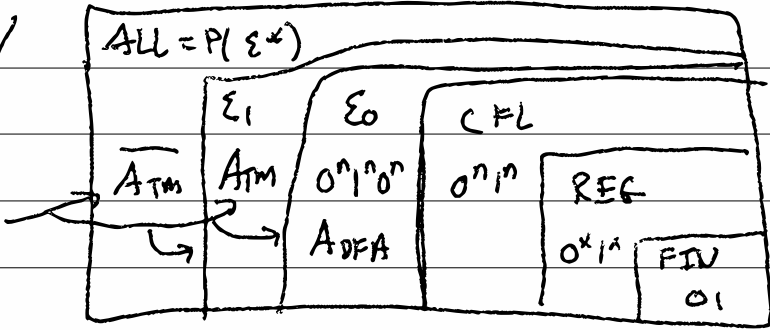


24-1/



24-2 Why does it matter if

ATM  $\notin \Sigma_0$

ATM  $\notin \Sigma_1$

LBA

= TM  
w/ 1 bit  
tape

Church - Turing Thesis

↓

↘

Alzo

Alan Turing

Church

(Turing Machine)

( $\lambda$ -calculus)

24-3 CTT = "The word 'algorithm' is folksy / means the same thing as a TM or  $\lambda$ -calculus program."

"When people count, they are doing addition by 1 in the space of natural numbers"

'Love' / 'attract' ::= OK Cupid's love  
Tinder swipe right

24-4/

Algorithms  $\leftrightarrow$  What humans can do

Turing Machine

$\lambda$ -calculus

$\updownarrow$   
ND, MT

$\updownarrow$

$\updownarrow$   
Stack

ISWIM

$\updownarrow$

$\updownarrow$

Algol

$\updownarrow$

Reg

C

Hardware

$\leftrightarrow$

$\mathbb{E}$

'Software'

$\leftrightarrow$  x86

rocket  $\leftrightarrow$

Java

24-5/

ATM  $\Phi$   $\Sigma_0$  — practical to run

ATM  $\Phi$   $\Sigma_1$  — impractical to run

$\Sigma_0$  —  
 $\Sigma_1$  — impossible to run