CSE 564 : Algorithms

PROGRAM 6 ANALYSIS

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Guide :

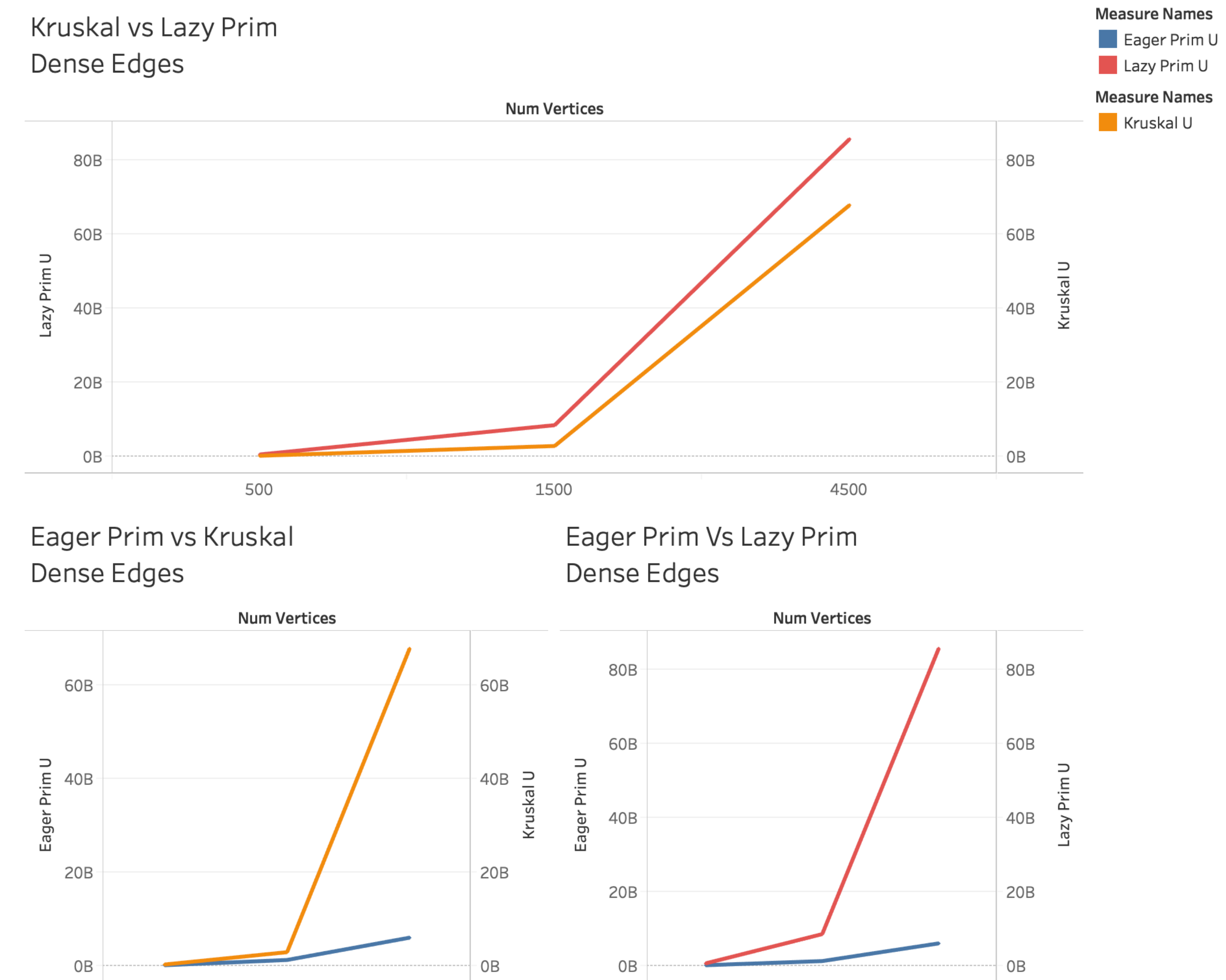
We timed the three algorithms : Eager Prim, Lazy Prim and Kuskral’s Algorithm.

We ran all the different combinations of

1. sparse vs dense graphs
2. uniformly distributed vs Gaussian distributed weights
3. number of vertices = 500, 1500, 4500

In the following graphs, you will see:

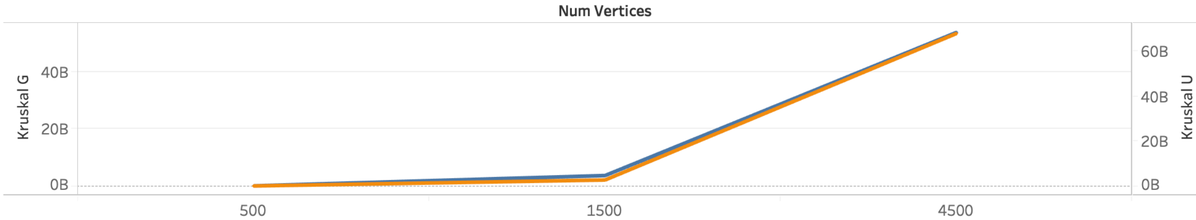
1. Time on the Y axis (nanoseconds) and
2. Number of vertices on the X axis



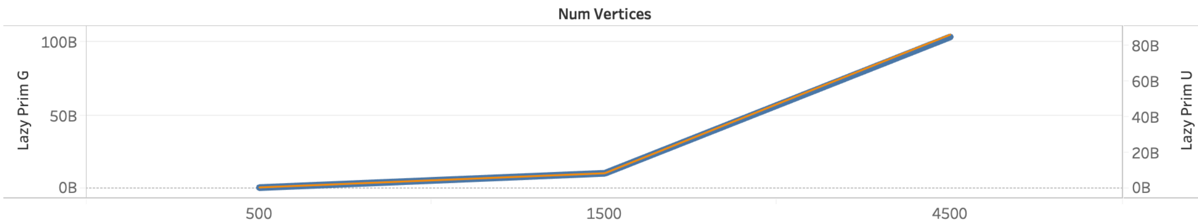
Lazy Prim and Kruskal’s have similar performance for dense edged graphs.

Eager Prim performs much better than both Lazy Prim and Kruskal’s Algorithm.

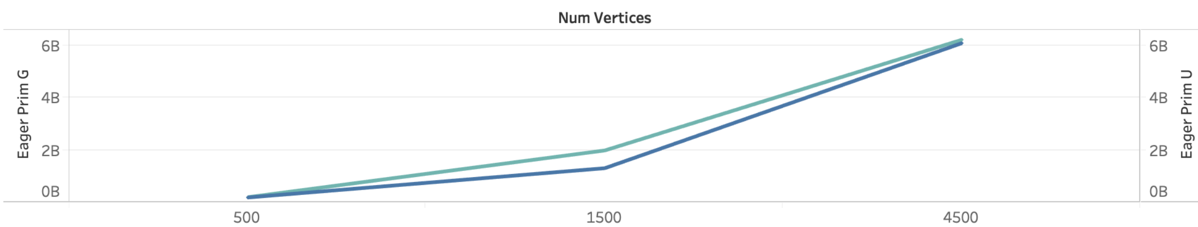
Kruskal Gaussian vs Uniform Weights
Dense Edges



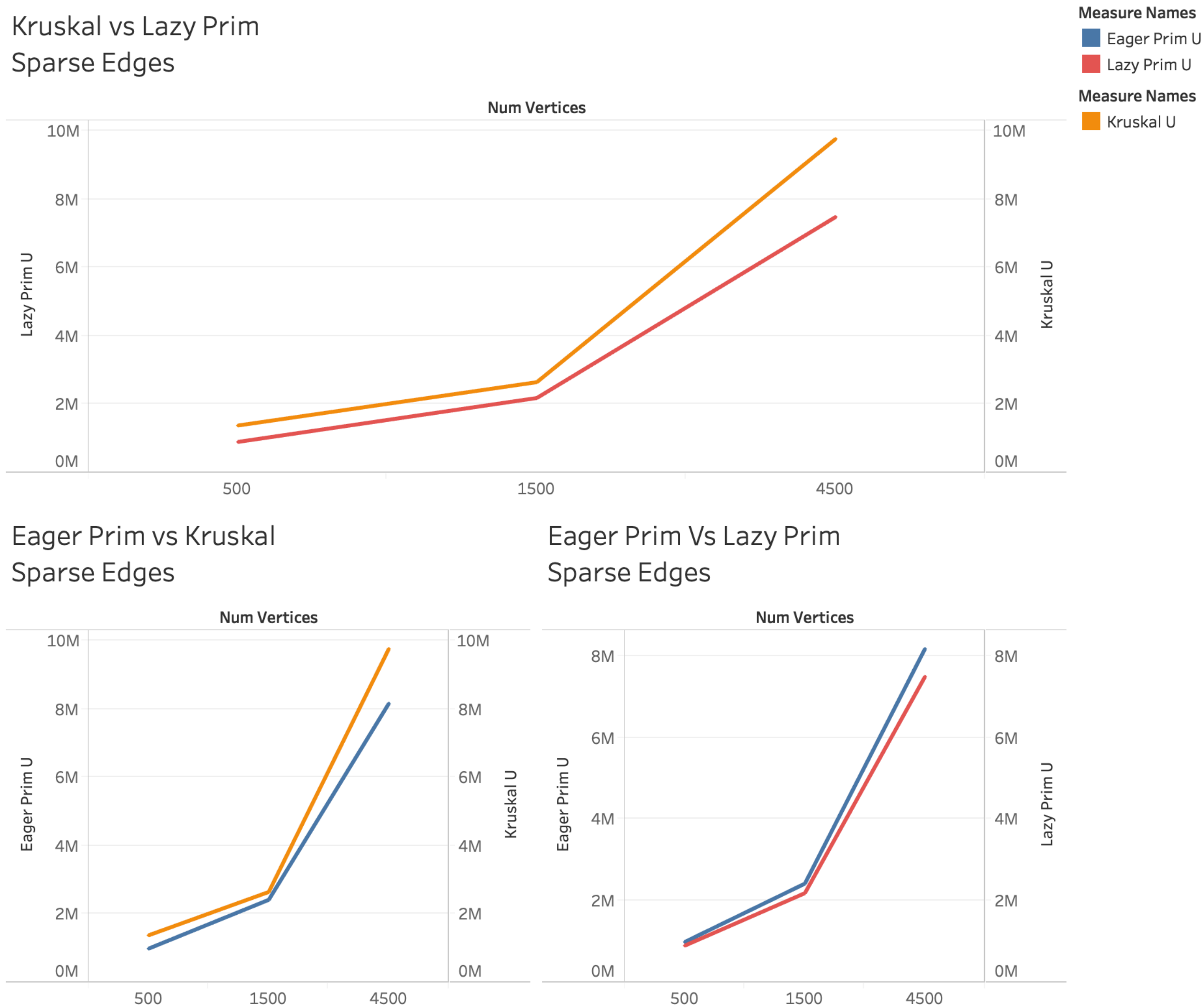
Lazy Prim Gaussian vs Uniform Weights
Dense Edges



Eager Prim Gaussian vs Uniform Weights
Dense Edges

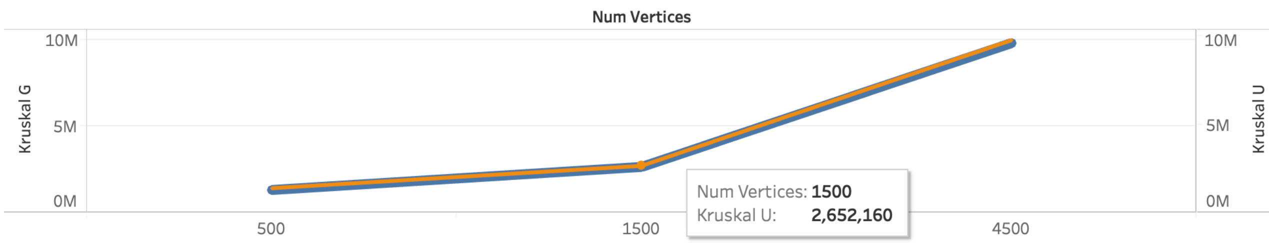


For dense edged graphs, the distribution of the weights (Gaussian vs uniform) does not seem to significantly impact the performance of the three different algorithms.

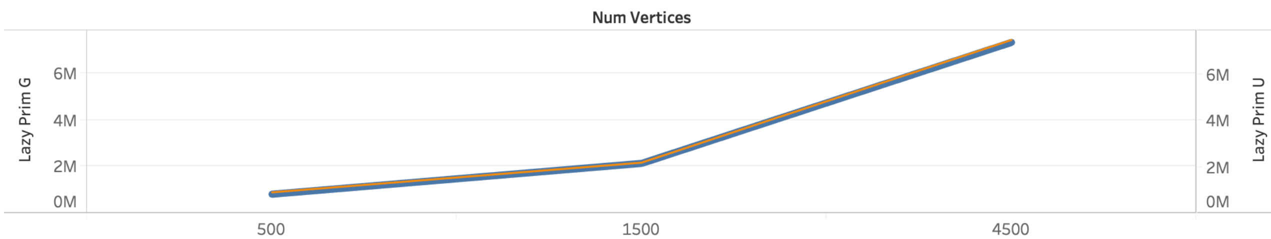


For sparse edged graphs, all three algorithms perform in a similar way.

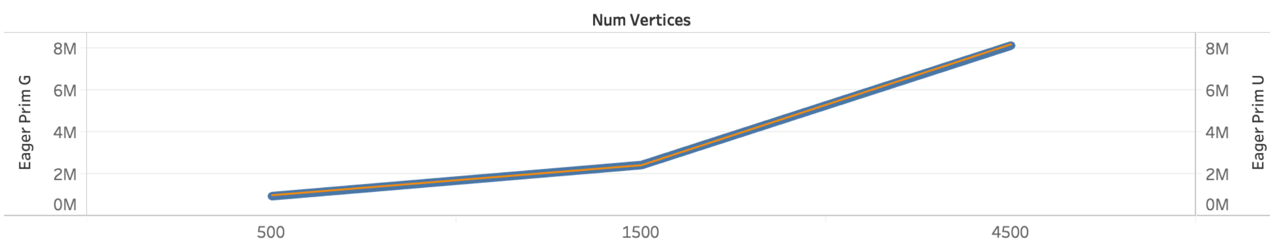
Kruskal Gaussian vs Uniform Weights
Sparse Edges



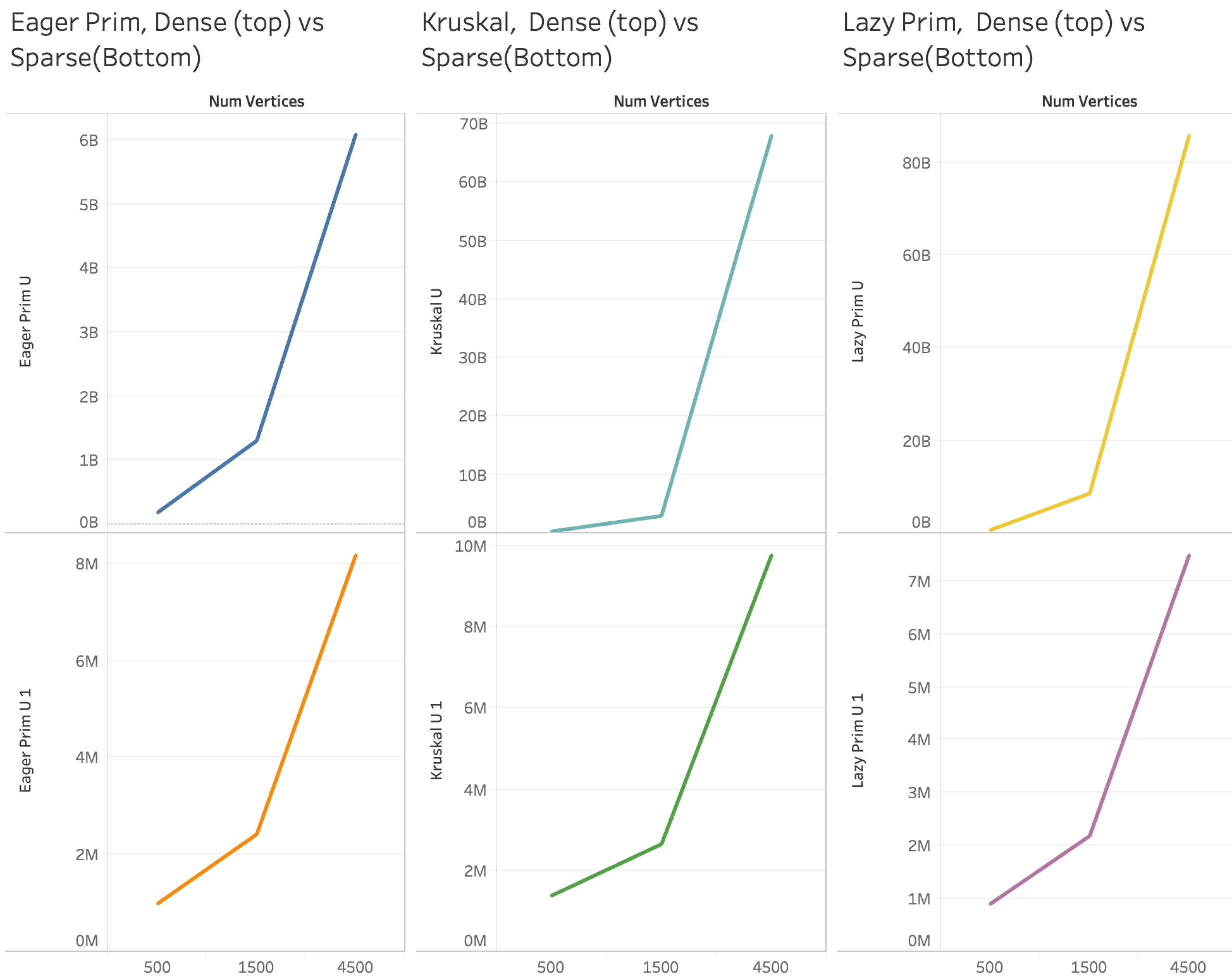
Lazy Prim Gaussian vs Uniform Weights
Sparse Edges



Eager Prim Gaussian vs Uniform Weights
Sparse Edges



For sparse edged graphs, the distribution of the weights (Gaussian vs uniform) does not seem to significantly impact the performance of the different algorithms.



Here, we can see that the lines that represent the times of the different algorithms on dense and sparse graphs have similar shapes. <u>Thus, they have a similar big-Oh notation. Their time complexity increases exponentially.</u>

However, in terms of the absolute value of the time taken, if you notice the scales on the axes of the graphs, then you notice that the <u>dense graphs take on average 100 times more time than sparse graphs with the same number of vertices.</u>

To summarize the above graphs :

1. All three algorithms have an exponential time complexity.
2. The distribution of the edge weights (Uniformly vs Gaussian) does not seem to impact the performance of either of the three algorithms.
3. For sparse edged graphs, the three algorithms all perform in a similar way.
4. For dense edged graphs, Eager Prim performs significantly better than both Lazy Prim and Kruskal’s algorithm.
5. All three algorithms take less time to run for sparsely edged graphs than for densely edged graphs.