Complexité avancée - Homework 2

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Due at 8.30 a.m., October 7, 2020

NL alternative definition

A Turing machine with *certificate tape*, called a verifier, is a <u>deterministic</u> Turing machine with an extra read-only input tape called *the certificate tape*, which moreover is *read once* (*i.e.* the head on that tape can either remain on the same cell or move right, but never move left). A verifier takes as input a word x in the alphabet, along with word u written in the certificate tape.

Define NL_{certif} to be the class of languages L such that there exists a polynomial $p : \mathbb{N} \to \mathbb{N}$ and a verifier M logarithmic space such that:

$$x \in L \text{ iff } \exists u, |u| \leq p(|x|) \text{ and } M \text{ accepts on input } (x, u)$$

1. Show that $\mathsf{NL}_{certif} = \mathsf{NL}$

2. What complexity class do you obtain if you remove the read-once constraint in the definition of a machine with certification tape ? Justify your answer. You may use the fact that SAT is NP-complete for logspace reduction.