In [ ]:
```
import pandas as pd

df = pd.read_csv('results.csv')

grouped_df = df.groupby([col for col in df.columns if col != 'TimeTaken(us)'])['TimeT
grouped_df
```

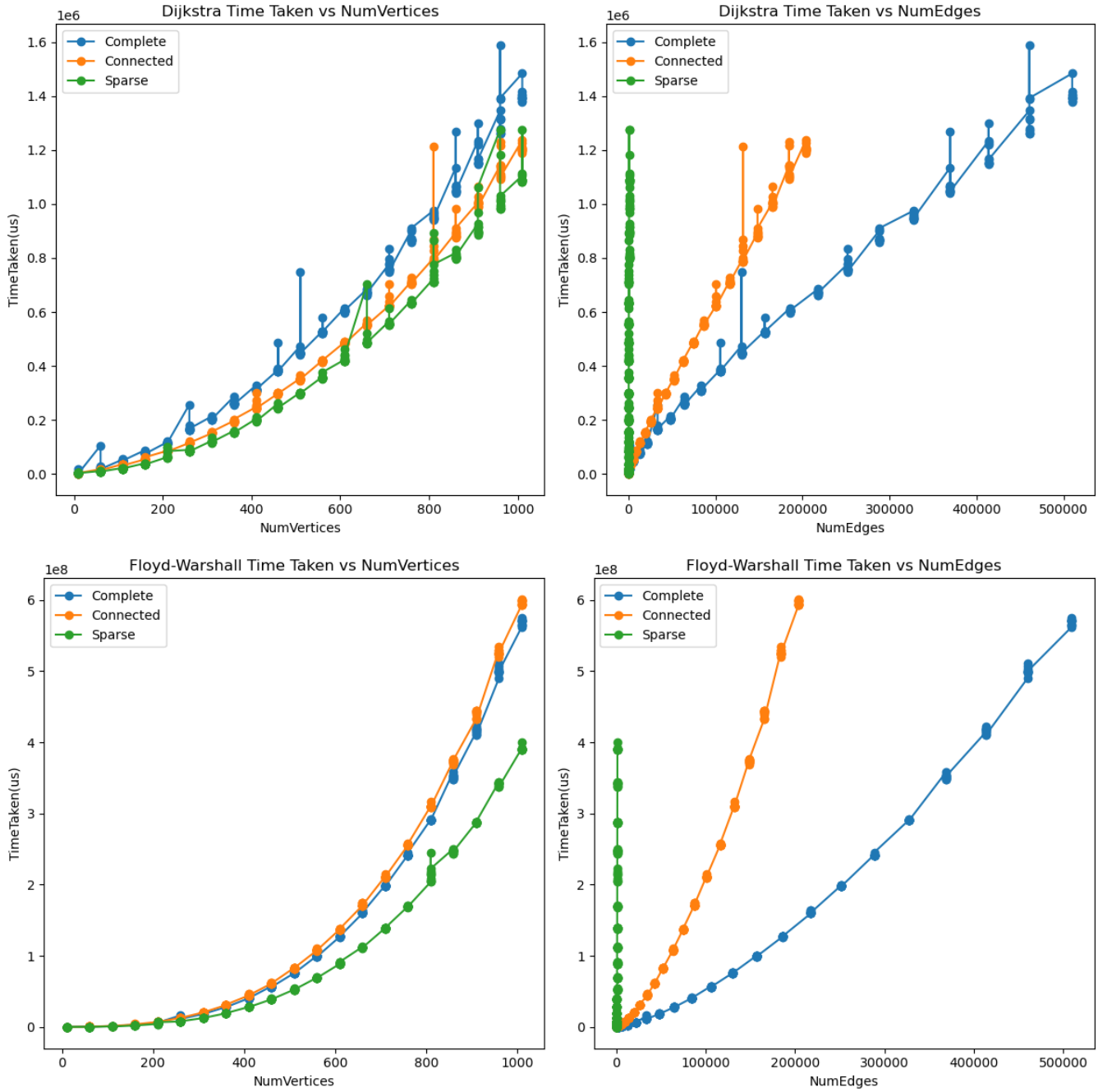
Out[ ]:

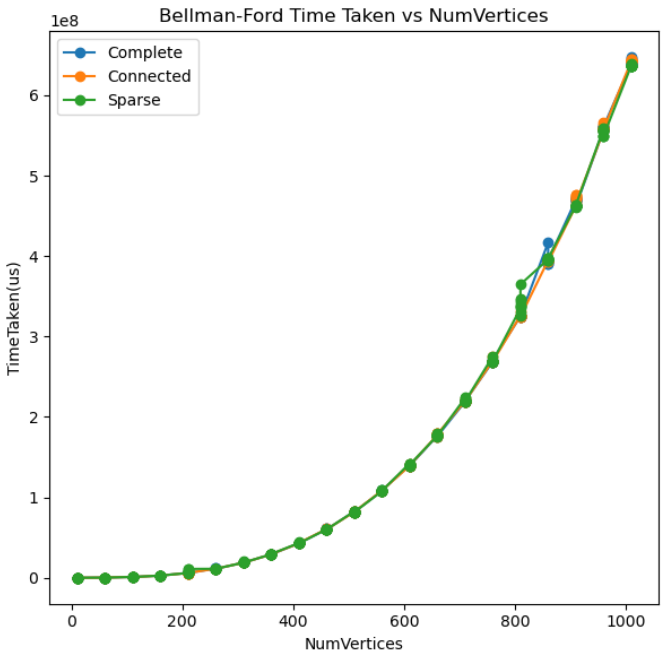
	NumVertices	NumEdges	GraphType	Algorithm	StartNode	EndNode	TimeTaken(us)
0	10	9	Sparse	A*	0	9	2010.2
1	10	9	Sparse	Bellman-Ford	0	9	4043.1
2	10	9	Sparse	Dijkstra	0	9	2936.1
3	10	9	Sparse	Floyd-Warshall	0	9	5903.6
4	10	19	Connected	A*	0	9	1857.5
...	...	...	...	...	...	...	...
247	1010	203882	Connected	Floyd-Warshall	0	1009	596705850.4
248	1010	509545	Complete	A*	0	1009	2212983.1
249	1010	509545	Complete	Bellman-Ford	0	1009	641950221.1
250	1010	509545	Complete	Dijkstra	0	1009	1404069.1
251	1010	509545	Complete	Floyd-Warshall	0	1009	568744651.3

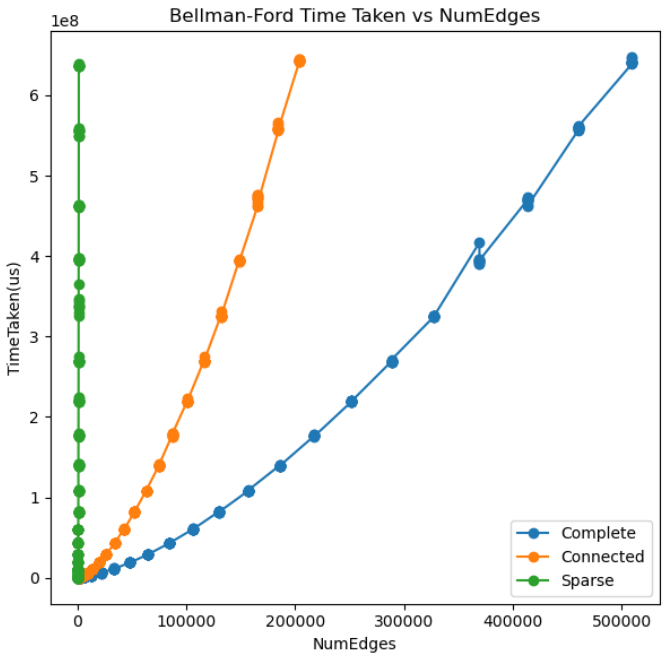
252 rows × 7 columns

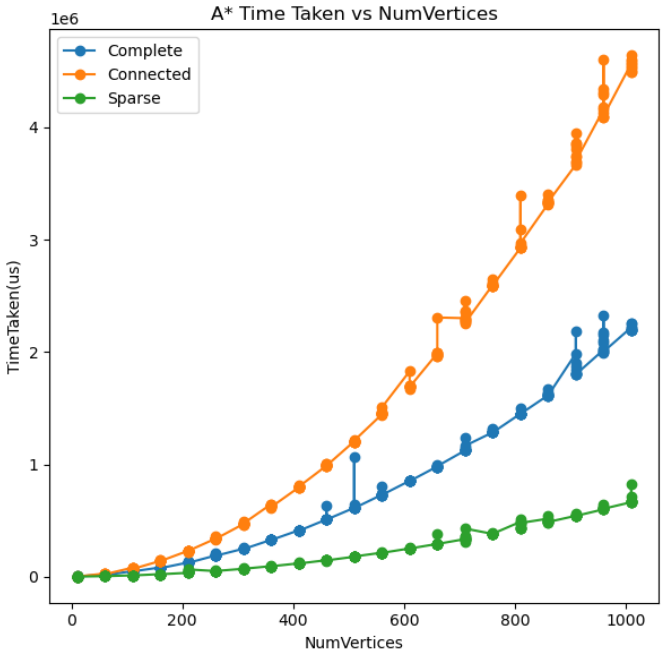
In [ ]:
```
import matplotlib.pyplot as plt

algorithms = df['Algorithm'].unique()
graph_types = df['GraphType'].unique()

for algorithm in algorithms:
    plt.figure(figsize=(12, 6))

    for graph_type in graph_types:
        algorithm_graph_df = df[(df['Algorithm'] == algorithm) & (df['GraphType'] ==

        plt.subplot(121)
        plt.plot(algorithm_graph_df['NumVertices'], algorithm_graph_df['TimeTaken(us)
        plt.title(f'{algorithm} Time Taken vs NumVertices')
        plt.xlabel('NumVertices')
        plt.ylabel('TimeTaken(us)')
        plt.legend()

        plt.subplot(122)
        plt.plot(algorithm_graph_df['NumEdges'], algorithm_graph_df['TimeTaken(us)'],
        plt.title(f'{algorithm} Time Taken vs NumEdges')
        plt.xlabel('NumEdges')
        plt.ylabel('TimeTaken(us)')
        plt.legend()

    plt.tight_layout()
    plt.show()

plt.figure(figsize=(12, 6))

for algorithm in algorithms:
    for graph_type in graph_types:
        algorithm_graph_df = df[(df['Algorithm'] == algorithm) & (df['GraphType'] ==
```

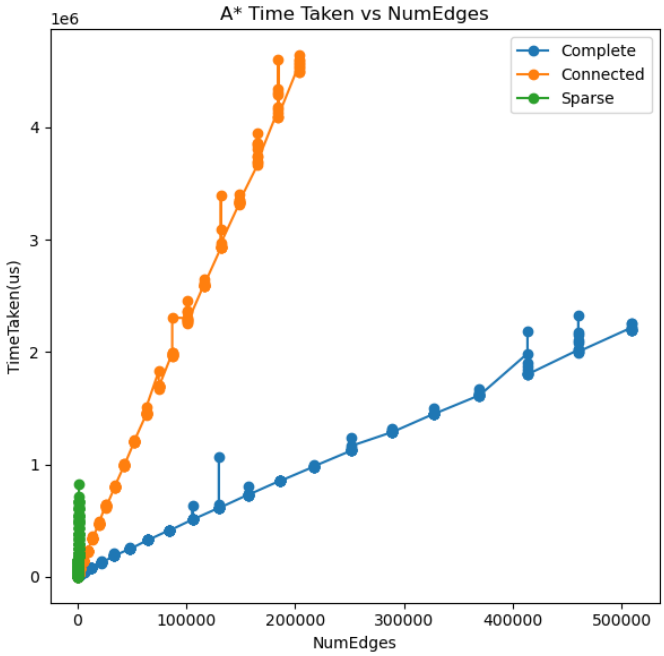
```
        plt.subplot(121)
        plt.plot(algorithm_graph_df['NumVertices'], algorithm_graph_df['TimeTaken(us)
        plt.title('All Algorithms Time Taken vs NumVertices')
        plt.xlabel('NumVertices')
        plt.ylabel('TimeTaken(us)')
        plt.legend()

        plt.subplot(122)
        plt.plot(algorithm_graph_df['NumEdges'], algorithm_graph_df['TimeTaken(us)'],
        plt.title('All Algorithms Time Taken vs NumEdges')
        plt.xlabel('NumEdges')
        plt.ylabel('TimeTaken(us)')
        plt.legend()

plt.tight_layout()
plt.show()
```

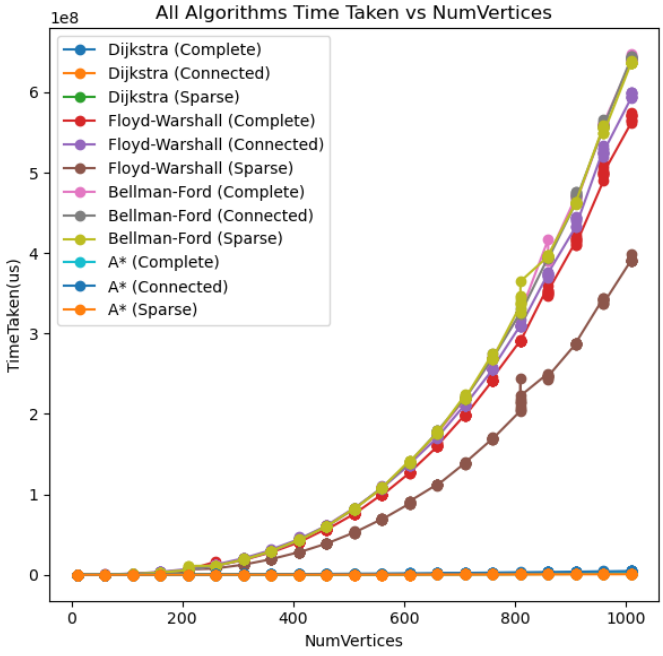


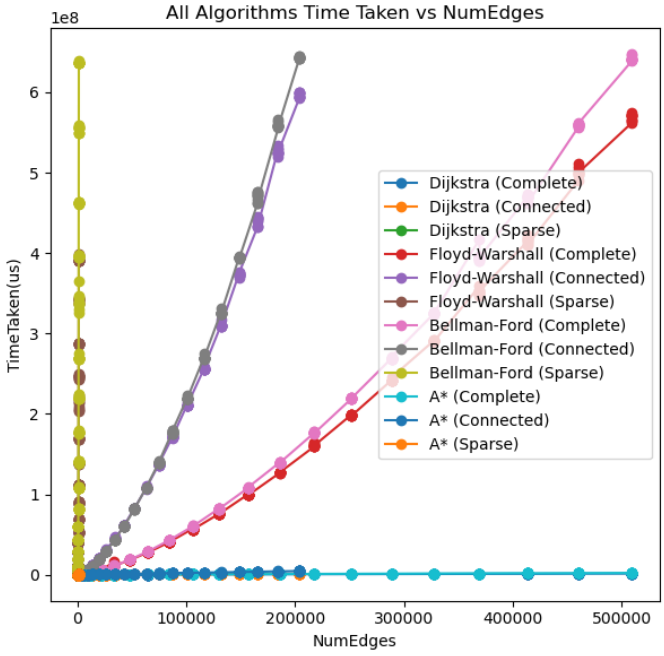












Как можно видеть на графиках, с большим отрывом самыми быстрыми алгоритмами оказались алгоритм Дейкстры и A* (причем A* работает еще быстрее).

Асимптотика алгоритов (E - количество ребер, V - количество вершин):

- Дейкстра: $O(E^2)$
- Беллман-Форд: $O(VE)$
- Флойд-Уоршелл: $O(V^3)$
- A*: $O(E)$