

Lecture 19: October 22

*Lecturer: Nicholas Harvey**Scribes: Kaitian Xie*

Definition 19.1 *The running time of a (deterministic) TM is a function $f : \mathbb{N} \rightarrow \mathbb{N}$ given by $f(n) = \max_{\substack{x \in \Sigma^* \\ |x|=n}} (\# \text{ of steps of } M \text{ on input } x)$.*

Typically we assume M is a decider now.

A class of languages defined by some resource constraint is called a complexity class.

Definition 19.2 $TIME(t(n)) = \{\text{language } L : \text{there exists a TM with running time } O(t(n))\}$. mmmm

Definition 19.3 $P = \bigcup_{c>0} TIME(n^c)$

Definition 19.4 $EXP = \bigcup_{k \geq 0} TIME(2^{n^k})$ or $EXPTIME$

$3COLORMAP \in TIME(4^n) \subseteq EXP$