

# LAB 5

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## Compare the efficiency of Bellman-Ford and Dijkstra in terms of (i) complexity and (ii) running time

### (i) Complexity

With the use of Fibonacci heap, the complexity of Dijkstra is  $\mathcal{O}(|E| + V \log |V|)$  for Graph<V,E>

The complexity of Bellman-Ford is  $\mathcal{O}(|V||E|)$  for Graph<V,E>

### (ii) Running time

Here is a test case **case.txt** with 3734 edges, downloaded from Coursera course, attached with the report.

```
1 | time python3 Dijkstra.py < case.txt
2 | time python3 BellmanFord.py < case.txt
```

Output:

```
1 | ['0', '79', '18', '186']
2 |
3 | real    0m0.079s
4 | user    0m0.047s
5 | sys     0m0.016s
6 | ['0', '79', '18', '186']
7 |
8 | real    0m0.428s
9 | user    0m0.406s
10 | sys     0m0.031s
```

## Conclusion

In graphs that has no negative cycles (the assumption), Dijkstra does better than Bellman - Ford both in theoretical complexity and practical running time.