**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： Axiom of Probability 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9月8日**

**实验报告提交时间： 2024年9月30日**

**教务处制**

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| Aim of Experiment:  1. To master the basic syntax of Python.  2. To employ probability and statistics tools to solve practical problems.  3. To prove the axioms of probability in Python.  4. To exercise the operations of sets in Python. |
| Experiment Content:  1. To estimate the probability that n flips of a fair coin will result in number of “heads” between k1 and k2.  2. To Pass the Final Test without error.  3. To exercise and evaluate the operations of sets in python and prove the inclusion-exclusion. |
| Experiment Process：   1. Probability 2. Use magic command to import Matplotlib and Numpy. 3. Understand ***np.random.rand*** function and use this function to write ***seq\_sum***, which generates n random coin flips from a fair coin and return the number of heads. 4. Write a function, ***estimate\_prob***, that estimate the probability by running m different trials of ***seq\_sum***and return the desired probability. 5. Successfully pass the Test Your Functions. 6. Sets 7. Import product from itertools. 8. Write the function ***complement\_of\_union*** that first determines A∪B and then evaluates the complement of this set and output the tuple: 9. Write the function ***intersection\_of\_complements*** that evaluates the intersection of complements of A&B and output the outcome of the function 10. To prove the inclusion-exclusion, write the function ***union*** to evaluate the union’s size and output the ordered pair 11. Write the function ***inclusion\_exclusion*** and use the inclusion-exclusion formula to determine , then output the tuple 12. Given that the inclusion-exclusion principle, write the function ***Union3*** to evaluates the size of the union, then output the tuple 13. Write the function ***inclusion\_exclusion3*** and uses the inclusion-exclusion principle to determine the size of the union, then output the tuple |
| Data Logging and Processing:  Data Logging:  Exercise 1   |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | Times | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | Heads | 53 | 56 | 54 | 49 | 49 | 52 | 49 | 47 | 53 | 47 |   Exercise 2   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Times | 1 | 2 | 3 | 4 | 5 | | Probability | 0.690 | 0.681 | 0.674 | 0.704 | 0.699 |   Processing:  For exercise 1, the average number of heads is  For exercise 2, the average of probabilities is |
| Experimental Results and Analysis:  1.Based on the average number of heads above, we can think that the probability of n flips of fair coins is 0.5, even though it is not exactly equal to 0.5.  2.By the operations of Set in Python, we prove that inclusion-exclusion principle. |
| 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。