Report: *PageRank for Identifying Central People in News Articles*

Introduction

This report presents the implementation and results of a PageRank-based iterative method to identify the most important people occurring in news articles. The data used is a plain text file containing an undirected and unweighted graph of a social network of co-occurrence in news articles. The graph has been constructed from a subset of 3000 news articles from the Reuters-21578 corpus by identifying person names.

Methodology

The PageRank algorithm is implemented from scratch using Python, with the power iteration method. The provided network was undirected, and therefore, before applying the PageRank algorithm, it was first converted to a directed network.

a) For each edge vertex1 vertex2, an edge in the opposite direction, i.e., vertex2 vertex1, was included.

b) The teleportation rate was set to 0.10.

Results

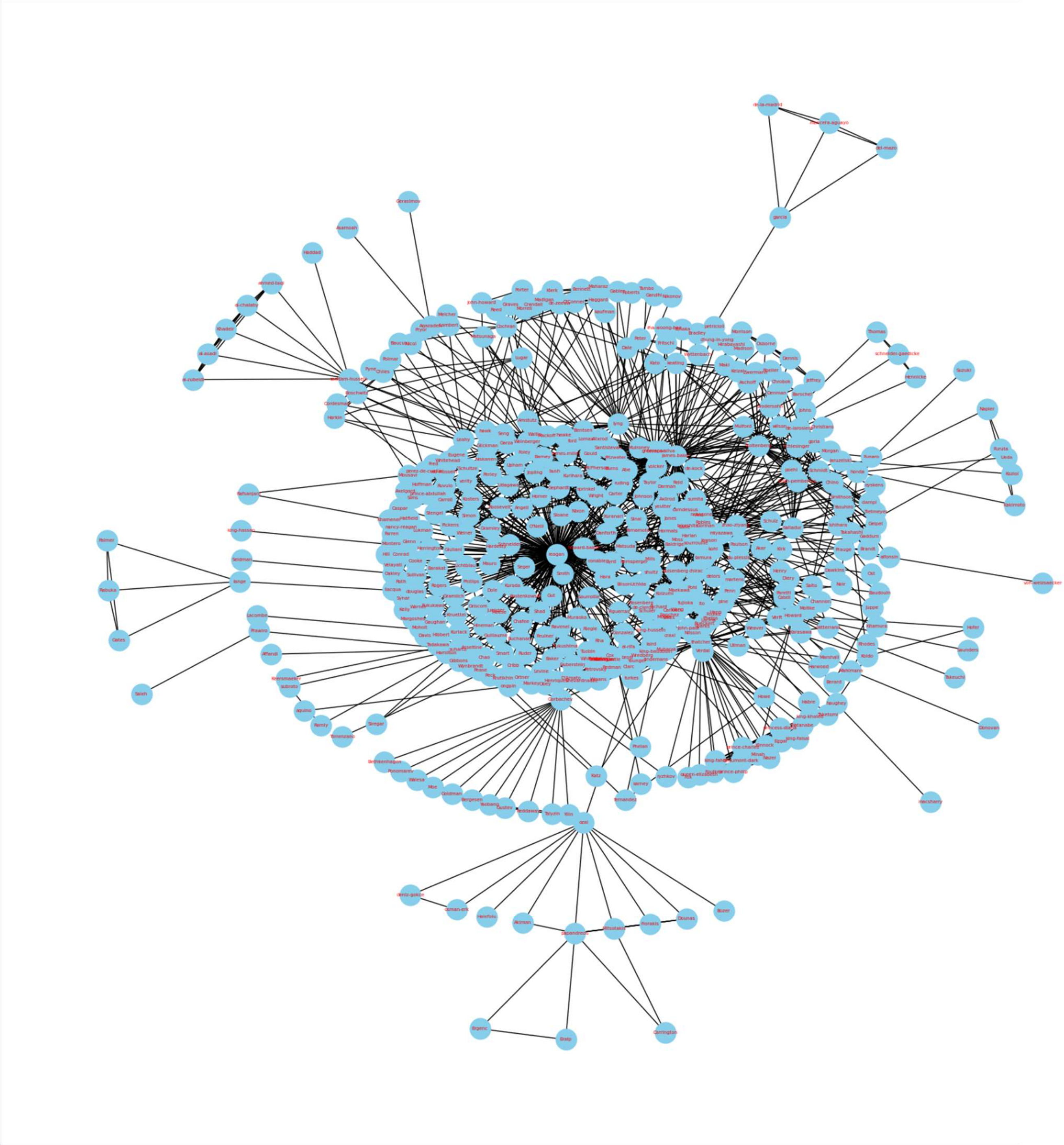
The PageRank algorithm was run on the directed network to determine the most central people in the co-occurrence graph. The names of the top 20 people, as well as their PageRank scores, are presented in the table below:

Rank	Name	PageRank Score	Node Number
1	Reagan	0.06556774409502332	Node 7
2	James Baker	0.02152838254339281	Node 2
3	Nakasone	0.016321790735326854	Node 6
4	Thatcher	0.01405100683504674	Node 38
5	Stoltenberg	0.011032520911152957	Node 43
6	Lyng	0.011001261817001048	Node 12
7	Weinberger	0.00969327172531046	Node 83
8	Volcker	0.009640655541153413	Node 3
9	Howard Baker	0.009296323591989826	Node 8
10	Yeutter	0.008759694982874483	Node 13

Rank	Name	PageRank Score	Node Number
11	Gorbachev	0.008154409808426516	Node 256
12	Greenspan	0.008039708487115724	Node 57
13	Miyazawa	0.007676814974598526	Node 33
14	Gephardt	0.007116743507893871	Node 151
15	Kohl	0.007002209233901579	Node 24
16	Poehl	0.00673408373018457	Node 45
17	Shultz	0.006181267819023077	Node 96
18	Howard	0.005893464789654408	Node 294
19	Ozal	0.005544136360031637	Node 36
20	Chirac	0.0051600557344136325	Node 31

Graph Visualization (Vertices and Nodes):

The graph of all the people given in the data with vertices, links and nodes are visualized using python as follow:



Discussion

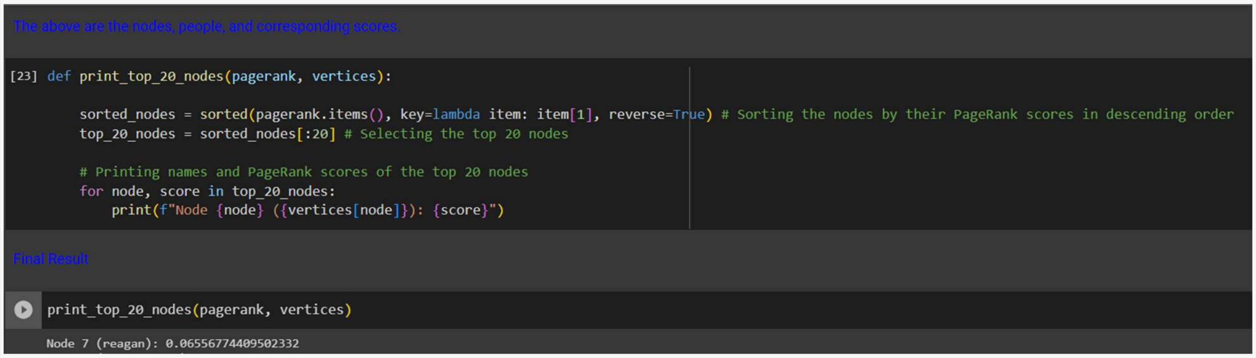
The names listed are prominent figures from the 1980s, which makes sense given that the dataset is from 1987 news articles. For example, Ronald Reagan was the 40th President of the United States during that time, and James Baker served as the Secretary of the Treasury and later as the Secretary of State under Reagan. Similarly, Margaret Thatcher was the Prime Minister of the United Kingdom, and Yasuhiro Nakasone was the Prime Minister of Japan.

This suggests that the PageRank algorithm is working as expected, identifying the most frequently mentioned and therefore presumably most important people in the news articles. However, to fully validate the results, a deep understanding of the context (i.e., the events and personalities of the time) is needed, or the results should be compared with a benchmark or ground truth if available.

This would help us confirm that our algorithm is truly capturing the essence of that fascinating decade.

Screenshots of Running Results:

Here are the screenshots of the results of our algorithm:



The above are the nodes, people, and corresponding scores.

```
[23] def print_top_20_nodes(pagerank, vertices):

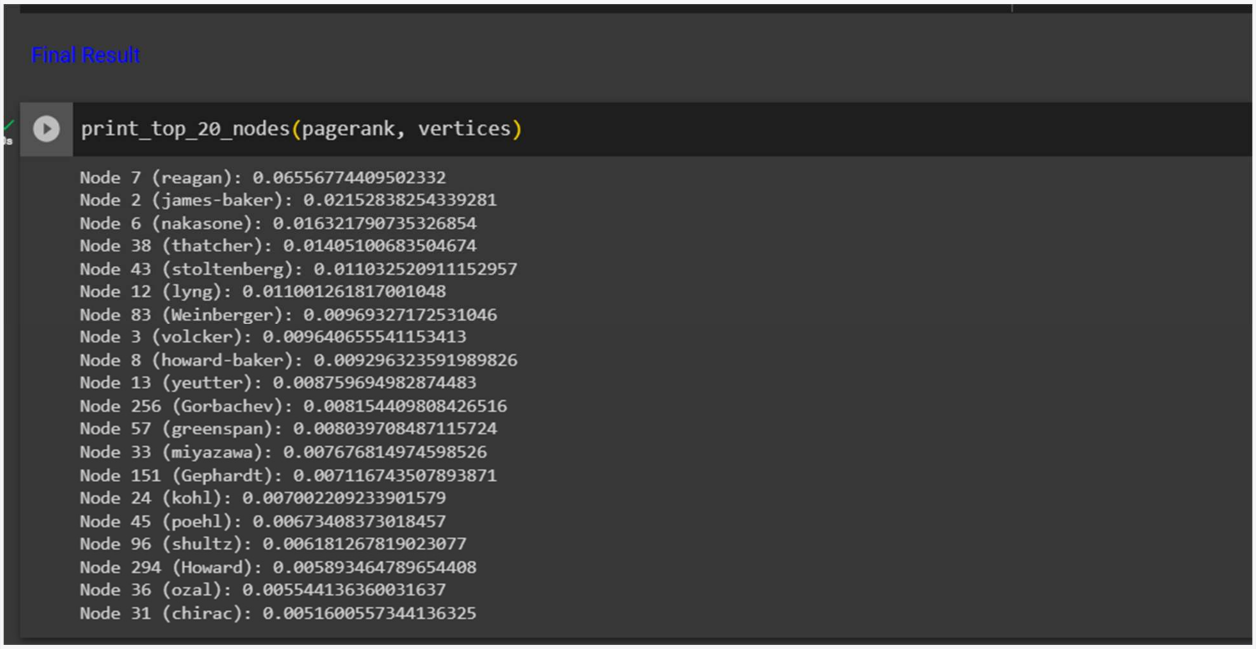
         sorted_nodes = sorted(pagerank.items(), key=lambda item: item[1], reverse=True) # Sorting the nodes by their PageRank scores in descending order
         top_20_nodes = sorted_nodes[:20] # Selecting the top 20 nodes

         # Printing names and PageRank scores of the top 20 nodes
         for node, score in top_20_nodes:
             print(f"Node {node} ({vertices[node]}): {score}")
```

Final Result

```
print_top_20_nodes(pagerank, vertices)

Node 7 (reagan): 0.06556774409502332
```



Final Result

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print_top_20_nodes(pagerank, vertices)

Node 7 (reagan): 0.06556774409502332
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Node 38 (thatcher): 0.01405100683504674
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```

Conclusion

The PageRank iterative algorithm is perfectly able to Identify Central People in News Articles as we can compare the results with the graph presented in the report.