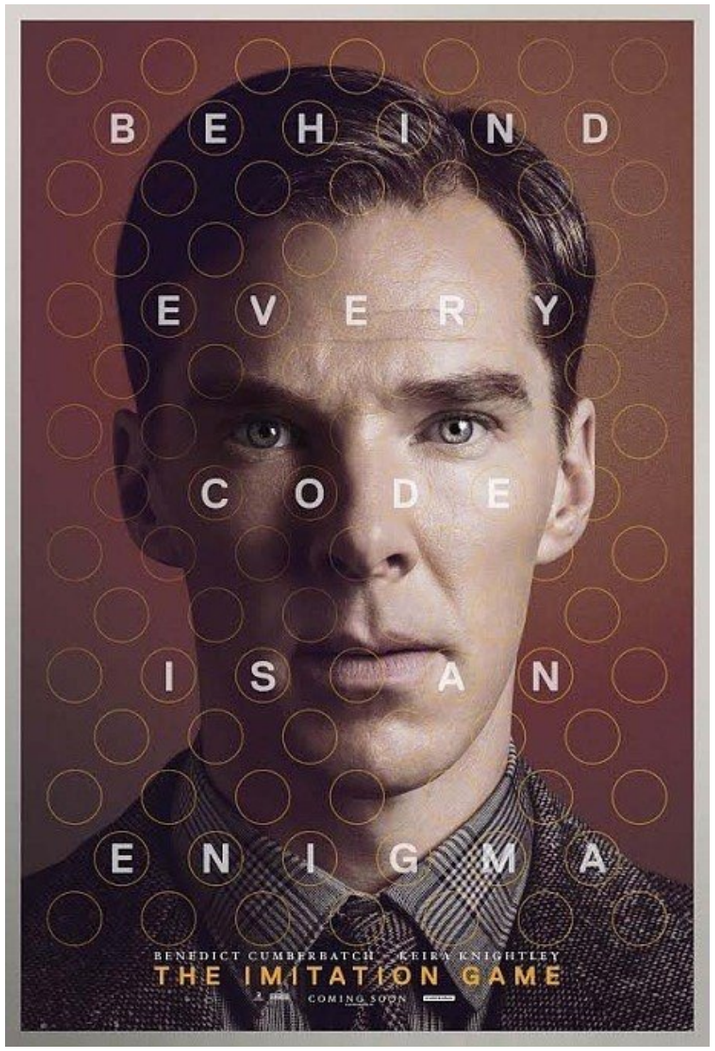
Automata & languages

A primer on the Theory of Computation



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Part 5 out of 5

Last week was all about

Context-Free Languages

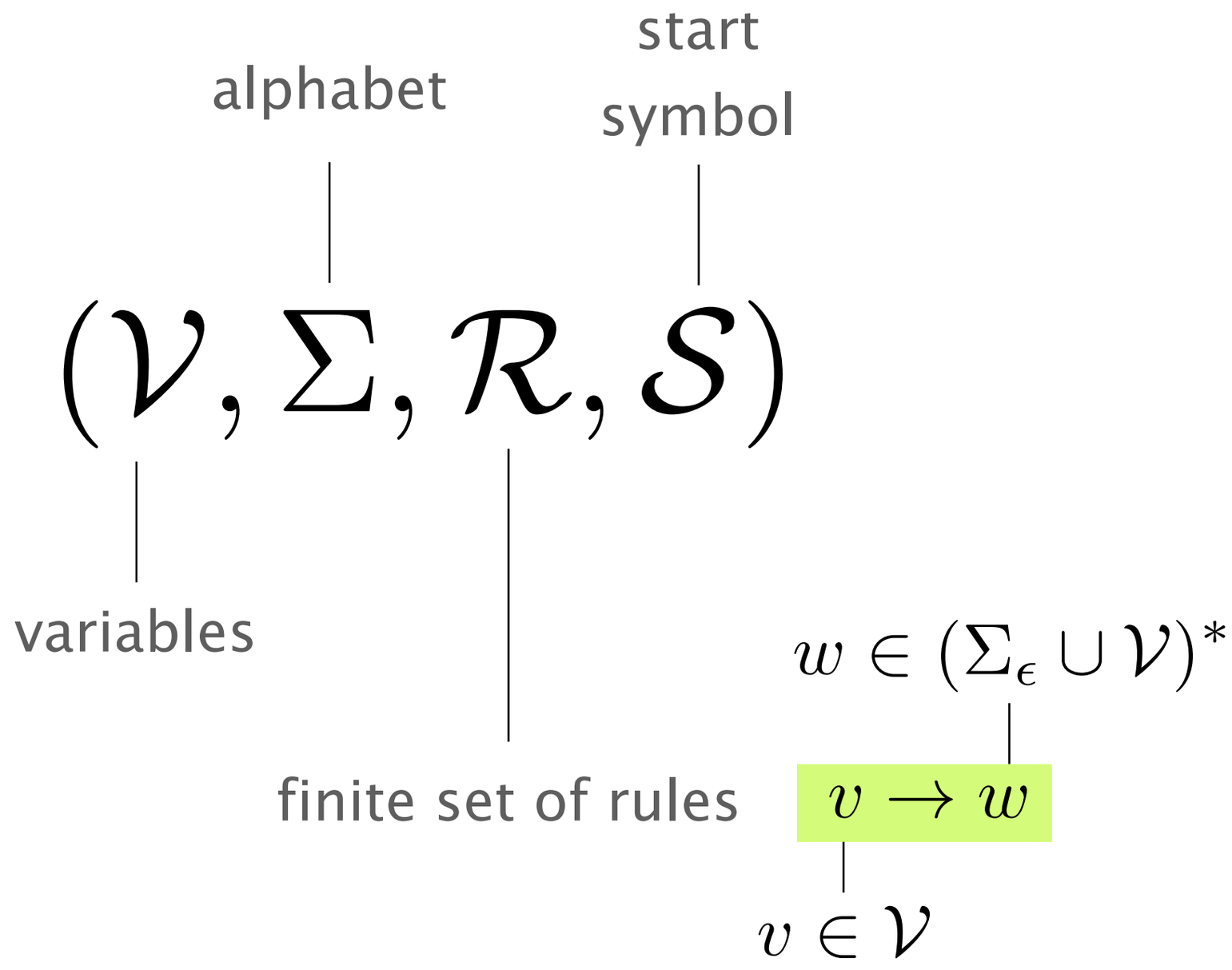
Context-Free Languages

a superset of Regular Languages

Example $\{0^n1^n \mid n \geq 0\}$ is a CFL but not a RL

We saw the concept of

Context-Free Grammars



As for Regular Languages,

Context-Free Languages are recognized by “machines”

Language	Regular	Context-Free
Machine	DFA/NFA	Push Down Automata

Push-Down Automatas are pretty similar to DFAs

$$M = (Q, \Sigma, \Gamma, \delta, q_0, F)$$

alphabet

start state

states

accepting states

Push-Down Automatas are pretty similar to DFAs except for… the stack and transition function

stack alphabet

$$M = (Q, \Sigma, \Gamma, \delta, q_0, F)$$

transition function

$$Q \times \Sigma_\epsilon \times \Gamma_\epsilon \to P(Q \times \Gamma_\epsilon)$$

We'll continue our exploration of Context-Free Languages this week

Today's plan

Thu Oct 17

1 PDA ≃ CFG

2 Pumping lemma for CFL

In particular,

we'll see that not all languages are CFL

Language $L = \{ w\#w \mid w \text{ in } \{0,1\}^* \}$

This is *not* a CFL!

Is the stack in a PDA fundamental?

Could we use other data structures such as a queue?

Stack-based PDAs can handle nested structures

symbols are pushed and popped in reverse order

Queue-based PDAs cannot handled nested structures

they cannot reverse the order of the symbols

They recognize different languages!

a queue-based PDA can easily recognize { w#w }