# Contents

# 1 Chapter 1

**§1.1**
finite automaton - finite no. of states, like CPU
Only current state can be viewed.

Notation
$A$ finite alphabet
Elements of $A$: letters
Finite seq. of letters is a word.
Empty sequence/word symbolized by $\epsilon$, $\Lambda$, or 1
Set of nonempty words symbolized by $A^+$
Concat non-commutative
$|uv| = |u| + |v|$
u$\epsilon$ = $\epsilon$u = u

**§1.2.1**
Concat product: $KL = \{uv | u \in K \text{ and } v \in L\}$
Power notation: $L^n$, where $L^0 = \{\epsilon\}$

morphism
For alphabets $A$ and $B$, a morphism from $A^*$ to $B^*$ is a mapping.
$\phi : A^* \to B^*$ s.t. :
$\phi(\epsilon) = \epsilon$
$\forall u, v \in A^*, \phi(u)\phi(v)$
Rational (Regular) Languages: Rat$A^*$ is least class of languages over the alphabet, A, s.t. :
1. the langauges $\emptyset$ and $\{a\}$ are rational $\forall a \in A$,
2. if $K$ and $L$ are rational languages, then $K \cup L, KL$ and $L^*$ are also rational.

Extended rational operations: rational ops + intersection, compliment, morphic image (?)
Class of extended rational languages over $A$ is X-Rat$A^*$

§1.2.2

# 2 Chapter 9