



Universität  
Zürich<sup>UZH</sup>



Blockchain & DLT  
Research Group



# Network Science HS24

## *Assignment 5*

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**Blockchain & Distributed Ledger Technologies Group**

FOR STUDIES PURPOSES ONLY

UZH Blockchain Center  
Faculty of Business, Economics and Informatics  
University of Zurich  
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# 1 Community Detection

1. (3 points) For the provided network datasets find the communities using (a) the greedy modularity maximization by Clauset Newman and Moore Clauset et al. [2004] and (b) the label propagation algorithm. Assign to each community a color and draw the resulting graph, where each node is colored after the community it belongs to, while community internal links and inter-communities links are clearly recognizable.

*Hint: in order to make the visualisation meaningful, tune nodes and links colours, e.g. internal links are black and external links are light gray)*

*Hint:*

*the greedy modularity maximization algorithm Clauset et al. [2004] is available as `greedy_modularity_communities()`.*

*Label propagation algorithm is available as `label_propagation_communities()`.*

2. (3 points) Randomise each network and repeat the exercise at point (1). Compare the number of communities obtained before and after randomisation and the quality of community detection before and after randomisation.

## Datasets provided

- `graph_madrid.gml`: A network of associations among the terrorists involved in the 2004 Madrid train bombing, as reconstructed from press stories after-the-fact Cardillo et al. [2013].
- `graph_starwars.gml`: Network of interactions in Star Wars episode 4. Nodes are characters and edges represent a co-appearance in the same scene Gabasova [2016].
- `graph_korea.gml`: The network represents women in Korea discussing family planning. Edges represent a planning discussion Sonquist [1984].
- `graph_karate.gml` Nodes represent members of a Karate club and Edges represent a tie between two members Zachary [1977].
- `graph_dolphins.gml` Dolphin social network: Nodes represent dolphins and Edges represent frequent associations observed among a group of 62 individuals Lusseau et al. [2003].

## References

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