

## CMPE 350 - Spring 2019

### PS 12 - 13.05.19

**4.30** Let  $A$  be a Turing-recognizable language consisting of descriptions of Turing machines,  $\{\langle M_1 \rangle, \langle M_2 \rangle, \dots\}$ , where every  $M_i$  is a decider. Prove that some decidable language  $D$  is not decided by any decider  $M_i$  whose description appears in  $A$ . (Hint: You may find it helpful to consider an enumerator for  $A$ .)

- Show that the set of undecidable languages are closed under complementation.
- Let  $L$  be the language of all Turing machine descriptions  $\langle M \rangle$  such that there exists some input on which  $M$  makes at least 5 moves. Show that  $L$  is decidable.
- Disprove: Every countable language is decidable.
- Let  $M$  be a Turing machine which loops on all strings of the form  $w^r$ . Is  $M$  a decider? Is the language recognized by  $M$  decidable?