Weekly Update 3

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1. Weekly Progress

1.1. Literature Review

- Study: *Maximal Labelled-Clique and Click-Biclique Problems for Networked Community Detection* (Hogan, Esposito)

  Clique A completely connected subgraph of an undirected graph. Used to model network communities.

  Biclique A subgraph induced by subsets of vertices (L, R) of an undirected bipartite graph with vertices such that there is an edge between every pair of vertices belonging to LXR.

  Labelled-Graph An unweighted, undirected graph $G = \langle V, E \rangle$ whose vertices are labelled by a subset of elements chosen from a finite discrete set of labels L.

  Labelled-Clique (LC) A subset of vertices $V' \subseteq V$ and a subset of labels $L' \subseteq L$ such that *(i)* there is an edge between every pair of vertices in V' and *(ii)* for every such vertex v, v is labelled using all the labels in L'

  Joined-Graph A network two disjoint sets of vertices U and V with edges between vertices of V and between a vertex in U and a vertex in V. There are no edges among vertices in U.

  Clique-Biclique (CBC) Two sets of vertices $\langle U', V' \rangle$ s.t. *(i)* $U' \subseteq U$ and $V' \subseteq V$, *(ii)* V' forms a clique in $G_R = (V, E_2)$ and (U, V) forms a biclique in $G_L = (U \uplus V, E_2)$.

- **Goal:** Interested in listing all Labelled Cliques which are maximal in a given labelled-graph and all Clique-Bicliques that are maximal in a given joined-graph. An LC or CBC is called maximal if it is not a subset of any other CBC.
- **Applications:**

- Targeted Advertising: social network analysis, can reveal important communities
- Cyber Physical Systems and Fog Computing: edge computing, could use this to allocate tasks quickly (Ex: drones)
- Hiring teams of experts: find maximal group of scientists who have worked on similar projects (can be modeled with this graph)
- Cluster Computing Orchestration: can allow virtual network service users and operators to have finer control over infrastructure
- Gene Network: How genes could potentially influence each other; association between genes and phenotypes; groups of connected genes (Ex: skin color)

1.2. Networking and Medicine/Personal Research

- *An IoT-Based Computational Framework for Healthcare Monitoring in Mobile Environments.* (Mora, et. al.) - a distributed framework based on the IoT paradigm is proposed for monitoring signals involved in physical exertion. Could potentially predict dangerous situations. `http://www.mdpi.com/1424-8220/17/10/2302/htm`
- *Shortest path based network analysis to characterize cognitive load states of human brain using EEG based functional brain networks.* (Thilaga, et. al)
- *Evolutionary and Neural Computing Based Decision Support System for Disease Diagnosis from Clinical Data Sets in Medical Practice.* (Sudha) - using machine learning for mining inferences in large clinical databases to assist clinician in strategic decision making; Uses ASIC decision support system. `https://link.springer.com/article/10.1007%2Fs10916-017-0823-3`

2. To-Do

- ☐ Create own dataset
- ☐ Social network dataset
- ☐ Metagenomics dataset