Social Networks & Recommendation Systems

IV. Network metrics.

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MSc program in Data Science has been developed
as a part of task 10 of the project
„NERW PW. Science - Education - Development - Cooperation”
co-funded by European Union from European Social Fund.

Project

Power law in the real data - case study

Excercise 1.

Import the data, draw their histogram.

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Excercise 5.

Which chart is the most readable? Which is most robust for the noise?

Power law in the real data - case study continuation

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Use the linear regression to the previous plots to determine the parameter α estimator.

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Compute (formula and value for our data) MLE estimator for α with aknown $x_{\min}$ assuming following distribution

$$\mathcal{P}(x) = \frac{\alpha - 1}{x_{\min}} \left(\frac{x}{x_{\min}} \right)^{-\alpha}.$$

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How will the result change if we do not know $x_{\min}$?

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Warning!

Excercises 1-8 in total are worth 30% points for the project.

Case study – summary

P4.1 Collect obtained scripts for power distribution analysis in one file. We will use them again and again. [20%]

Nearest neighbors degree in practice

P4.2 Prove that for uncorrelated network $\langle k \rangle_{nn}(k_i) = \frac{\langle k^2 \rangle}{\langle k \rangle}$. [20%]

P4.3 Determine the dependence of the average degree of the nearest neighbor on the degree of the vertex for selected real or artifical networks. [20%]

P4.4 Check how random edge switching affects the result of the previous task. [20%]

Correlation coefficient in practice

P4.5 Make the derivation omitted on the lecture slide. [20%]

P4.6 Find the correlation coefficient for the network from task P3.4 (before and after edge switching). [20%]

What real networks are?

Let's check!

Network's name	$\leftrightarrow$?	N	E	$\langle k \rangle$	α	ℓ	r
...	...	...	...	...	...	...	...

P4.7 Let's fil the above table with metrics od selected real networks, use the built-in functions for counting the parameters. Compare the results with the literature. [50%]

Erdős numer – empirical data

Erdős Number Project

`oakland.edu/enp/`

P4.8 Analyse the data on the ENP website. Draw histograms of the Erdős number for the Nobel prize and the Fields medal laureates. [20%]

Inspiration for the final project?

Bacon number

Oracle of Bacon

`oracleofbacon.org`

P4.9 Check the Bacon number of selected actors. Draw a histogram of Bacon number among Oscar winners. Who will find the actor with the highest Bacon number? [20%]

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