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CENG 327: Introduction to Scientific Computing
Homework 2

1 Discussion for 2nd question

Uniform Distribution:

- Pi Estimate: 3.141112
- The Uniform distribution gives a good estimate close to the actual value of Pi. This is expected since the points are evenly spread in the square, providing a fair representation of the quarter circle.

Normal Distribution:

- Pi Estimate: 3.245072
- The Normal distribution doesn't perform well in estimating Pi. Points generated with a normal distribution cluster around the mean, resulting in an inaccurate representation of the quarter circle.

Chisquare Distribution:

- Pi Estimate: 3.360452
- The Chisquare distribution provides a poor estimate of Pi. The points are not evenly distributed across the entire square, leading to an inaccurate estimation of the quarter circle.

Poisson Distribution:

- Pi Estimate: 3.554072
- The Poisson distribution gives a very poor estimate of Pi. Uneven distribution of points results in a highly inaccurate representation of the quarter circle.

Power Distribution:

- Pi Estimate: 1.999368
- The Power distribution doesn't provide an accurate estimate of Pi. The distribution of points doesn't match the characteristics needed for an effective Monte Carlo simulation in this context.

Rayleigh Distribution:

- Pi Estimate: 3.17634
- The Rayleigh distribution gives a poor estimate of Pi. Uneven distribution of points leads to an inaccurate representation of the quarter circle.

Overall Comparison:

- **The Uniform distribution yields the best estimate of Pi**. In our Monte Carlo simulation, the Uniform distribution proves to be the most dependable for estimating Pi. Its fair representation is guaranteed by the equal likelihood of points across the unit square. The uniformity across all x-values sets it apart from distributions that introduce variations or asymmetry. The Uniform distribution's consistent accuracy makes it the preferred choice for Pi estimation.
- Normal, Chisquare, Poisson, Power, and Rayleigh distributions perform poorly in estimating Pi due to uneven point distributions and failure to cover the entire square effectively.

Table 1 shows the Pi estimates obtained with various distributions.

Distribution	Pi Estimate
Uniform	3.141112
Normal	3.245072
Chisquare	3.360452
Poisson	3.554072
Power	1.999368
Rayleigh	3.17634

Table 1: Pi Estimates for Different Distributions

2 Plots for 3rd question

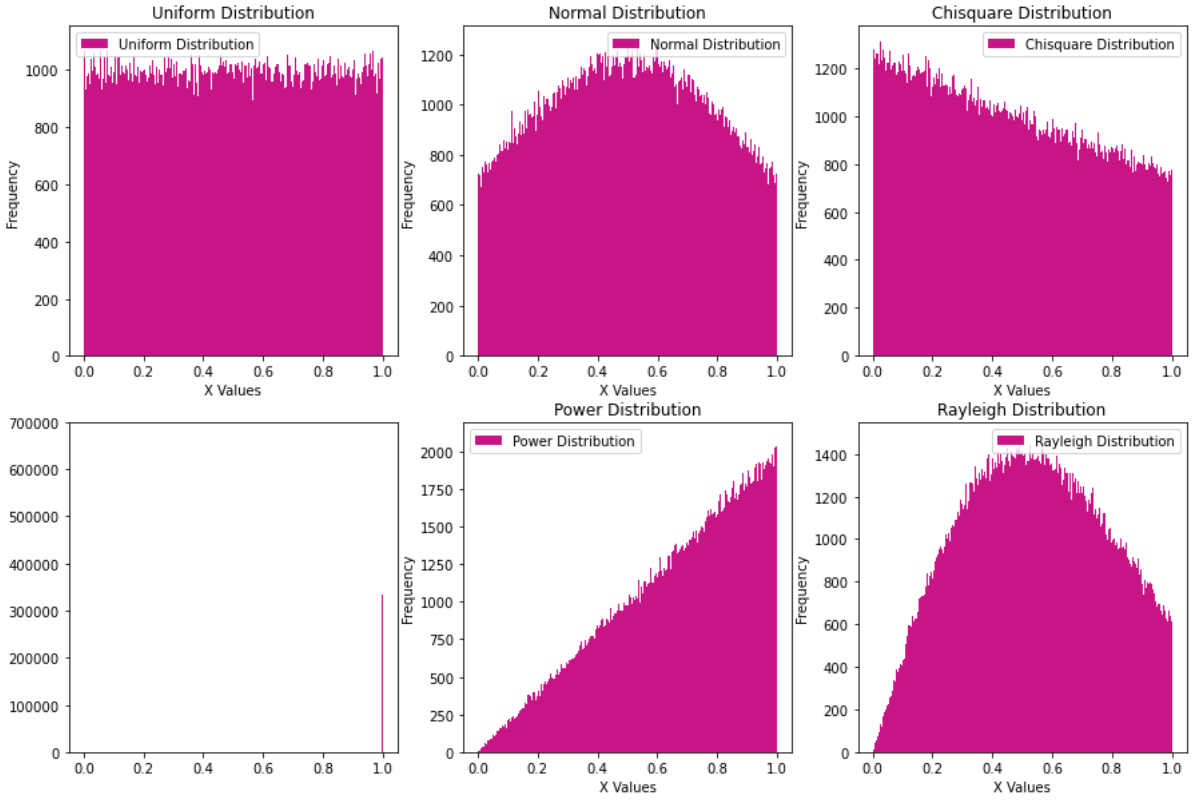

Figure 1: Histograms of Values Generated by Different Distributions

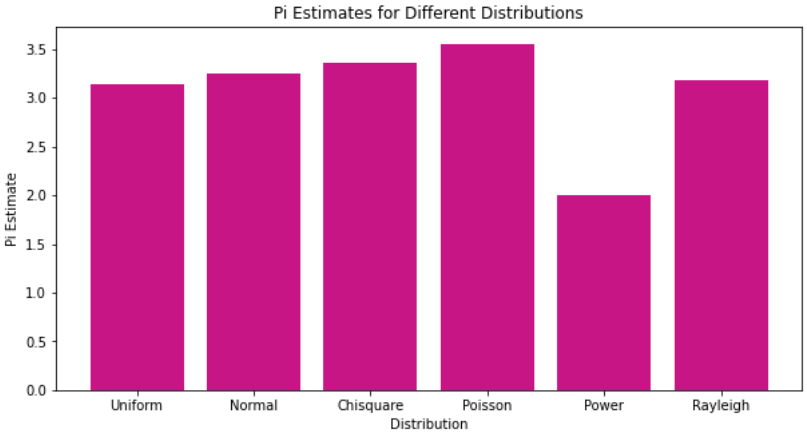

Figure 2: Pi Estimates for Different Distributions