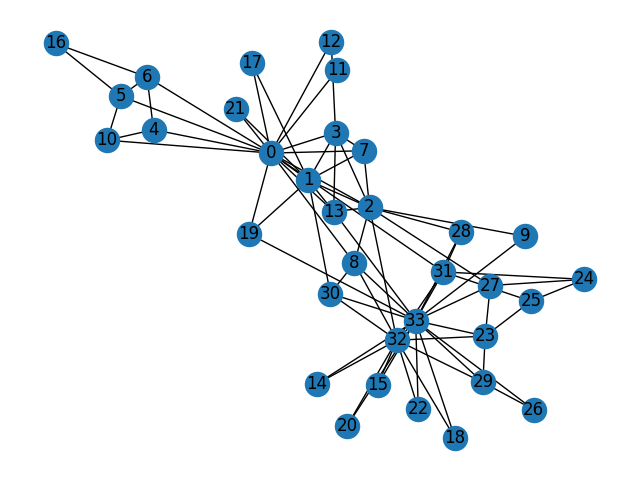
HW#1

2022711835 Junhee Kwon

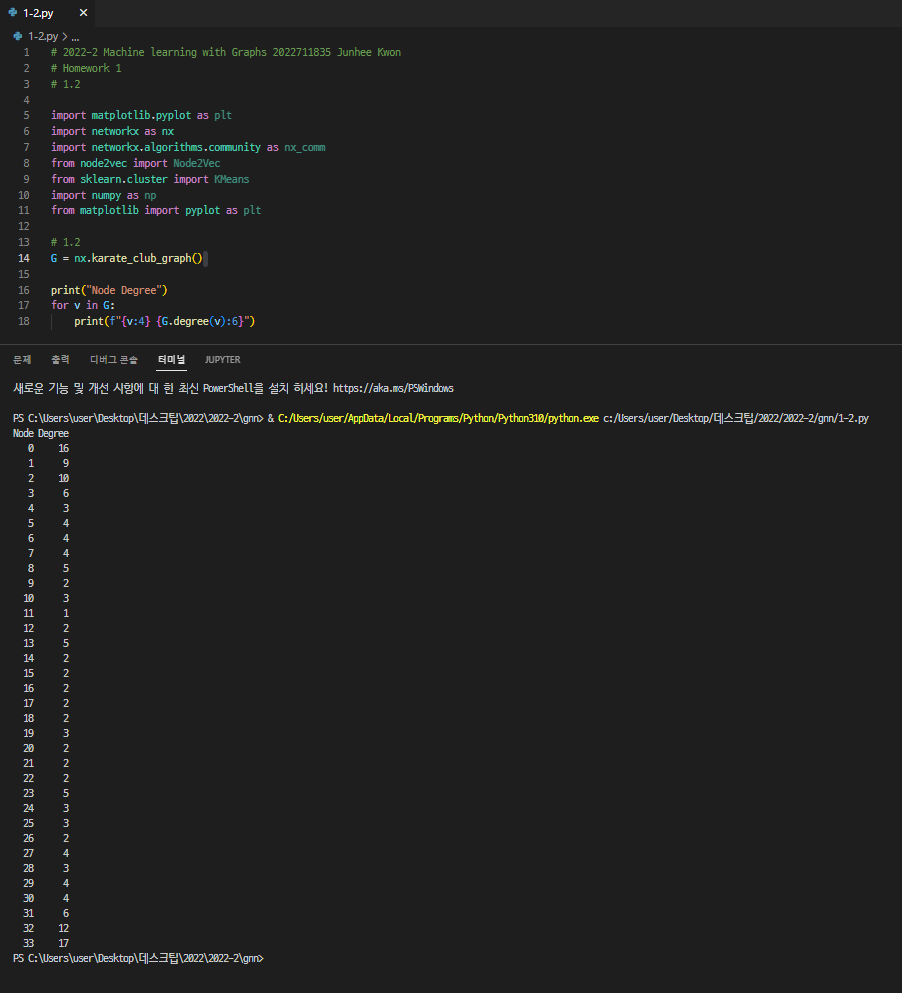
1. Data Preparation

Through matplotlib, I drew the graph of the karate club dataset.



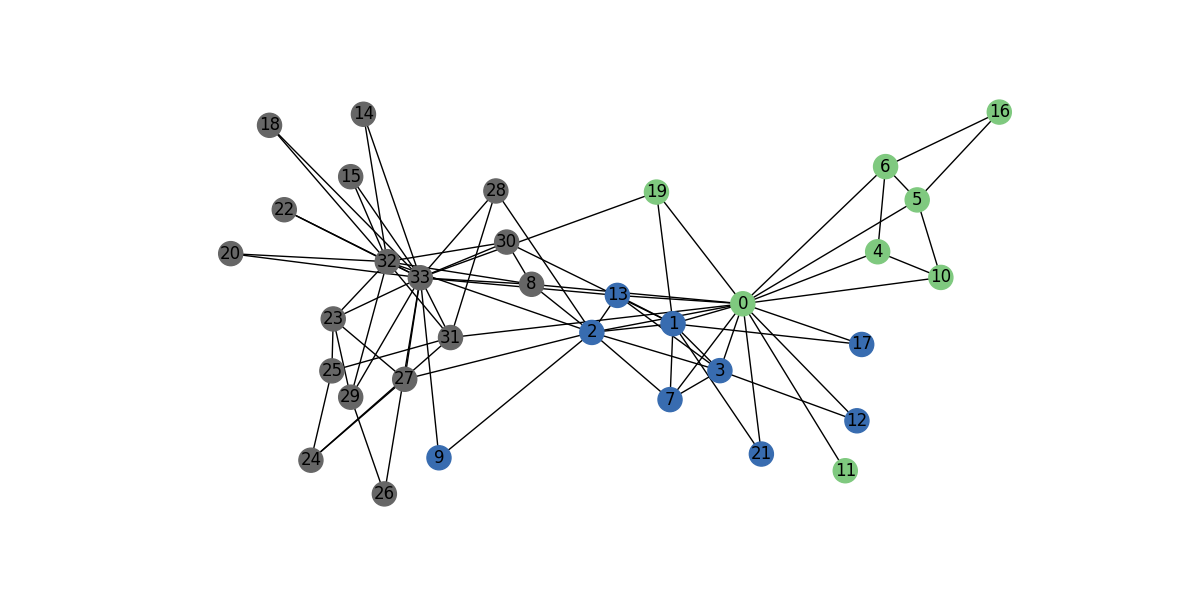
1. Degree Computation

By using the degree method of the network library, I could find the degree information of the nodes.



1. Community Detection

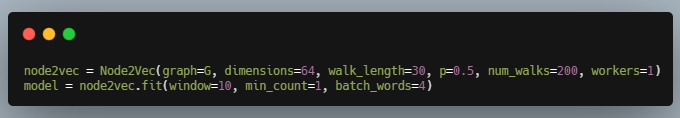
Through the *greedy\_modularity\_communities()* method of the networks library, I could cluster the nodes in 3 communities.

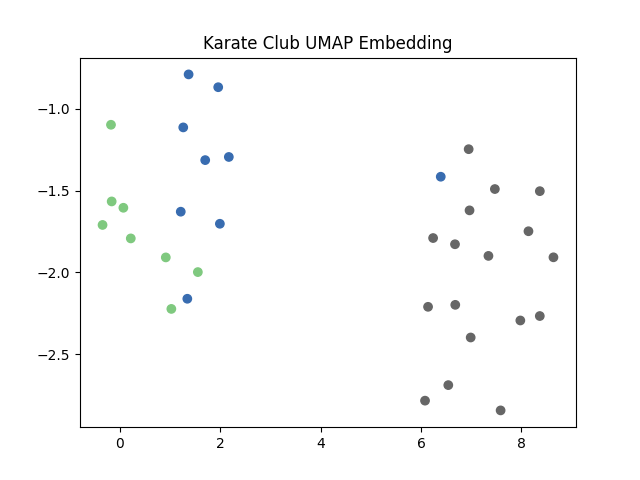


1. Learning node2vec with initial parameters

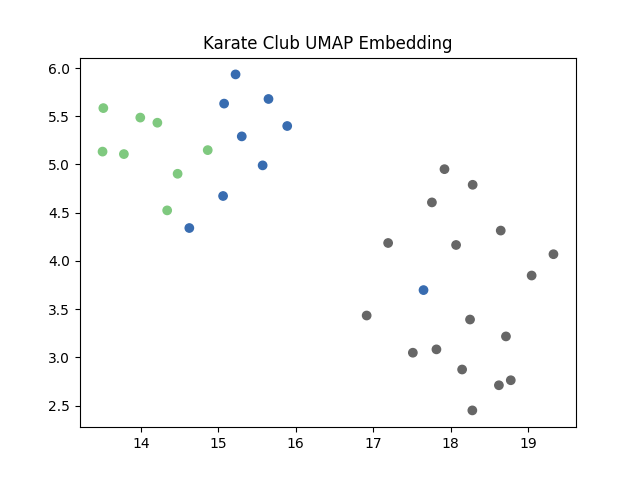
Based on the [GitHub - eliorc/node2vec: Implementation of the node2vec algorithm.](https://github.com/eliorc/node2vec) page, I set the initial values of the node2vec method.

You can check out the node2vec code with the initial values below.





1. Learning node2vec with your best parameters



To make result better than that of initial values, I tried to adjust the parameters.

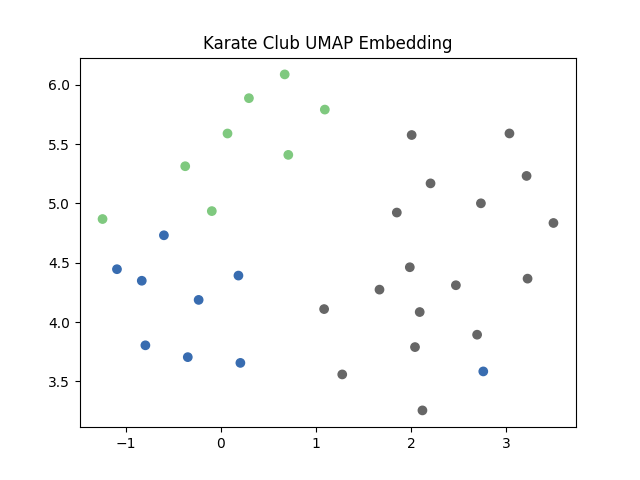
**Initial parameter**

* p=0.5 (default)
* q=1 (default)
* dimensions=64
* walk-length=30
* num-walks=200
* workers=1 (for Windows)
* windows=10

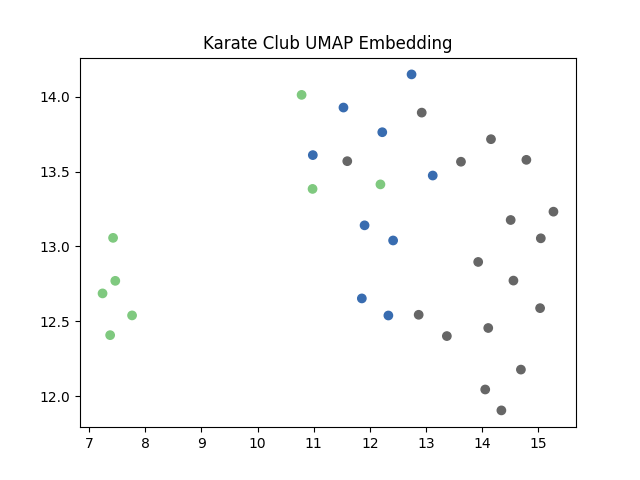
**Adjusted parameter**

* p= 0.4
* q= 0.8
* dimensions=64
* walk-length=30
* num-walks=200
* workers=1 (for Windows)
* windows=15

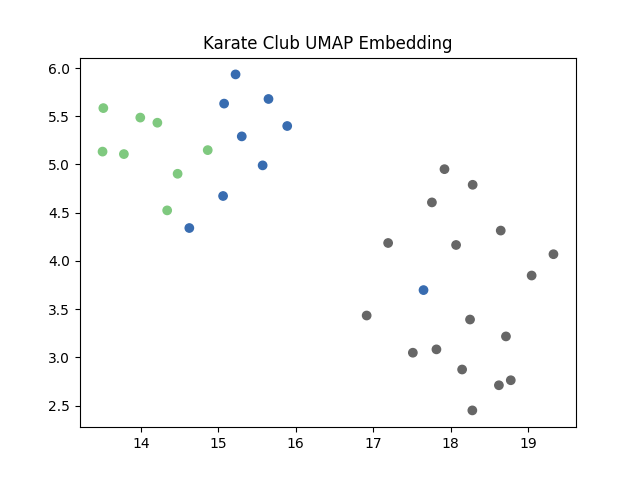
1. Values of p and q
   1. Low p and high q case can explore the graph like BFS that considers the narrow region.
   2. High p and low q case can explore the graph like DFS that considers the broad region.
   3. Low p and high q case shows the lower error than other cases. To find the community, we can use the low p and high q.
   4. Low p & High q case’s graph (Extremely)
      * It searches the nodes near the base node, but ***q*** is too big to find unrelated nodes.



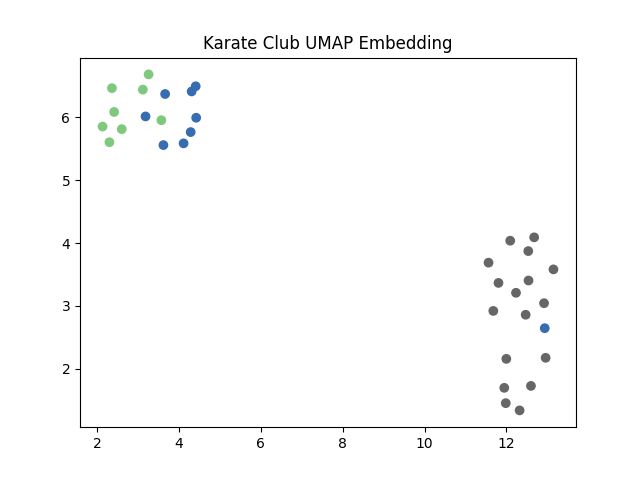
* 1. High p & Low q case’s graph (Extremely)
     + It cannot distinguish the communities, because this condition searches the nodes based on depth.



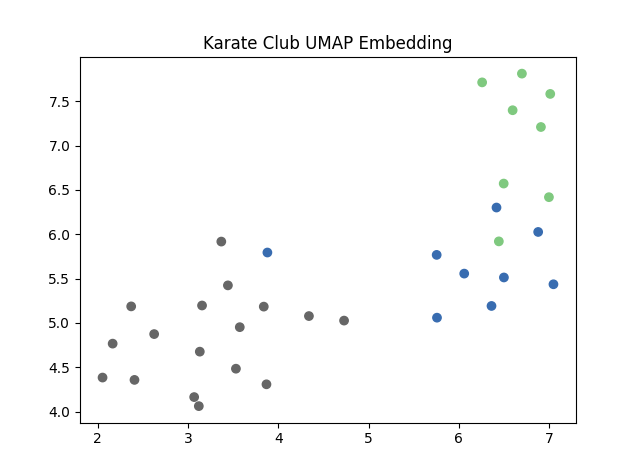
* 1. Moderately small p & large q
     + works well



1. For better result, adjusted the other parameters
   1. Change window value
      * from 10 to 15: more clustered, but green nodes and blue nodes are mixed



* + - from 10 to 5: more sparsed



* 1. Smaller and bigger walk-length made result worse
  2. num\_walks and dimension also do not have effect to the result.