Community Detection and Applications

Research Activities – PCOG Yearly Team Meeting

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Contribution in ComplexNetworks2020

A different perspective on the state-of-the-art, based on locality of the approaches.

Local Community Detection

Introducing our own algorithm that outputs all the communities of a network benefiting from local information of a node at each step.



Providing several experiments to validate our model, its quasi-linear time complexity, and the ability of self-defining source nodes.







Applications

SNT

- Bio-networks: Functional interpration [1]
- Epidemic disease targeted immunization [2]
- Privacy-preserving solution : Sybil attack [3]

[1] Rahiminejad, Sara, et al. "Topological and functional comparison of community detection algorithms in biological networks." *BMC bioinformatics 20.1* (2019)



[2] Gupta, Naveen, et al. "Community-based immunization strategies for epidemic control." *IEEE COMSNETS*. 2015 [3] Amoretti, Michele, et al. "Local-First Algorithms for Community Detection." *KDWeb*. 2016.

Work Flow – Applications





[1] Rahiminejad, Sara, et al. "Topological and functional comparison of community detection algorithms in biological networks." *BMC bioinformatics* 20.1 (2019)

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Does AI Help Humans to Take More Intelligent Decisions?



Finlayson, Samuel G., et al. "Adversarial attacks on medical machine learning." Science, 2019.



Explainable AI: XAI

What we want from AI?

- Systems that do not harm people
- Incoperate ethcial values
- Make human more intellegent!

XAI: Science and technology for the eXplanation of AI decision making

Explainable AI is the basic building brick for preserving and expanding human autonomy, and helping humans make better decisions

- To **empower** individuals against undesire effects of automated decisions making
- To **implement** GDPR
- To help making better decisions
- To **preserve** and expand human autonomy



Find more on EU: https://www.humane-ai.eu/research-roadmap/

What is a Good eXplanation?



- End users
 - Am I being treated fairly?
 - What could I do differently to get a positive outcome?
- Data scientists
 - Is my system working as designed?



Research Lines of XAI



• Algorithms and model for Explainable AI

To develop a logical/statistical framework a family of algebras of explanations of adequate expressiveness, capble to tackle

- The Explanation by Design XbD
- The Black Box Explanation BBX



Wish you a great Christmas Holiday!

Saharnaz



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Thank You!