CS 381: Assignment #6

Due on Tuesday, Dec 11th, 2014

Prof. Grigorescu 12:00pm

Yao Xiao(xiao67)

Problem 1

1.As shown in the textbook and the slides. In order to prove Longest path is NP. We need to show that

- it apparently easy to verify if the length is greater t
- the edge should be simple-path
- the edge should be on the graph

All of them can be verified in polynomial time.
2. We need to prove that

$$3 - SAT \leq_p Longest - Path$$

Since 3-SAT is Np-complete, so I have to reduce the longest-path from 3-sat
As we see in the slides

$$3 - SAT \leq_p Hamilton - path$$

So we construct a Hamilton path with all the edges with weight=1. The problem becomes can I find a hamilton path with the length k-1.
So

$$3 - SAT \leq_p Hamilton - path \leq_p Longest - Path$$

3. Use binary search$(0, \sum^{e} length)$, for each result, verify if that longest path exists. If so, binary search(upperhalf), else binary search(lowerhalf), the complexity becomes $O(log(\sum^{e} length))$

Problem 2

1. To show it if it is NP just need to verify if all the sports is covered and the number of teacher is less than k.

2. Construct a graph with

$$G(V, E), where E = sports, V = instructor$$

if an instructor can teach a sport set that instructor on the vertex of the edge. So this problem becomes vertex cover question.
So

$$Vertex - cover \leq_p Instructor$$