**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： Application of Central Limit Theorem**

**学院： 电子与信息工程学院**

**专业： 电子信息工程**

**指导教师： 陈昌盛**

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**班级： 04**

**实验时间： 2024年12月2日**

**实验报告提交时间： 2024年12月28日**

**教务处制**

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| Aim of Experiment:   1. Familiar with the central limit theorem. 2. Understand the implementation of the central limit theorem in python. 3. Know how to visualize data in different distributions. |
| Experiment Content:   1. Learn what are samples and the sampling distribution 2. Learn the central limit theorem 3. Demonstrate CLT using simulations in Python 4. Application of CLT in Investing/Trading 5. Master visualization |
| Experiment Process：   1. Learn back information about samples, sampling distribution and central limit theorem 2. Demonstrate CLT using simulations in Python    1. Exponentially distributed population       1. Define the PDF of this population       2. Calculate the mean of this population       3. Calculate the standard deviation of this population       4. Randomly sampling 50 times from this population with random samples size of 2       5. Calculate the mean of each sample and plot them       6. Repeat the above process with sample size of 500       7. Check the mean and the standard deviation of the 50 samples       8. Compare the estimated standard deviation of the 50 sample with the value stated by CLT    2. Binomially distributed population       1. Randomly sampling 50 times from this population with random samples size of 2       2. Calculate the mean of sample means and compare it with the value stated by CLT       3. Calculate the standard deviation of sample means and compare it with the value stated by CLT 3. Application of CLT in Investing/Trading    1. The great Assumption of Normality in Finance       1. Fetch the ITC stock data from yfinance library       2. Calculate daily log return       3. Visualize the daily log return       4. Plot a simple histogram with title ‘Actual values of Daily log returns over time’       5. Plot a simple histogram with title ‘Distribution of Daily log returns’    2. More visualization exercises       1. Load the data from directory       2. Extract the information from data       3. Plot them in histogram with label and title    3. Additional exercise       1. Load the data of temperature of Detroit       2. Calculate the moving average temperature in 7 days       3. Plot them |
| Data Logging and Processing:   1. Demonstrate CLT using simulations in Python    1. Exponentially distributed population       1. Drawing 50 random samples       2. Distribution of the mean of 50 random samples:       3. Distribution of 50 random samples:       4. The first 5 values from the 50 samples means:       5. The mean and the standard deviation:    2. Binomially distributed population       1. Distribution of 50 random samples:       2. The mean of 50 random samples:       3. The standard deviation of 50 random samples: 2. Application of CLT in Investing/Trading    1. The great Assumption of Normality in Finance       1. Fetching the ITC stock data from yfinance library for the past 10 years       2. Plot them    2. More visualization exercises       1. Load the data from directory and plot them    3. Additional exercise       1. Load the data of temperature of Detroit and Plot them |
| Experimental Results and Analysis:   1. Demonstrate CLT using simulations in Python    1. Exponentially distributed population       1. Results:       2. Analysis: the results are close to the ideal value from CLT, which means we successfully simulate CLT using python    2. Binomially distributed population       1. Result:       2. Analysis: the results are close to the ideal value from CLT, which means we successfully simulate CLT using python 2. Application of CLT in Investing/Trading    1. The great Assumption of Normality in Finance       1. Results:       2. Analysis: two diagrams indicate that daily log return main distributes between -0.05 and 0.05 centralized at 0    2. More visualization exercises       1. Results:       2. Analysis: the temperature mainly is between 270 and 295, which means the city probably is located to the north    3. Additional exercise       1. Results:       2. Analysis: the temperature changes Periodically every year, which corresponds to season. |
| 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。