# Network Analysis Project
## Social Data Management

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February 9, 2018

## 1 Study case

The *ego-Facebook* dataset of the Stanford Network Analysis Project was used for the purpose of the analysis. It consists of an unidirected, unweighted graph describing a subset of the social circles on the network.

## 2 Environment

The study was led on a **Python 2.7** conda environment enriched with network analysis-centered packages **NetworkX**, and **python-louvain**.

- **NetworkX**: NetworkX is a Python package for the creation, manipulation, and study of the structure, dynamics, and functions of complex networks. Most of the needed algorithms are present in this packages; namely degree and clustering coefficient calculation, all pairs shortest path determination, as well as centrality computation.

- **python-louvain** This module implements community detection.

  It uses the Louvain method described in [**?**]

The full list of dependencies is described in the requirements.txt file of the GitHub repository of the project.

## 3 Minimum Requirements

### 3.1 Number of nodes and edges

For graph $\mathcal{G}$:

$$L = 88234, N = 4039$$

### 3.2 Graph plot

### 3.3 Degrees

#### 3.3.1 Real network

Degree distribution seems to follow a power law, with an average degree equal to $\langle k \rangle = 43.6910126269$

#### 3.3.2 Random network

Degrees follow the distribution $K$:

$$K \sim \mathcal{B}(N - 1, p)$$

where

$$p = \frac{\langle k \rangle}{N - 1}$$

The average degree is equal to the real network's.

### 3.4 Clustering coefficient

#### 3.4.1 Real network

Clustering coefficient distribution is described in this graph

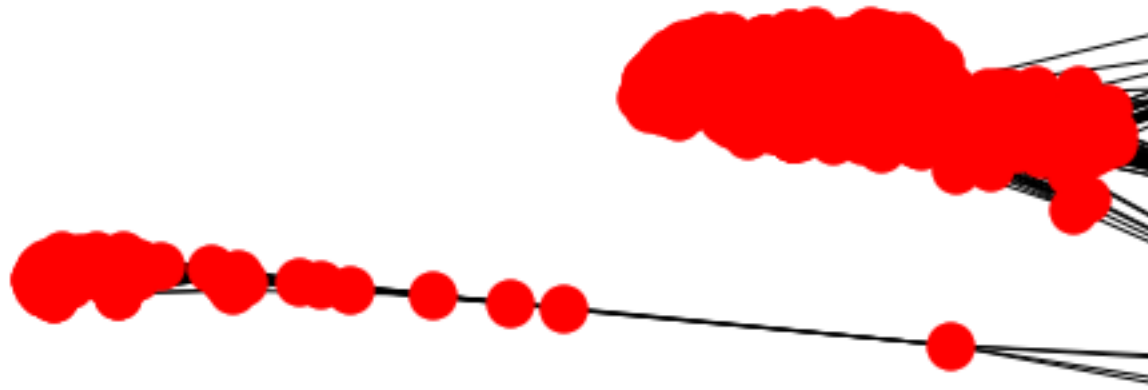Figure 1: ego-Facebook network



Figure 2: Degree histogram of $\mathcal{G}$

Figure 3: Degree histogram of $\mathcal{R}$