic articles as well as textbooks. Your poster should summarize important aspects of your research on the problem effectively. Your poster should be easy to read and understand, and is visually appealing. We do not expect you to present all aspects of what you have done during the presentation. However, we expect you as a group to know very well what you have done so that you can explain to us if we choose to ask a question on a different aspect

of your solution. You can use any programming language and any package. But you need to understand the theoretical basis for the library you have used. We expect at least 1 hour of work from each student per week to be put into the project.

2 Background Story

We are going to solve a problem in the wizarding world of Harry Potter In the Forbidden Forrest of Hogwarts, there is a kind of magic tree, known as Jiuling, not only it is always invisible but it has no physical form, thus cannot be seen or detected even by someone as power and as wise as Albus Dumbledore. However, the fruit of Jiuling trees, known as Tayes, can be seen without any problem once it reaches the ground. Hermione Granger started her master project to wield data science to determine the number of Jiuling trees in the Forbidden Forest.

Every time students have a class in the Forbidden Forrest, they have to walk from the entry on Hogwarts' side, but Hagrid uses an ancient and secret spell to Apparate all students back to the Hogwarts Castle once the class is over. In order to complete her master project, Hermione has secretly cast a spell on Harry Potter, Ron Weasley and herself. The spell activates every time when they are in the Forbidden Forrest. It records the position of the person under the spell at an 1-minute interval, and records the number of Tayes **close by** (less 1 meter away) on the ground and the number of Tayes **not too far away** (less 3 meters away) on the ground from the person. It is known that the spell is perfect in terms of the position of the person, and the number of Tayes close by. However, the spell is known to be inaccurate when comes to recording the number of Tayes not too far away. But the precise nature of this inaccuracy is not known. Over the years, the spell has collected all those information for various trips that each person attended Hagrid's class. Hermione knows the Forbidden Forrest is 107 meters wide and 107 meters long. She also researched the origin of Jiuling. It turns out they were created and planted by Godric Gryffindor in the beginning of Hogwarts as a symbol of eternal knowledge and learning. You never see the true form of it, because it has none, but you see the fruit of learning and having knowledge. Jiuling never dies, and cannot move around or be stolen. Since Godric Gryffindor never told the secret about how to create and plant Jiuling. The number of Jiuling has never changed over the history of Hogwarts.

3 Your Task

The followings are the tasks for you as Hermione to do:

Task 1

Since the spell that Hermione used is not a common spell, the first thing to do is to understand what have been recorded by the spell. Graphs of the locations and information that is

available are very much useful. You should include at least one graph in your poster, and one graph in your presentation.

Task 2

The main task is to estimate the number of Jiuling in the Forbidden Forrest, then the location of Jiuling. The estimated number of Jiuling and their locations will largely affected by your assumptions. You first need to make sure you know and understand all the assumptions your model is based on. As long as your assumptions are consistent with the data, whether those assumptions are correct "in practice" is a secondary objective.

Task 3

Propose what we will need in order to address the main task if Jiuling can actually move!