<p style="text-align:center">PH 4130/PH 6130 Assignment 2</p>

<p style="text-align:center">Deadline **28** January 2020 before **17:00 hrs**</p>

All problems have equal weightage of 20 points each. Please show the source code used for each of the problems. Please don't hesitate to ask questions if you're stuck anywhere. The final assignment must be submitted as a pdf filex

1. In the class, we demonstrated the Central Limit Theorem for a sample drawn from a uniform distribution. Reproduce a similar plot for a sample drawn the from chi-square distribution with degrees of freedom equal to 3, for samples drawn once, 5 times, and 10 times. Either plot all of these on one multipanel figure similar to AstroML figure 3.20. (20 points)
   (Hint: look up `numpy.random.chisquare` and show the distribution of x from 0 to 10)

2. The luminosity and redshift of galaxy clusters from XMM-BCS survey (details available at arXiv:1512.01244) can be downloaded `http://www.iith.ac.in/~shantanud/test.dat`. Plot the luminosity as a function of redshift on a log-log scale. By eye, do you think the datasets are correlated? Calculate the Spearman, Pearson and Kendall-tau correlation coefficients and the p-value for the null hypothesis. (20 points)

3. Wind speed data from the Swiss Wind Power data website can be found at `http://wind-data.ch/tools/weibull.php`. Using the data provided on the website, plot the probability distribution and overlay the best-fit Weibull distribution (with the parameters shown on the website). (20 points)
   (Hint : A on the website is same as λ, which was used in class to parameterize the Weibull distribution.)

4. Generate two arrays of size 1000 drawn from a Gaussian distribution of mean of zero and standard deviation of one. Calculate Pearson correlation coefficient and its $p-$value using `scipy` module. Also check if the $p-$ value agrees with that calculated using the Student-t distibution.