

CyFinder, an App for Analyzing Biological Networks

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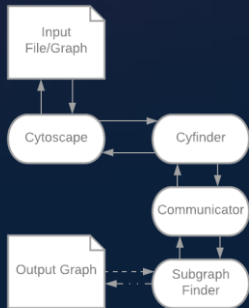
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PROBLEM

CyFinder is a Cytoscape plug-in; Cytoscape is software to graph biological networks; the purpose of CyFinder is to process graphs where nodes are proteins or genes and edges are their interactivity between them; our task was to implement and review certain community detection algorithms such as an infomap.

SYSTEM DESIGN



CURRENT SYSTEM

The work was on understanding the topic well--reading multiple academic papers on the topic--and implementing the infomap algorithm, afterwards we also improved its performance.

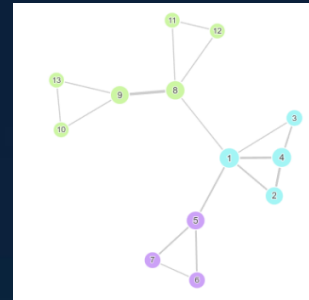
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ABCB1	BIRC5	352
ABCB1	CDKN1A	215
ABCB1	CTSD	235
ABCB1	EGF	800
ABCB1	EGFR	284
ABCB1	ERBB2	623
ABCB1	ESR1	247
ABCB1	GLI1	227
ABCB1	GSTP1	823
ABCB1	IGF1	224
ABCB1	IL6	217
ABCB1	JUN	832
ABCB1	MGMT	643
ABCB1	NME1	274
ABCB1	NR3C1	216
ABCB1	PGR	402
ABCB1	PTEIN	247
ABCB1	PTGS2	800
ABCB1	TGFB1	215
ABCB1	TP53	959
ABCG2	AKT1	815
ABCG2	ATM	916
ABCG2	BAD	297
ABCG2	BIRC5	287
ABCG2	CDH1	163
ABCG2	CDK2	218
ABCG2	CDKN1A	216

verification

$$L(M) = \left(\sum_{i=1}^m q_{i\cap} \right) \log \left(\sum_{i=1}^m q_{i\cap} \right) - 2 \sum_{i=1}^m q_{i\cap} \log (q_{i\cap}) - \sum_{\alpha=1}^n p_{\alpha} \log (p_{\alpha}) + \sum_{i=1}^m \left(q_{i\cap} + \sum_{\alpha \in i} p_{\alpha} \right) \log \left(q_{i\cap} + \sum_{\alpha \in i} p_{\alpha} \right).$$

IMPLEMENTATION

Communities were structured by using the map equation to develop an average bit length for a network and then checking the modularity gain when a node was moved to a new module until the bit length stays consistent.



REQUIREMENTS

Java 11. is used to implement the plug-in

Apache ant is used to create jar files

Cytoscape 3.9.1: the plug-in is made for this platform



SUMMARY

- This project required research into the map equation and infomap algorithm.
- The infomap equation was also implemented into Cytoscape through an a gui option in the CyFinder plug-in
- Some work from the previous developers was also refined.

REFERENCES

- Edler, D., Bohlin, L., & Rosvall, M. (2017). Mapping higher-order network flows in memory and multilayer networks with Infomap. Scientific Reports, 7(1), 1-13. doi: 10.1038/srep46689
- Rosvall, M., & Axelsson, D. (2009). The map equation. The European Physical Journal Special Topics, 178(1), 13-23. doi: 10.1140/epjst/e2010-01179-1

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