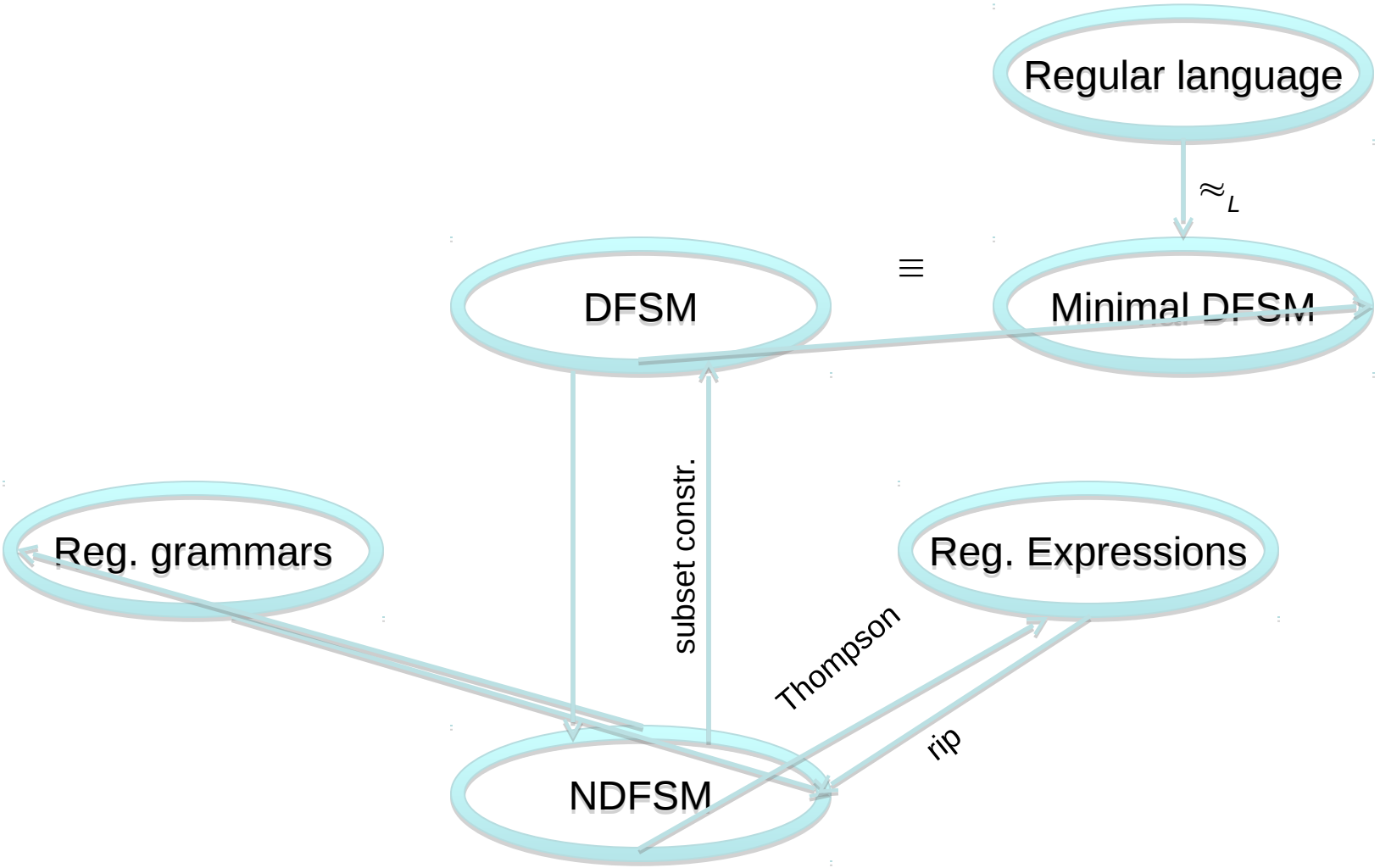
Midterm Review

Regular Languages

- Finite State Machines (FSM)
  - Deterministic (DFSM)
  - Nondeterministic (NDFSM)
- Regular Expressions
- Regular Grammars
- Moore and Mealy Machines

Conversions



Conversions

- NDFSM -> DFSM
- DFSM -> minimal DFSM
- Reg.Exp. -> NDFSM
- NDFSM -> Reg.Exp.

IS Regular

- Prove that a language is regular
  - Construct a:
    - DFSM
    - NDFSM
    - Reg.Exp.
    - Reg.Grammar
  - Prove that $\approx_L$ has finitely many classes
    - Build minimal DFSM

Closure Properties

- Union
- Concatenation
- Kleene star
- Complement
- Intersection
- Difference
- Reverse

IS NOT Regular

- Prove that a language is not regular
  - Use pumping theorem
  - Use closure operations

Decision Problems

- Membership
- Emptiness
- Totality
- Finiteness
- Equivalence
- Minimality
- Specific questions

Pattern Matching / Searching

- Pattern *p* and text *T:*
  - Matching: L($\Sigma^* p\ \Sigma^*$)
  - Searching: L($\Sigma^* p$)

Context-Free Languages

- Context-Free Grammars (CFG)
- Pushdown Automata (PDA)

Conversions

- CFG -> Chomsky Normal Form
  - Algorithm
- CFG -> unambiguous CFG
  - No algorithm

IS Context-Free

- Prove that a language is context-free
  - Construct a:
    - CFG
    - PDA

Closure Properties

- Union
- Concatenation
- Kleene star
- Reverse
- Intersection with regular language
- Difference with regular language
- Complement – NOT
- Intersection – NOT
- Difference – NOT

IS NOT Context-Free

- Prove that a language is not context-free
  - Use pumping theorem
  - Use closure operations
    - Intersection with a regular language

Decision Problems

- Membership
- Emptiness
- Finiteness
- Specific questions