Data Analysis and Interpretation

Report

Week One | Assignment One

Anish Kulkarni, Parth Jatakia, Toshi Parmar, Vedant Basu

28 September 2016

---

1 Assigned Responsibilities

The following Responsibilities were designated to each team member:

Week	Role Assigned	Member
Week One	Leader	Vedant Basu
	Coder	Parth Jatakia
	Website Manager	Anish Kulkarni
	Report Writer	Toshi Parmar

Table 1: Week By Week Summary of Assigned Roles

2 Summary of Work Done

1. **Webpage Designing**
   Anish designs the webpage considering appropriate specifications with the help of Google Sites.

2. **Familiarising with Python 2.7**
   Members familiarise themselves with Python 2.7 & the matplotlib library by plotting Gaussian(Fig 1), Binomial(Fig 2) & Poisson distributions(Fig 3) for three different parameter values. Following are the plots for respective distributions-

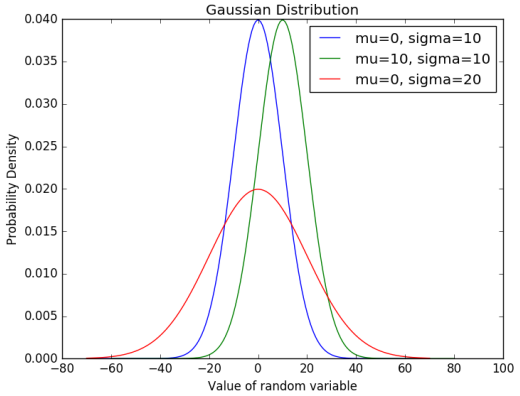


Figure 1: Gaussian Distribution

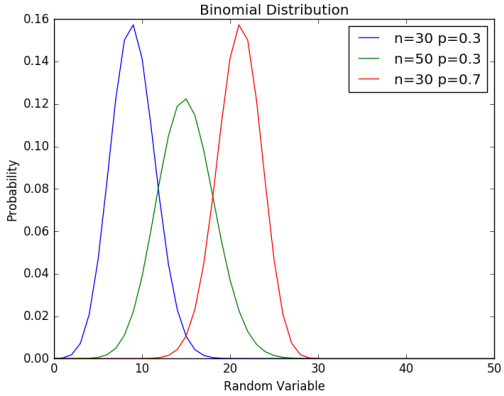
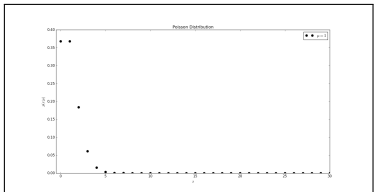
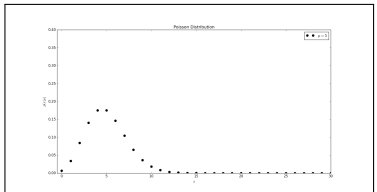


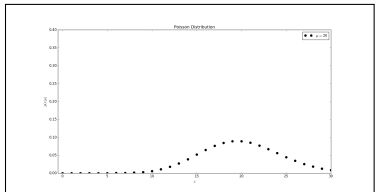
Figure 2: Binomial Distribution



(a) Poisson Distribution, $\mu = 1$



(b) Poisson Distribution, $\mu = 5$



(c) Poisson Distribution, $\mu = 20$

Figure 3: Poisson Distribution

3. **Algorithm for Monte-Carlo Estimation of π**
   Discussion ensued in the first meet of the team to decide an efficient algorithm to carry out the Monte-Carlo Approximation. Method followed is -

   (a) Generating random numbers.
   Using numpy's $numpy.random.uniform(-1, 1, 2000)$ command which draws random numbers from a uniform distribution in the interval, 4000 random numbers for the abscissa and ordinate of points are generated.

   (b) Finding π for each iteration.
   No. of points which lie inside the circle (distance less than the radius of circle, $r = 1$ are calculated(n). The value of π in this iteration is -
   $$\boxed{\pi_i = 4\frac{n}{2000.0}}$$

   (c) Mean value of π, Sample Width, Standard Deviation & *Error*.
   The mean value of π is the average of all sample values obtained from 500 iterations of the former two steps.
   $$\boxed{\pi = \sum_{i=1}^{500} \pi_i}$$
   Next up, the sample width of our distribution is estimated as the standard deviation of the π values.
   And the standard deviation of our data can be estimated as-
   $$\boxed{\sigma = \frac{No.of Trials}{No.of Trials - 1}}$$
   Error in the data is equalled to the standard deviation of our data, i.e. σ.

   (d) Plotting the Histogram[4]
   $The matplotlib library's Histogram generating function is used with bin size equalled to 500^{0.5}$ (since it is an ideal central factor for 500 observations) which approximates to 23.
   The histogram is *normalised* to 1.

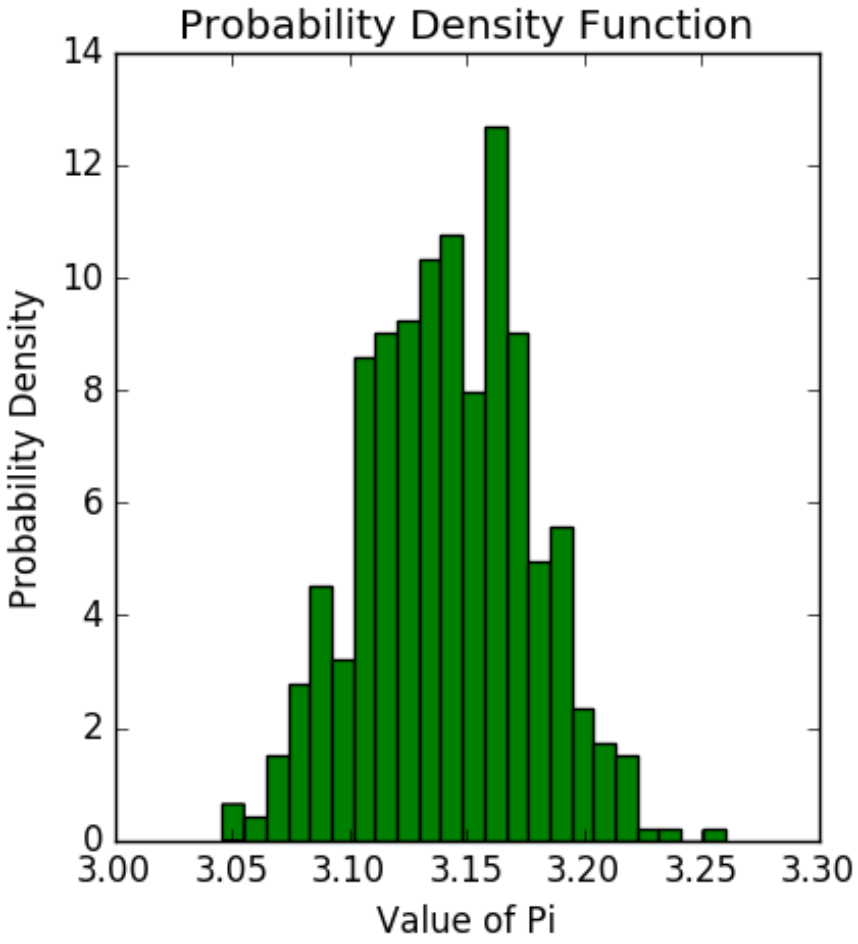


Figure 4: Approximation of π