LAB REPORT : COMPSCI 2XB3

LAB SECTION – L02

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Submitted By –

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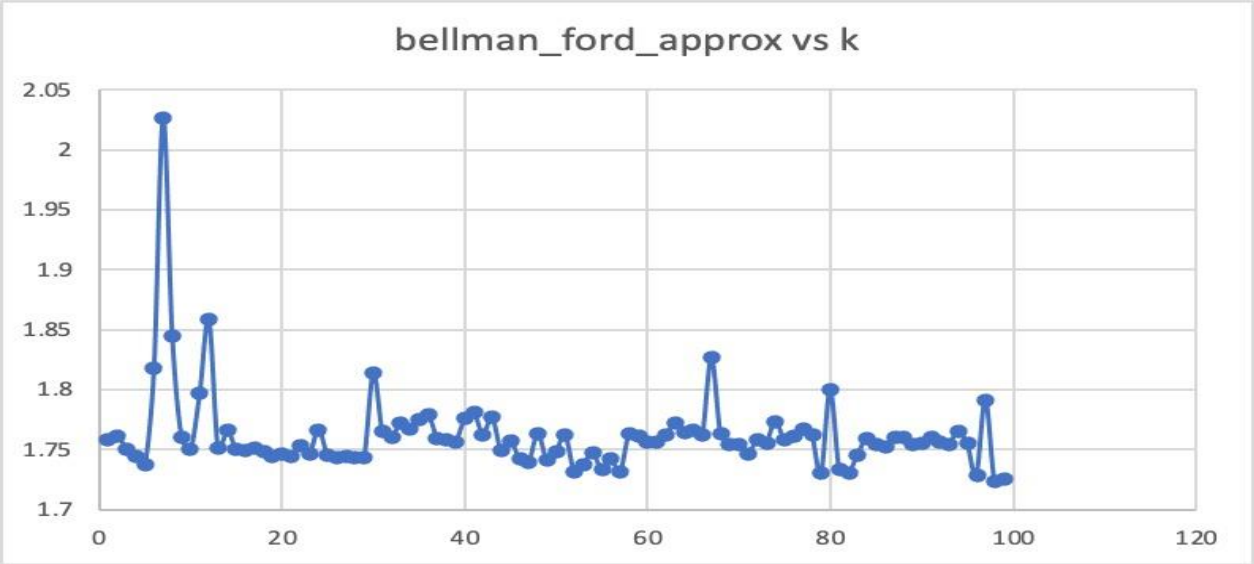
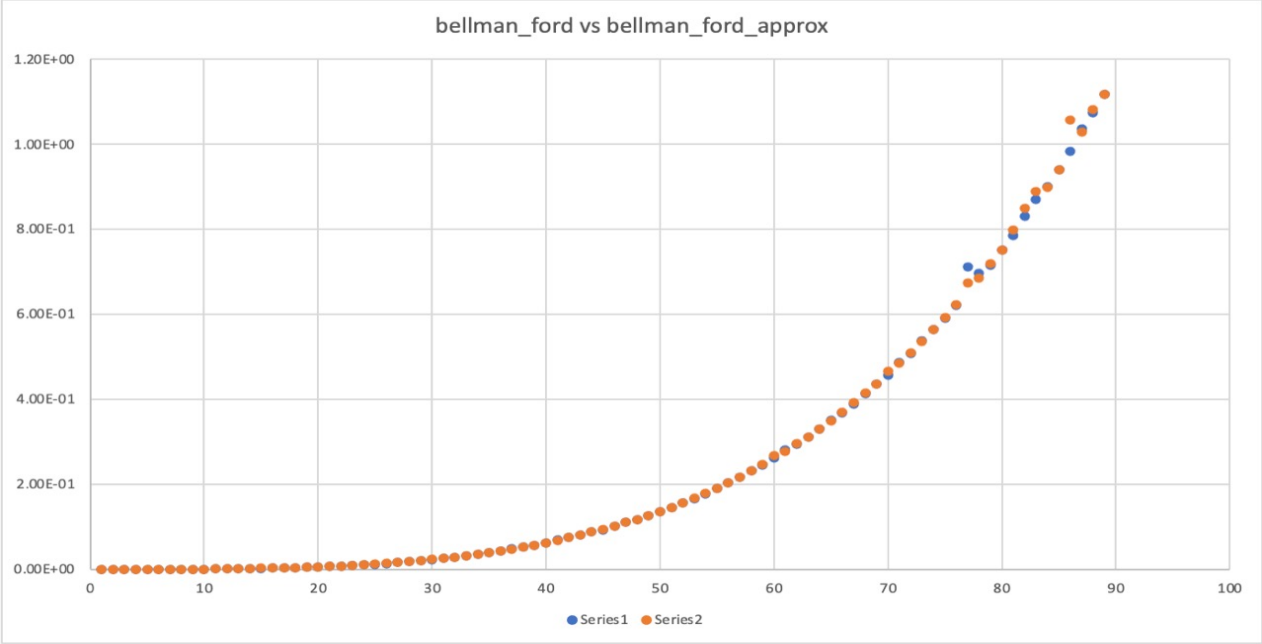
Bellman-Ford Approximation

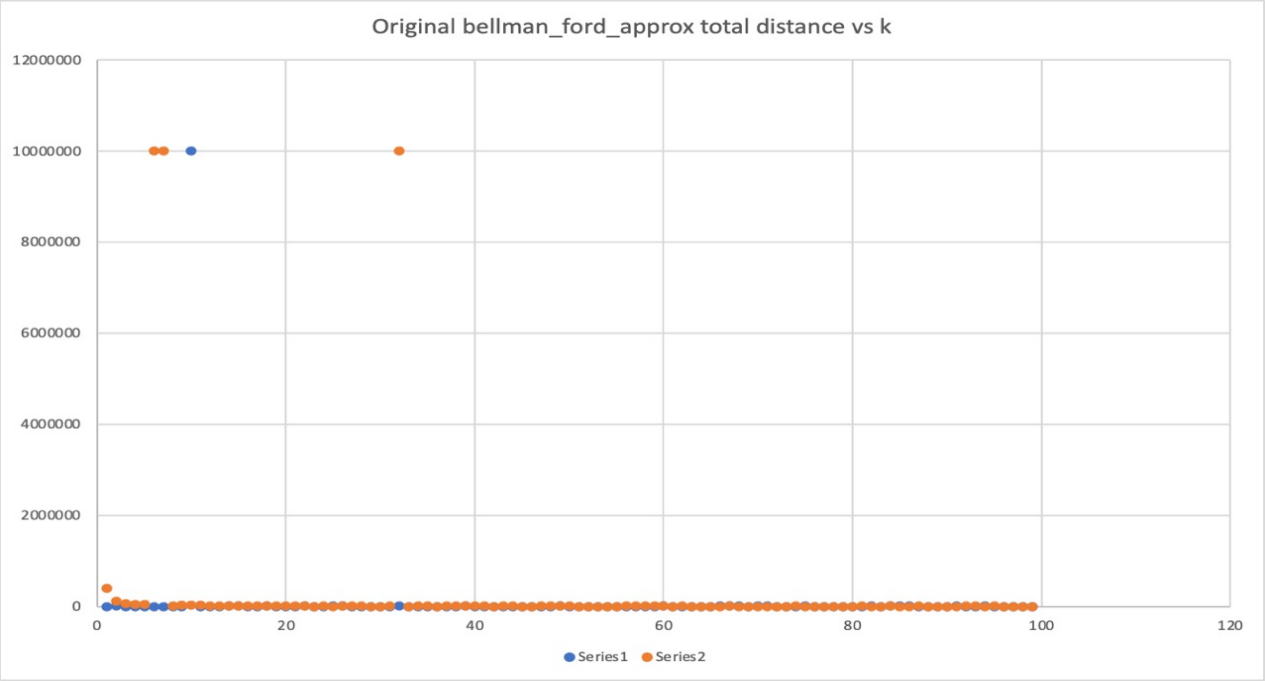
Following graph shows the approximation on the basis of runtime for bellman_ford_approx().



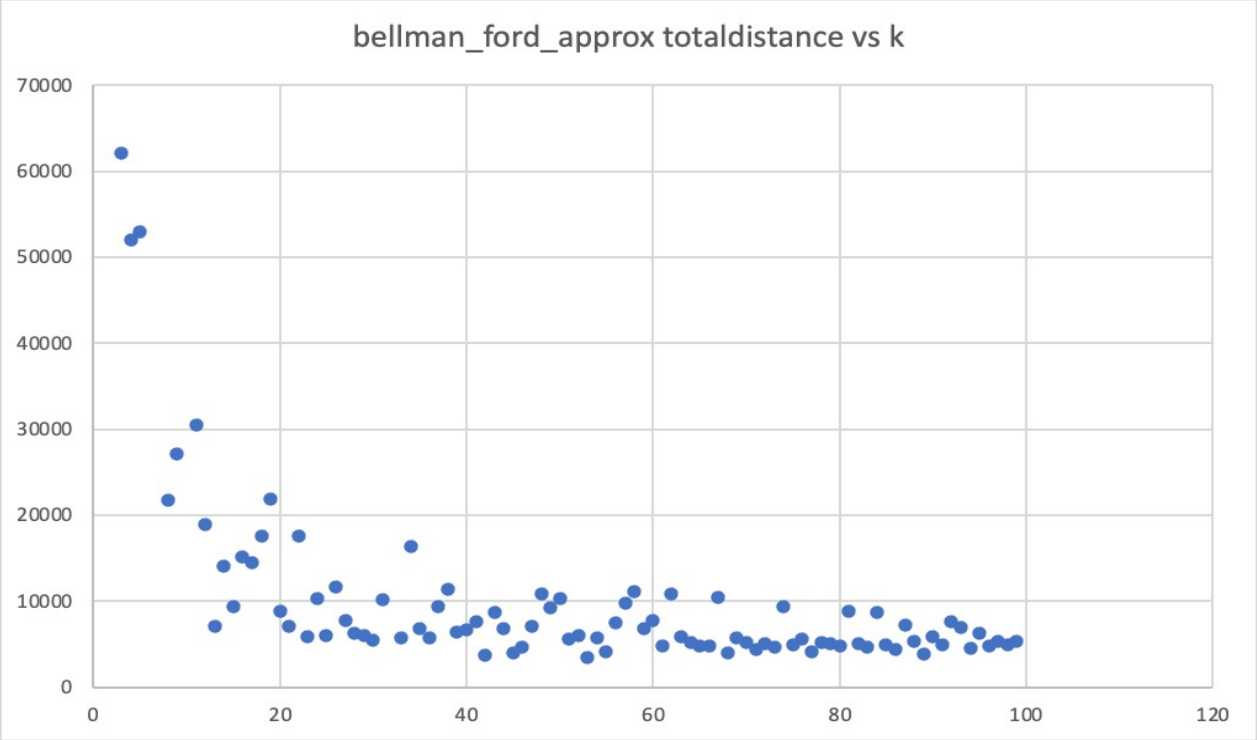
Graph shows the comparison on the basis of runtime between bellman_ford() and bellman_ford_approx() which are series 1 and series 2 respectively.



Initially, the following graph was plotted for both bellman_ford() and bellman_ford_approx() on the basis of total distance.



The following graph shows the bellman_ford_approx() vs k on the basis of total distance.



Any value of k which is more than 32 which is recommended as the given implementation has the maximum value infinity so the path was coming out to be infinity for some values.

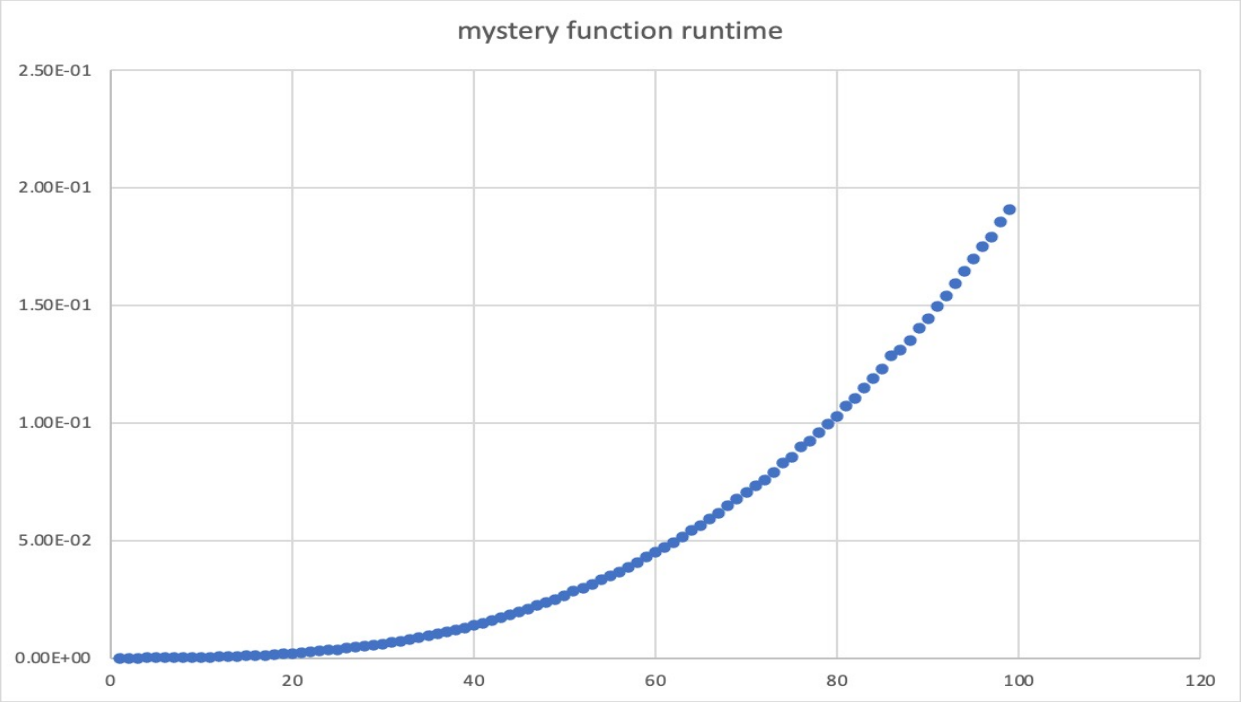
All Pairs Shortest Paths

From the implementation of both the functions one can conclude that all_pairs_dijkstra() is better for dense graphs and all_pairs_bellman_ford() for sparse graphs. For instance, all_pairs_bellman_ford() works better for Fibonacci Heaps as it runs $O(VE+V^3lgV)$ which for dense graphs would be $O(V^3)$ and all_pairs_dijkstra() on the other hand does worse than in terms of asymptotic runtime.

Mystery Function

This function returns a nested list of all possible paths with least weight for each node to all the other subsequent nodes in the graph. The outcome remains the same even with negative edge weights.

After running some experiments the graph came out to be polynomial.



To get the degree of polynomial as 3 similar experiments were performed and a graph with slope 2.6454 was obtained. Which can be evidently seen that it is a polynomial of degree of 3. This is not surprising as the function consists of three nested for loops which indicates that the complexity for the mystery function is $O(n^3)$.