BSDS3002 A3 Part II report
Yvonne Yaqi JIN
3035535339

Q3. Construction and summary Information of the bipartite network

After imported the dataset, we constructed an undirected, bipartite network with 772 nodes and 1206 edges. The summary information are as follows.

a. The number of nodes in the **insect** node set is 679, which means there are 679 types of insects in the dataset. The number of nodes in **plant** node set is 93, which means there are 93 types of plants in the dataset. In addition, based on further exploration of the dataset, we found that there are in total 81 types of species and 72 types of genera in those 93 types of plants.

b. The number of edges in the bipartite network 1206, which means there are 1206 pairs of insect-plant pollinating relationships observed in the dataset.

Q4. Degree calculation

The **insect** node with highest degree is no.196, a type of insect under genre Bombus. This means Bombus pollinated the most plants (25 different types).

The **plant** node with highest degree is no.12, a type of plant called under genre Anthriscus and under species aemula. This type of plant is pollinated by the most insects (189 different types).

Q5. Common neighbours of insects

Insects no. 196 and no.198 share the maximum number of neighbours (10), which means they are the strongest competitors to each other, pollinating 10 same types of plant together.

Q6. Project the bipartite network into two one-mode networks

- Interpreting the projected network

The edge in each projected network means the nodes connected by this edge share the same neighbours. Specifically, for the **projected insect network**, it means the two insects connected by an edge pollinate for at least one same type of plant. The weight of the edge is the number of types of plant they pollinate together. For the **projected plant network**, it means the two plants connected by an edge are pollinated by at least one same type of insect. The weight of the edge is the number of types of insects they are commonly pollinated by.

- Summary information of the two projected networks

The **projected insect network** has 679 nodes and 31443 edges, which means among the 679 types of insects, there are 31443 pairs insects that have common plant they pollinate for.

The **projected plant network** has 93 nodes and 1345 edges, which means among the 93 types of plants, there are 1345 pairs insects that have common insects that they are pollinated by.

Q7. Nodes with the largest degree centrality

- Calculation result and Interpretation

Among **insects**, no. 398 has the largest degree centrality of 0.7168, which means the type of insect share common target of pollination with 71.68% of all insects studied. Among **plants**, no. 90 has the largest degree centrality of 0.7826, which means it shares common pollinator with 78.26% of all plants studied.

- Comparison to results in Q4

The node with the highest degree measures the number of insect-plant relationships, while the result in Q7 measures the commonality WITHIN insects or plants. Even though no.12 has the largest number of insects pollinating for it, it does not necessarily mean it will need to compete with the most type of plants for the same set of insect to get pollinated.

Q8. Isolated nodes

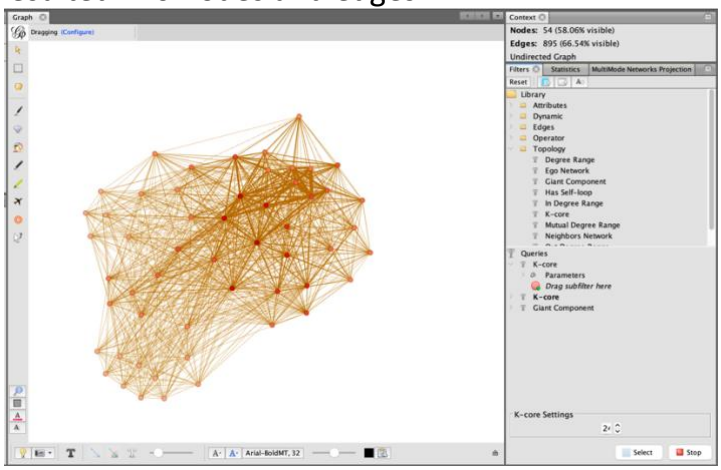
In the **projected insect network**, no. 586 is an isolated node. This means this type of insect don't pollinate for plants that other type of insects also pollinate for.

In the **projected plant network**, no. 17, no.29, no.89 are isolated nodes. This means they don't get pollinated by insects that also pollinate for other plants. Moreover, no.17 and no.89 are isolated nodes in the original bipartite network, which means no insect was found to pollinate for them during the research period.

Q9. Cluster analysis

Projected plant network

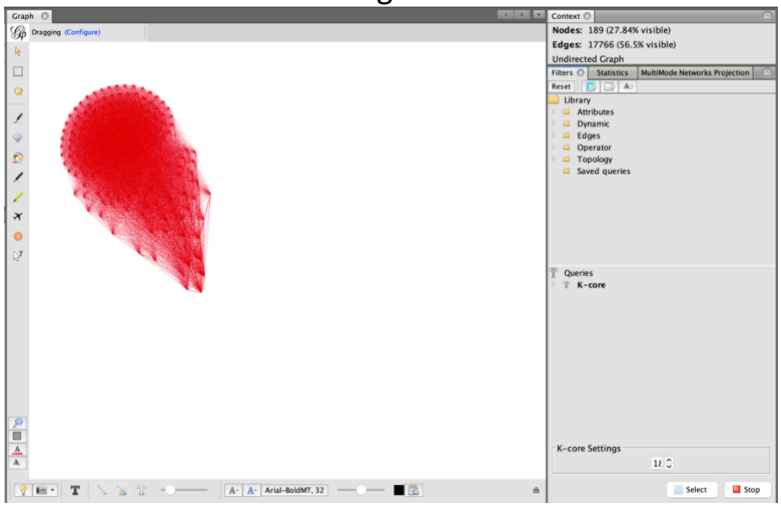
A k-core analysis with k = 24 performed in Gephi resulted in a subgraph with 58.06% of nodes and 66.54% of edges, as shown in the screenshot below. When k=25, it resulted in 0 nodes and edges.



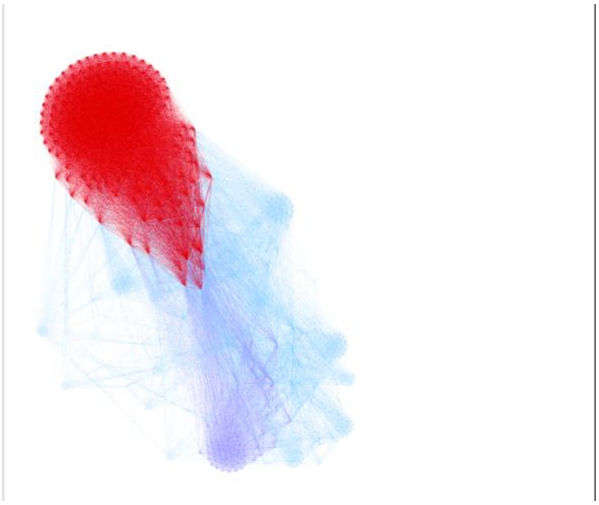
This means the **main core** of the projected plant network is with k = 24. This means the plants highlighted in brown in the following graph represents the plants is the most cohesive network which have the strongest competition to get pollinated by the same types of insects, where each plant needs to compete with at least 24 types of plants.

Projected insect network

A k-core analysis with k = 188 performed in Gephi resulted in a subgraph with 27.84% of nodes and 56.5% of edges, as shown in the screenshot below. When k=189, it resulted in 0 nodes and edges.



This means the **main core** of the projected insect network is with k = 188. This means the plants highlighted in red in the following graph represents the insects is the most cohesive network which have the strongest competition to pollinate same set of plants, where each plant needs to compete with at least 188 types of insects.



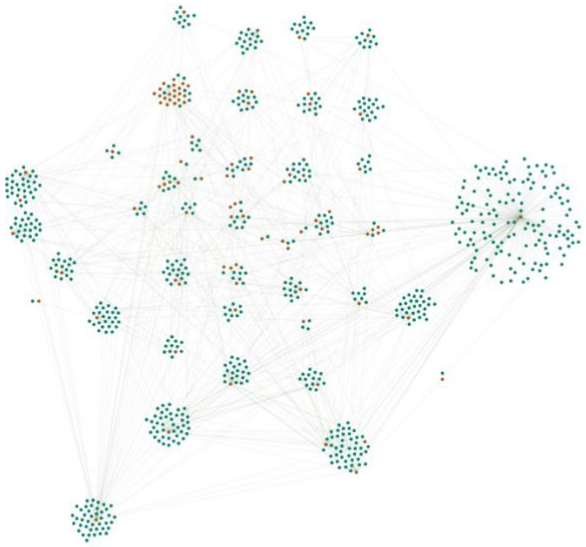
Q10. Degree assortativity coefficient

Degree assortativity coefficient is 0.1497 for the projected insect network, which means there is a weak similarity of connection for insect nodes.

Degree assortativity coefficient is -0.1510 for the projected plant network, which means there is a weak difference of connection for plant nodes.

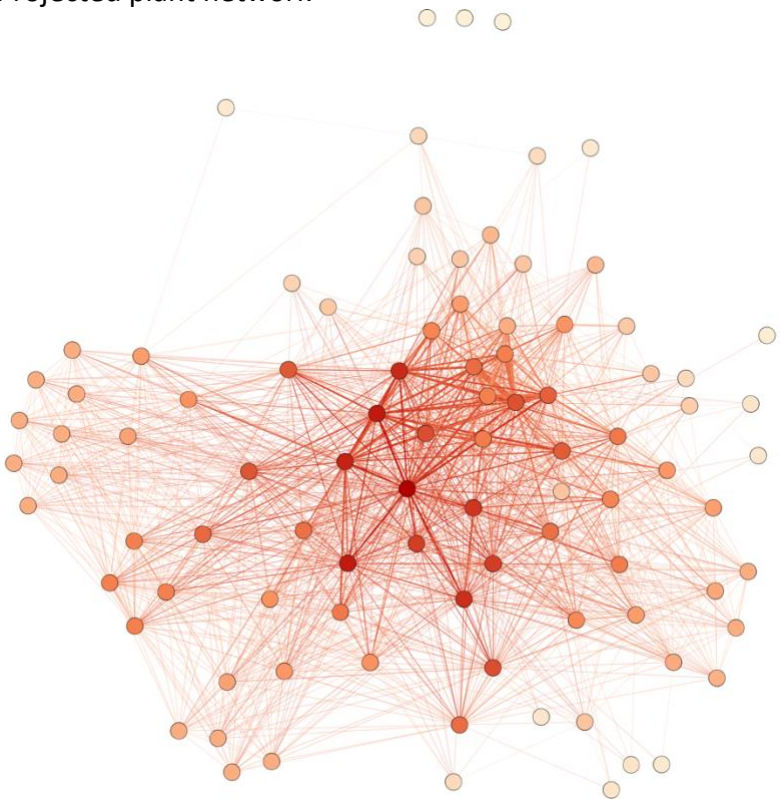
Q11. **Visualization**

- Bipartite network



- Projected insect network

- Projected plant network



*note: for the projected network, degree is shown in the darkness of color instead of size, due to Gephi malfunction.