PhD Course on Network Science, Pisa, Italy

Ex. 1 — (Network analysis)
You are asked to study a real network trace investigating in particular the aspects covered during the first lessons (diameter, average distance, clustering, degree distribution, etc.). You have also to compare the actual trace with the average characteristic of an Erdös-Rényi (ER) graph with the same number of nodes and the same average degree, obtained by generating an adequate number of graph samples. Partial answers, like bounds or Monte Carlo estimations for the quantities of interest, will be taken into account.
You can develop from scratch your own code (in C, Java, Python or MatLab), but you are strongly invited to use NetworkX (`http://networkx.lanl.gov/`).
Write a short report with your results and your code.
In the table below you can find the list of traces. All the traces are available at `http://snap.stanford.edu/data/index.html`. Directed networks have to be studied as undirected. If a network has multiple components, you can simply study the largest one. In order to determine the number of your trace, sum the decimal ASCII codes of the first 4 letters of your family name (all capitals) and take the rest of the division by 6. *Example: Family name=NEGLIA,* $N = 78$*,* $E = 69$*,* $G = 71$*,* $L = 76$*.* $(78+69+71+76)\%6 = 0$*, then the trace to work on is trace* 0 *soc-Epinions1.*

Trace number	Trace name	Nodes#	Edges#
0	soc-Epinions1	75,879	508,837
1	soc-sign-Slashdot081106	77,357	516,575
2	soc-sign-Slashdot090216	81,871	545,671
3	soc-sign-Slashdot090221	82,144	549,202
4	loc-Brightkite	58,228	214,078
5	email-Enron	36,692	367,662

Table 1: Traces.

In alternative you can decide to perform some experiments to test some of the properties of Erdös-Rényi graphs we studied in class.