**深 圳 大 学 实 验 报 告**

**课程名称：­ 概率论与数理统计**

**实验项目名称：Conditional Probability and Bayes Rule in Python**

**学院： 电子与信息工程学院**

**专业： 电子信息工程**

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**班级： 04**

**实验时间： 2024年10月12日**

**实验报告提交时间： 2024年10月28日**

**教务处制**

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| Aim of Experiment:   1. Learn to use Numpy to solve probability problems and use Matplotlib to plot figures about probability and so on. 2. Verify the conditional probability and Bayes rule in Python. |
| Experiment Content:   1. Calculate the probability of each face of a fair die. 2. Calculate the probability of the event that outcome of trail is even. 3. Calculate the specified conditional probability using Baye’s Rule. 4. Conduct a conditional probability analysis for math scores. |
| Experiment Process：   1. Die Rolls    1. Import some modules, Matplotlib, Numpy, and Ipywidgets.    2. Set the seed value of the random number generator.    3. Write a function partial block which simulates n random die rolls that are recorded into a array of Numpy.    4. Calculate the probability of each face and visualize them using Matplotlib.    5. Use similar process above to calculate the probability of the event that outcome is even. 2. Conditional Probability and Baye’s Rule    1. Calculate the ,    2. Consider that the probability of A being picked is equal to he probability of B being picked, thus there are .    3. Based on Conditional probability, we get that , .    4. We get that the probability of the white balls being picked is .    5. Based on Baye’s Rule, we get that 3. Conditional probability analysis for math scores    1. Import Pandas and Matplotlib    2. Read the whole data file from folder.    3. Choose G3 and studytime to analyze.    4. Plot the probability of each studytime interval.    5. Plot the probability of low and high score.    6. Plot Probability of study interval given that the student gets a high score.    7. Plot the probability of low and high score.    8. Plot the Probability of high score given study interval. |
| Data Logging and Processing:   1. Die Rolls   When n =1000, we get:    Figure 1:Empirical and theoretical probabilities of the 6 faces  When n = 8469, we get:  Figure 2:Odds of rolling an even number   1. Conditional Probability and Baye’s Rule   Add print code to show the probability of the randomly chosen ball belonged to urn A given that it is white, as shown in Figure 3.    Figure 3:P(A|w)   1. Conditional probability analysis for math scores     Figure 4:the probability of each studytime interval    Figure 5:the probability of low and high score    Figure 6:Probability of study interval given that the student gets a high score    Figure 7:Probability of high score given study interval |
| Experimental Results and Analysis:   1. Die Rolls    1. For Empirical and theoretical probabilities of the 6 faces, we clearly know that the probability of each face occurring is same ideally and this die is a fair die.    2. From Figure 2, we also know that while n increases, the empirical probabilities of , is approximately equal to theoretical probabilities. 2. Conditional Probability and Baye’s Rule    1. Based on Conditional Probability and Baye’s Rule, we successfully calculate the probability of randomly chosen ball belonged to urn A given that it is white. 3. Conditional probability analysis for math scores    1. From the Figure 6, we know that if a student get a high score, his study time most likely is 2 to 5 hours.    2. From the Figure 7, we know that if a student’s study time is 5 to 10 hours, he will get high score most easily. |
| 指导教师批阅意见：  成绩评定：  指导教师签字：  年 月 日 |
| 备注： |

注：1、报告内的项目或内容设置，可根据实际情况加以调整和补充。

2、教师批改学生实验报告时间应在学生提交实验报告时间后10日内。