Homework 3

Task 1 (10 points)

1) Use a temporal network (e.g. one of the email-Eu-core temporal network from Stanford Network Analysis Project) to complete this task.
2) Construct a static network from the temporal data until <u>half</u> of the links ($N_e/2$) appear.
3) Perform the following link prediction methods:
   - Common neighbors
   - Adamic-Adar
   - Local path index (you can use any parameters you want)
4) Rank the not connected node pairs according to their distances for each measure.
5) Check what fraction of the first $N_e/2$ links in the rankings belongs to the originally existing links.

Task 2 (10 points)

1) Download the daily closure stock price data of at least 50 stocks from January 2015 to November 2020. (You can use e.g. stocks in the Standard & Poor's Index.)
2) Extract the daily stock return r(t) defined as r(t)=ln(P(t+1))-ln(P(t)) where P(t) is the daily closure stock price.
3) For each year obtain the minimum spanning tree (MST) by using the distance d(ij) defined as d(ij)=1-rho(ij) as dissimilarity measure between stock i and stock j. (rho(ij) is the Pearson cross-correlation between return ri(t) of stock i and return rj(t) of stock j.) Comment on the networks obtained.
4) Compare minimum spanning trees of successive years computing the Jaccard measure about them. The Jaccard measure is defined as the number of edges (for example the edge between NKE and SBUX), which are present in both networks divided by the total number of distinct edges present in both networks.

Deadline: 2 December 23:59