CS3110: Assignment 8
(NP-Completeness)
July 20 2017

The assignment is deliberately short, try to submit it sooner to leave enough time for preparation for the final exam.

Q1 [50 marks]. A decision version of interval scheduling would be: given a collection of intervals and an an integer *k*, is there a subset of non-overlapping intervals of size at least k? Answer the following questions with yes, no or unknown, with a brief explanation

1. Interval Scheduling $\leq_P$ Vertex Cover?
2. Independent Set $\leq_P$ Interval Scheduling?

Q2 [50 marks]. Given a graph G and two nodes a and *t*, consider the following two questions :

*A) What is the length of the **shortest** path from s → t?*

*B) What is the length of the **longest** path from s → t?*

Recall that the theory of np-completeness applies to decision problems, not optimization problems (although they are related as explained in the class):

1. *Formulate A to a decision problem (a problem with a yes/no answer), call it AD*
2. *Formulate B to a decision problem (a problem with a yes/no answer), call it BD*

Analyze the np-completeness of the problems and answer the following questions with (yes,no or unknown), with a brief explanation

3. AD is P
4. AD is NP
5. AD is NP-Complete
6. AD is NP-Hard
7. BD is P
8. BD is NP
9. BD is NP-Complete
10. BD is NP-Hard