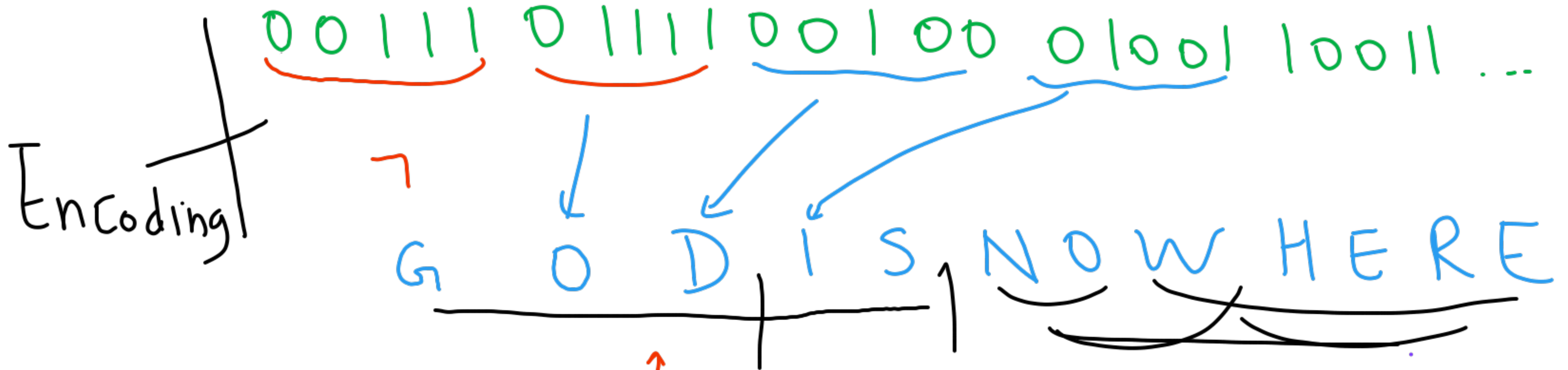


30.8.2025

Bits / Alphabet

CS 310

→ G. Sivakumar
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"stand on the shoulders of giants"

Natural Language
Formal → we define the Syntax, Semantics

AMBIGUITY

3 models
 Finite State Automata FSA
 Push Down Turing machine PDA TM

What

Computer



Science & Engineering

Turing test

Abacus

Slide rule

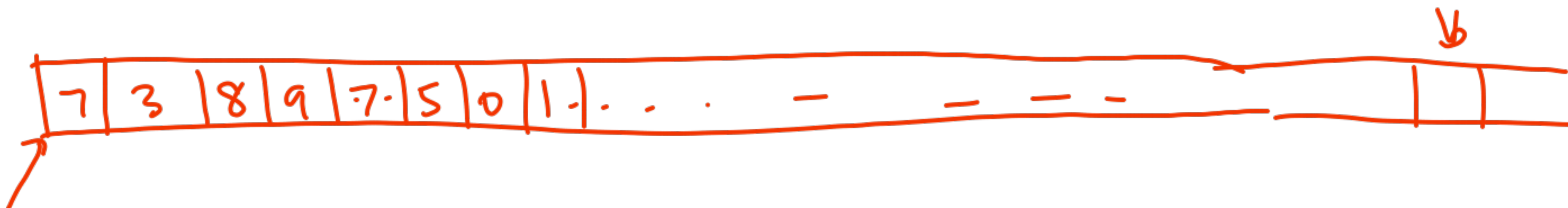
Casio FX

mobile phone

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·
·
·

Hilbert's 10th problem
 $3x^2 - 5x + 7 = 0$
 $\rightarrow 7x^3y^2 - 9x^2y^3 + 13xyz$
 $+ \dots = 0$
 undecidable

Input Tape



Is it
→ divisible by 7?

FSA

→ Give a solution (diagram)
that any 10-year old
can use to answer
in "real-time"

PDA

Input Tape

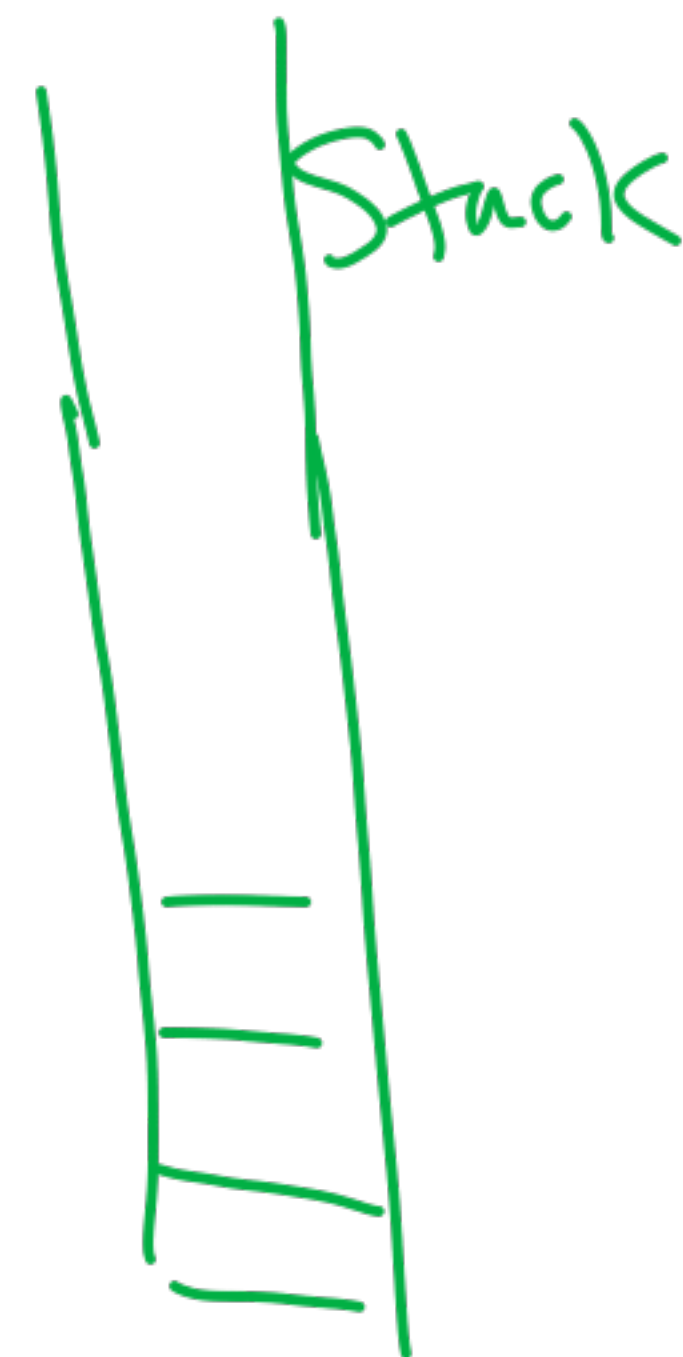
Is the string of the form $7^n 9^n$?

$n \geq 1$



Is it
a palindrome?

→ Non-determinism
(guess)



Turing machine

turingmachinesimulator.io

Input
tape
Read/write



- ① replace a digit by some symbol.
- ② move 1-step L or R q_k

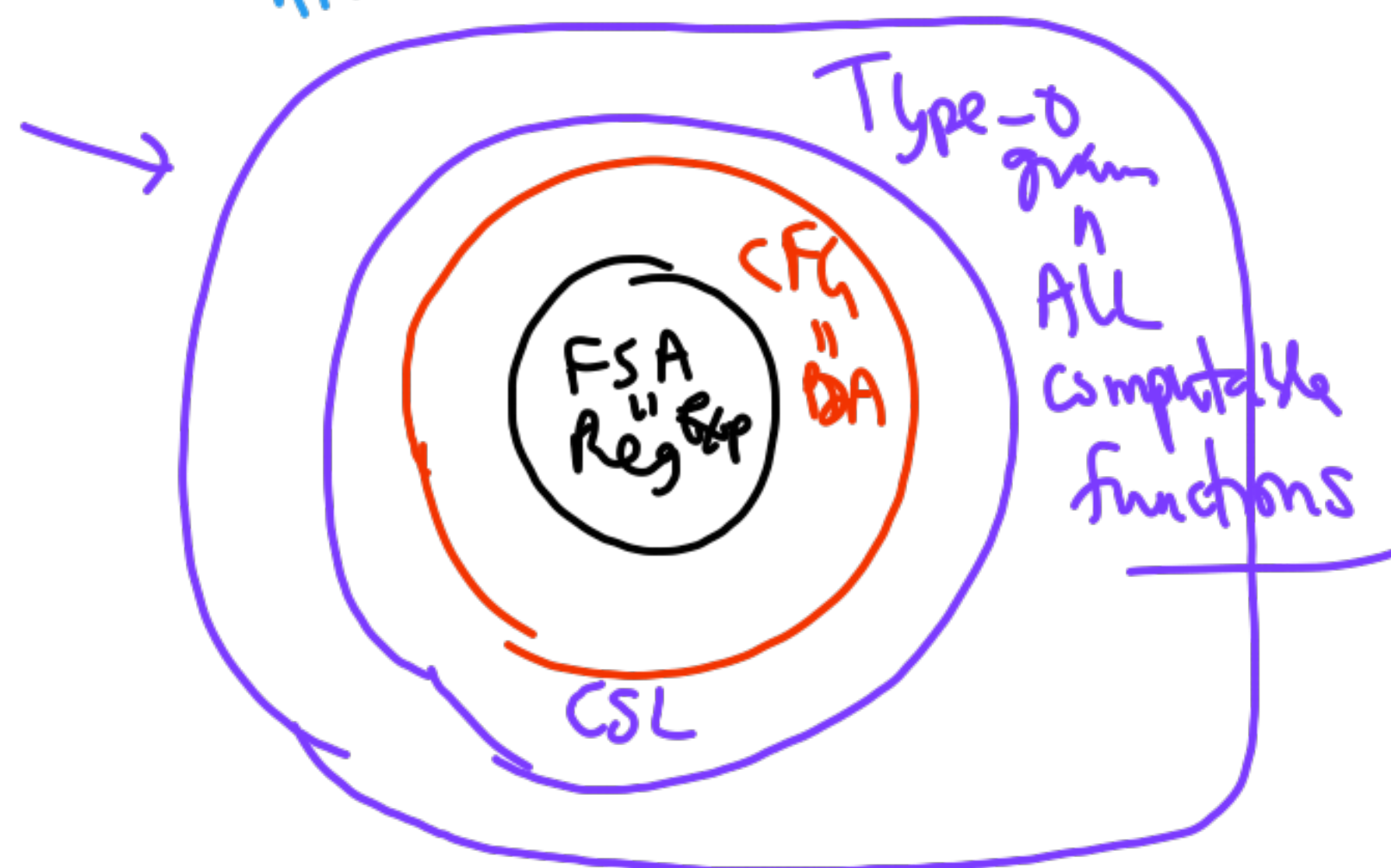
Is n prime?

Chomsky
hierarchy

Machines	Language
FSA	Regular Expression
PDA	Context free grammar
TM	Type 0 grammar

$(0+00)^*1^*$

$S \rightarrow aSb$
 $S \rightarrow ab$
 ~~$B \rightarrow cb$~~



lhs
Can have
any
string

$a^n b^n c^n$
 $aSc \rightarrow Sbc$

a^n
 S^n

