Assuming my Algorithm as A as assuming that there is an algorithm O which produces an optimal solution(outputs lesser time than A).

Proving by contradiction:
 Lets say O takes less time than A from travelling all the way to the hospital. Lets suppose A stops at L2 and L3 while O stops at L3 and L4. Lets swap 2 stops of both algorithms. If for instance O's time increases, it means that at some point, O is taking more time which makes it less optimal which is a contradiction. If we swap, we will come to a point that both O and A will have the same time. So by this, we can prove that our algorithm A is optimal.