

Theory of Computation, CSCI 438 spring 2022
Cantor's Diagonalization Method (the existence of an uncountable set), 202-207
April 18

Recall acceptance problems.

The acceptance problem for Turing Machines is A_{TM} .

$A_{TM} = \{ \langle M, w \rangle \mid M \text{ is a TM, } w \text{ is a string in the language of the TM and } w \in L(M) \}$

A Universal TM is a machine that recognizes A_{TM} . That is, for Universal Turing machine U , $\mathcal{L}(U) = A_{TM}$.

Note that:

A_{TM} is a language (only one of these)

Universal TM is a machine (infinite of these)

Countability

The size of set A can be written $|A|$.

Two sets have the same size iff there is a 1-1 correspondence between the elements of the sets.

(page 202)

Countable (Def. 4.14) A set is countable if it is finite or is the same size as the natural numbers $(1, 2, \dots)$.