## Complexité avancée - Homework 2

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September 30, 2020 Due at 8.30 a.m., October 7, 2020

## NL alternative definition

A Turing machine with certificate tape, called a verifier, is a deterministic 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  $\mathsf{NL}_{certif}$  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:

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

- 1. Show that  $NL_{certif} = NL$
- 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.