Lecture 27 – Course Review

COSE215: Theory of Computation

Jihyeok Park

2024 Spring

Goal of This Course

PLRG

- What is the *mathematical model* of computers?

Goal of This Course

PLRG

- What is the *mathematical model* of computers?

Turing Machine!

Let's learn **Turing Machine**

Goal of This Course

PLRG

- What is the *mathematical model* of computers?

Turing Machine!

Let's learn **Turing Machine**

- Is it possible to solve *every problem* using computers?

Goal of This Course

PLRG

- What is the *mathematical model* of computers?

Turing Machine!

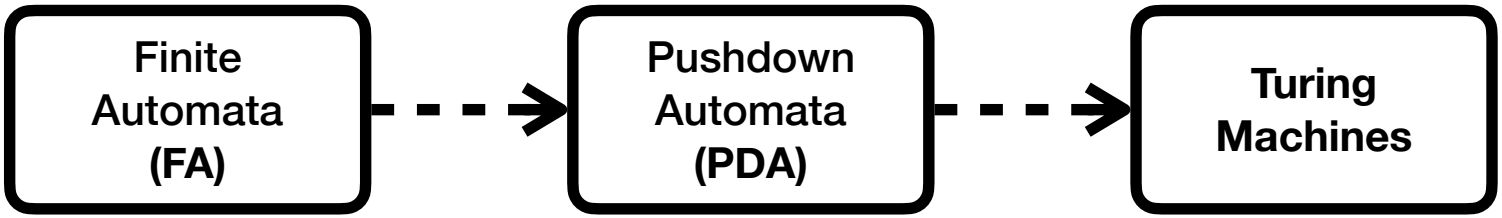
Let's learn **Turing Machine**

- Is it possible to solve *every problem* using computers?

No!

Let's learn **Undecidability** and **Intractability**

Roadmap: Towards Turing Machine



- **Finite Automata (FA)**
  - Regular Expressions and Languages
  - Applications: text search, etc.
- **Pushdown Automata (PDA)**
  - Context-Free Grammars (CFGs) and Languages (CFLs)
  - Applications: programming languages, natural language processing, etc.
- **Turing Machines (TMs)**
  - Extensions of Turing Machines
  - Undecidability and Intractability

Summary

	Automata	Grammars	Languages
(Part 3) Turing Machines			
(Part 2) Pushdown Automata			
(Part 1) Finite Automata			
(Part 0) Basic Concepts			

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	Automata	Grammars	Languages
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(Part 1) Finite Automata			
(Part 0) Basic Concepts	(Lecture 1) **Mathematical Preliminaries**		

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	Automata	Grammars	Languages
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(Part 2) Pushdown Automata			
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(Part 0) Basic Concepts	(Lecture 1) **Mathematical Preliminaries**	(Lecture 2) **Scala**	

Summary

	Automata	Grammars	Languages
(Part 3) Turing Machines			
(Part 2) Pushdown Automata			
(Part 1) Finite Automata	(Lecture 3) DFA		(Lecture 3) RL
(Part 0) Basic Concepts	(Lecture 1) **Mathematical Preliminaries**	(Lecture 2) **Scala**	

Summary

	Automata	Grammars	Languages
(Part 3) Turing Machines			
(Part 2) Pushdown Automata			
(Part 1) Finite Automata	(Lecture 4) NFA $\rightleftarrows$ (Lecture 3) DFA		(Lecture 3) RL
(Part 0) Basic Concepts	(Lecture 1) **Mathematical Preliminaries**	(Lecture 2) **Scala**	

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	Automata	Grammars	Languages
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(Part 1) Finite Automata	(Lecture 4) NFA ⇄ (Lecture 3) DFA ⇄ (Lecture 5) ϵ-NFA		(Lecture 3) RL
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Summary

PLRG

	Automata	Grammars	Languages
(Part 3) Turing Machines			
(Part 2) Pushdown Automata			
(Part 1) Finite Automata	(Lecture 4) (Lecture 3) (Lecture 5) NFA $\rightleftarrows$ DFA $\rightleftarrows$ ϵ-NFA	(Lecture 6) RE	(Lecture 3) RL
(Part 0) Basic Concepts	(Lecture 1) **Mathematical Preliminaries**	(Lecture 2) **Scala**	

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	Automata	Grammars	Languages
(Part 3) Turing Machines			
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(Part 1) Finite Automata	(Lecture 4) NFA ⇄ (Lecture 3) DFA ⇄ (Lecture 5) ϵ-NFA ← (Lecture 7) → (Lecture 6) RE		(Lecture 3) RL
(Part 0) Basic Concepts	(Lecture 1) **Mathematical Preliminaries**	(Lecture 2) **Scala**	

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	Automata	Grammars	Languages
(Part 3) Turing Machines			
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(Part 1) Finite Automata	(Lecture 4) NFA ⇄ (Lecture 3) DFA ⇄ (Lecture 5) ϵ-NFA; (Lecture 7) ϵ-NFA → RE; (Lecture 6) RE → DFA	(Lecture 6) RE	(Lecture 3) RL **Closure Properties** (Lecture 8)
(Part 0) Basic Concepts	(Lecture 1) **Mathematical Preliminaries**	(Lecture 2) **Scala**	

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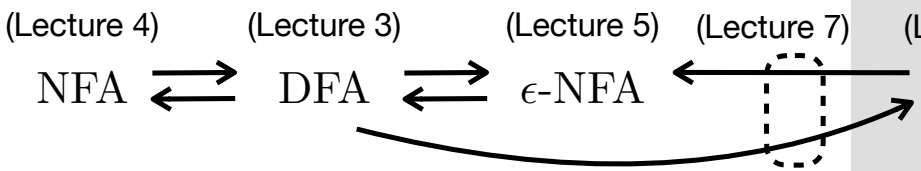
(Part 1) Finite Automata			(Lecture 3) RL **Closure Properties** (Lecture 8) **Pumping Lemma** (Lecture 9)
(Part 0) Basic Concepts	(Lecture 1) **Mathematical Preliminaries**	(Lecture 2) **Scala**	

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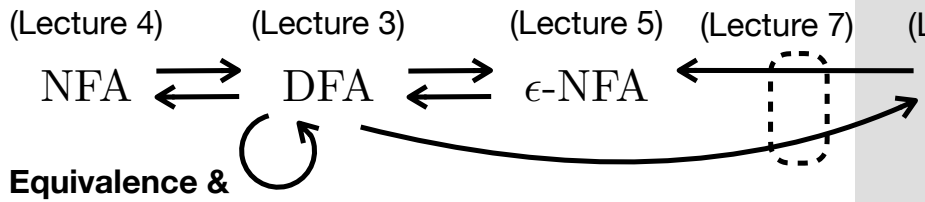
(Part 1) Finite Automata	 **Equivalence & Minimization** (Lecture 10)		(Lecture 3) RL **Closure Properties** (Lecture 8) **Pumping Lemma** (Lecture 9)
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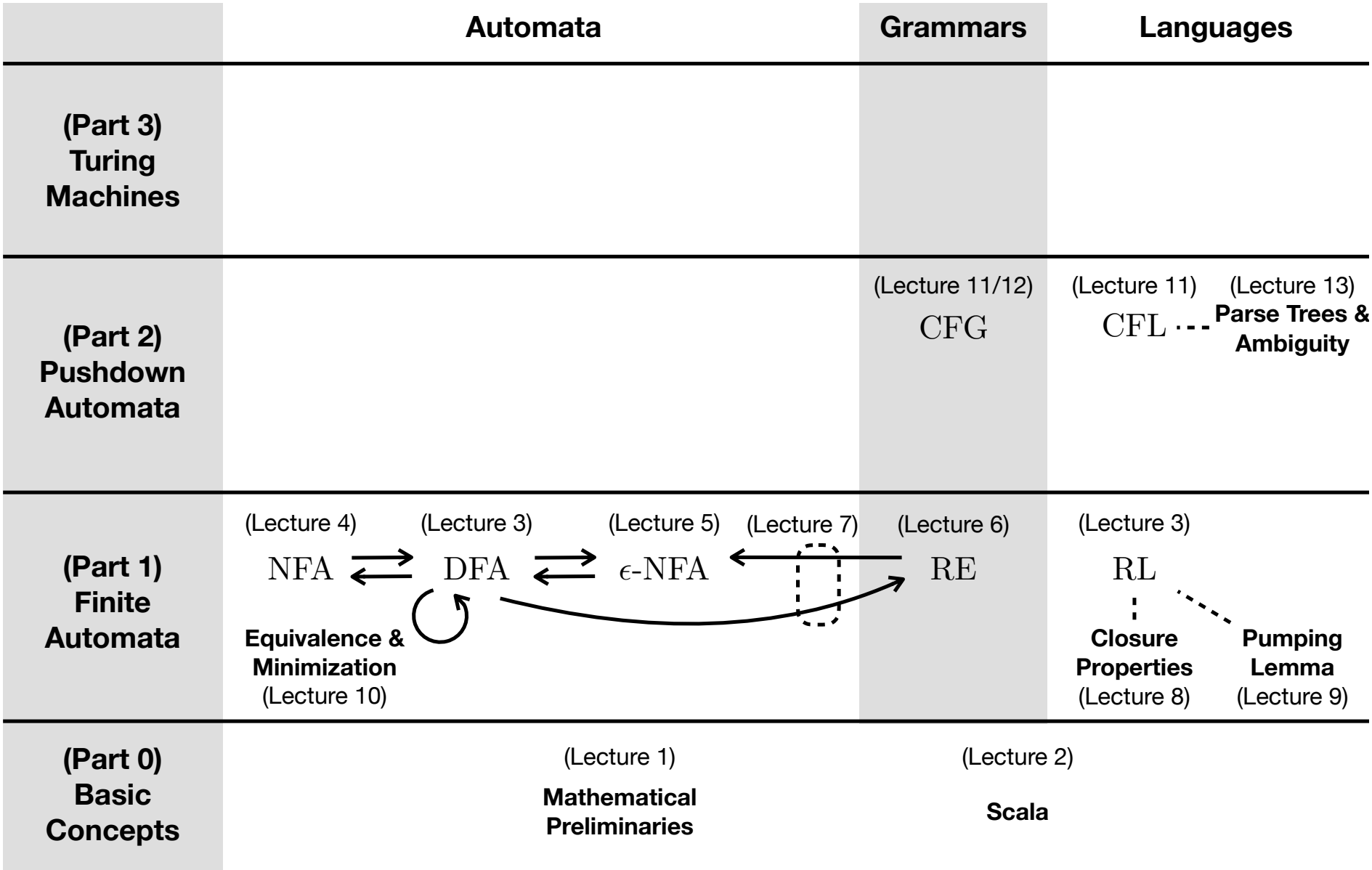
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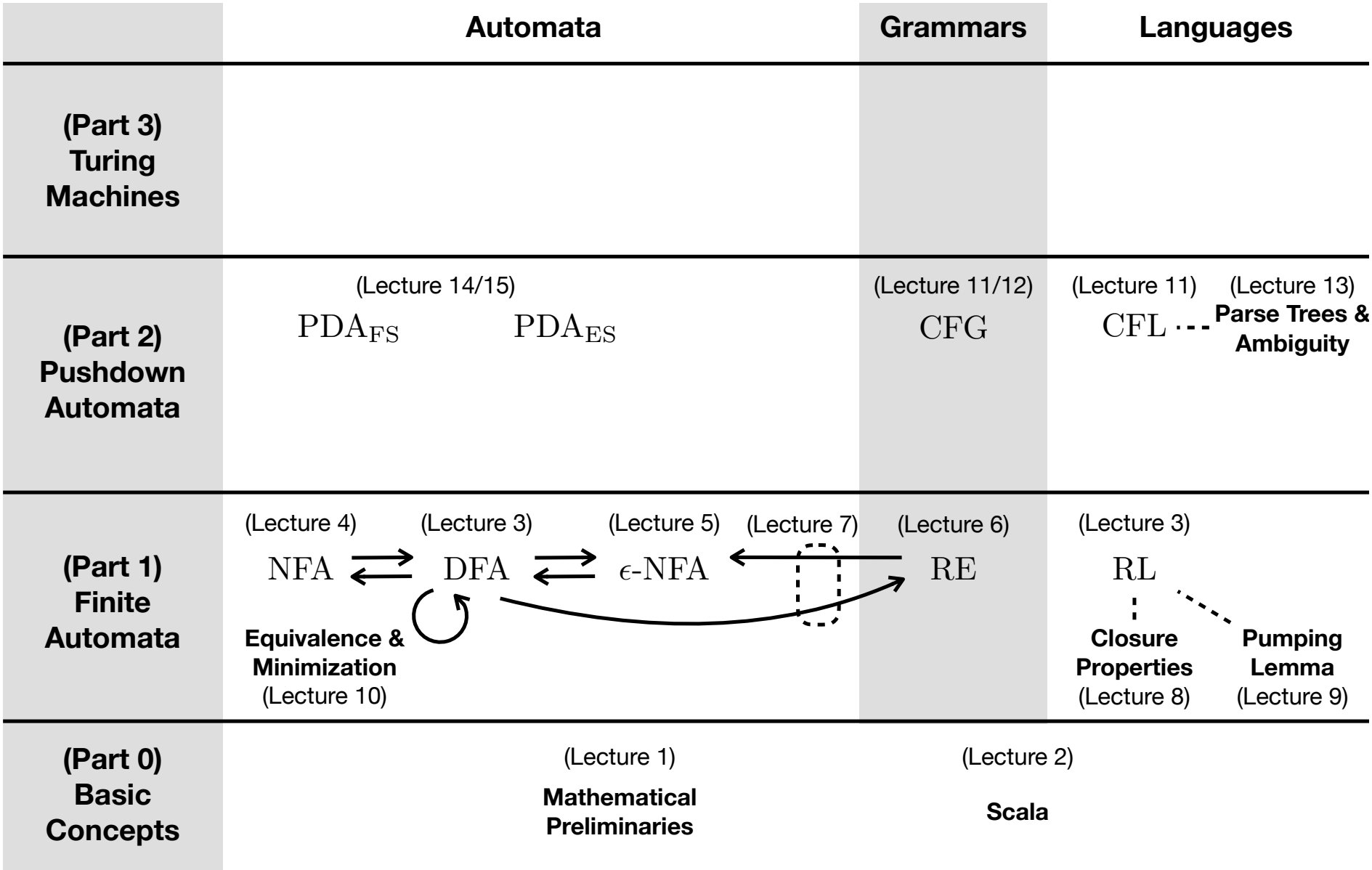
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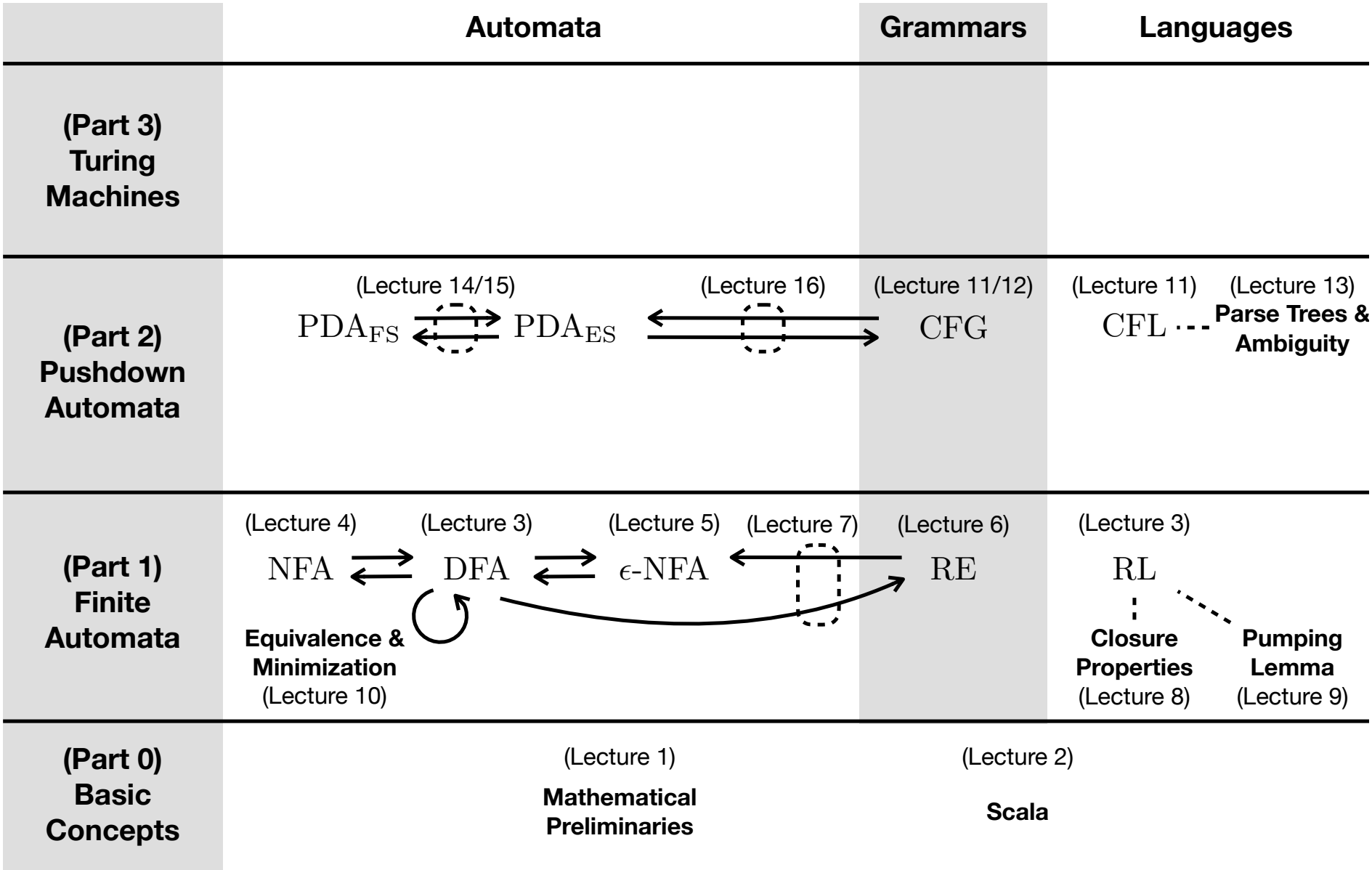
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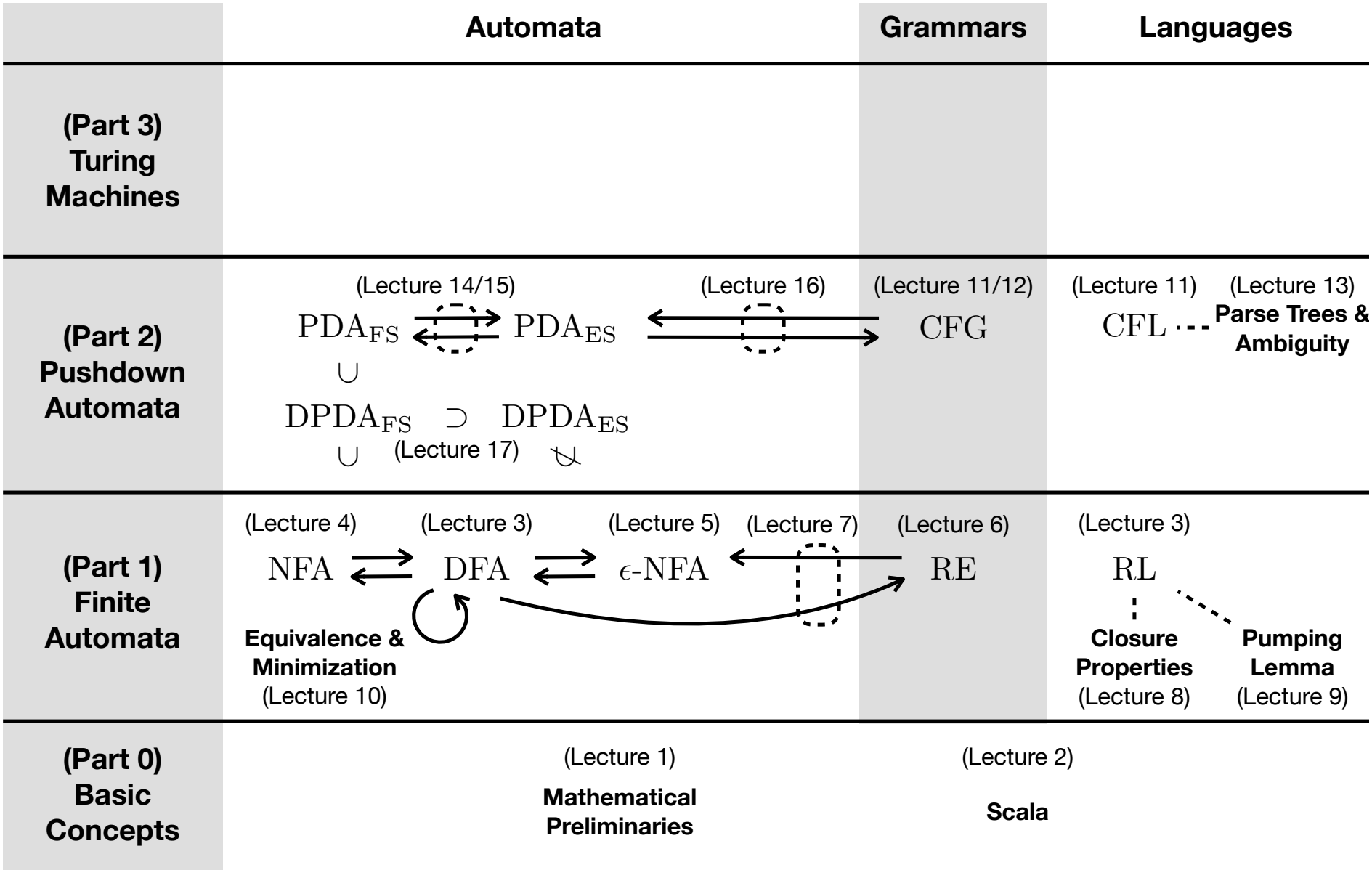
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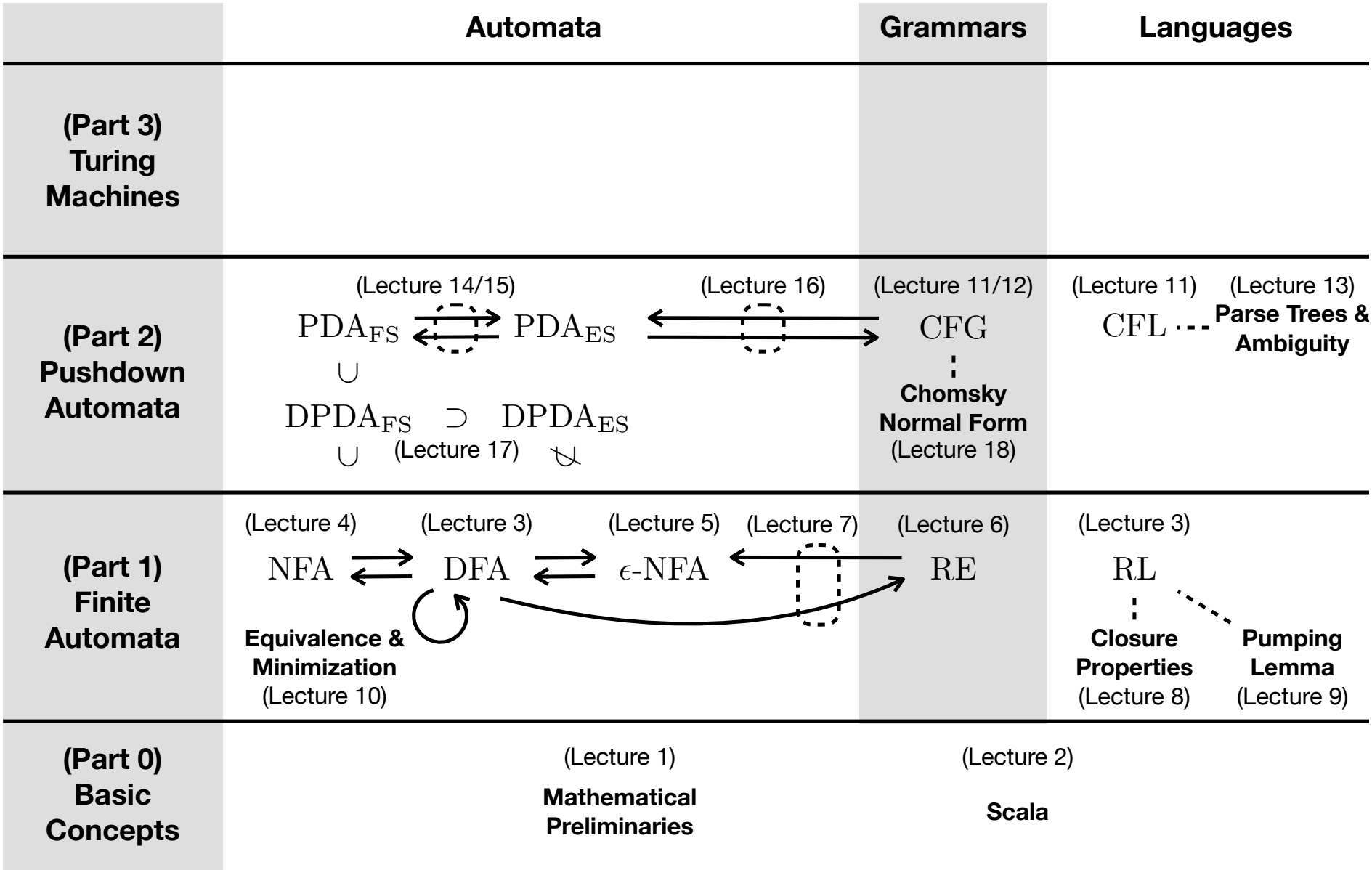
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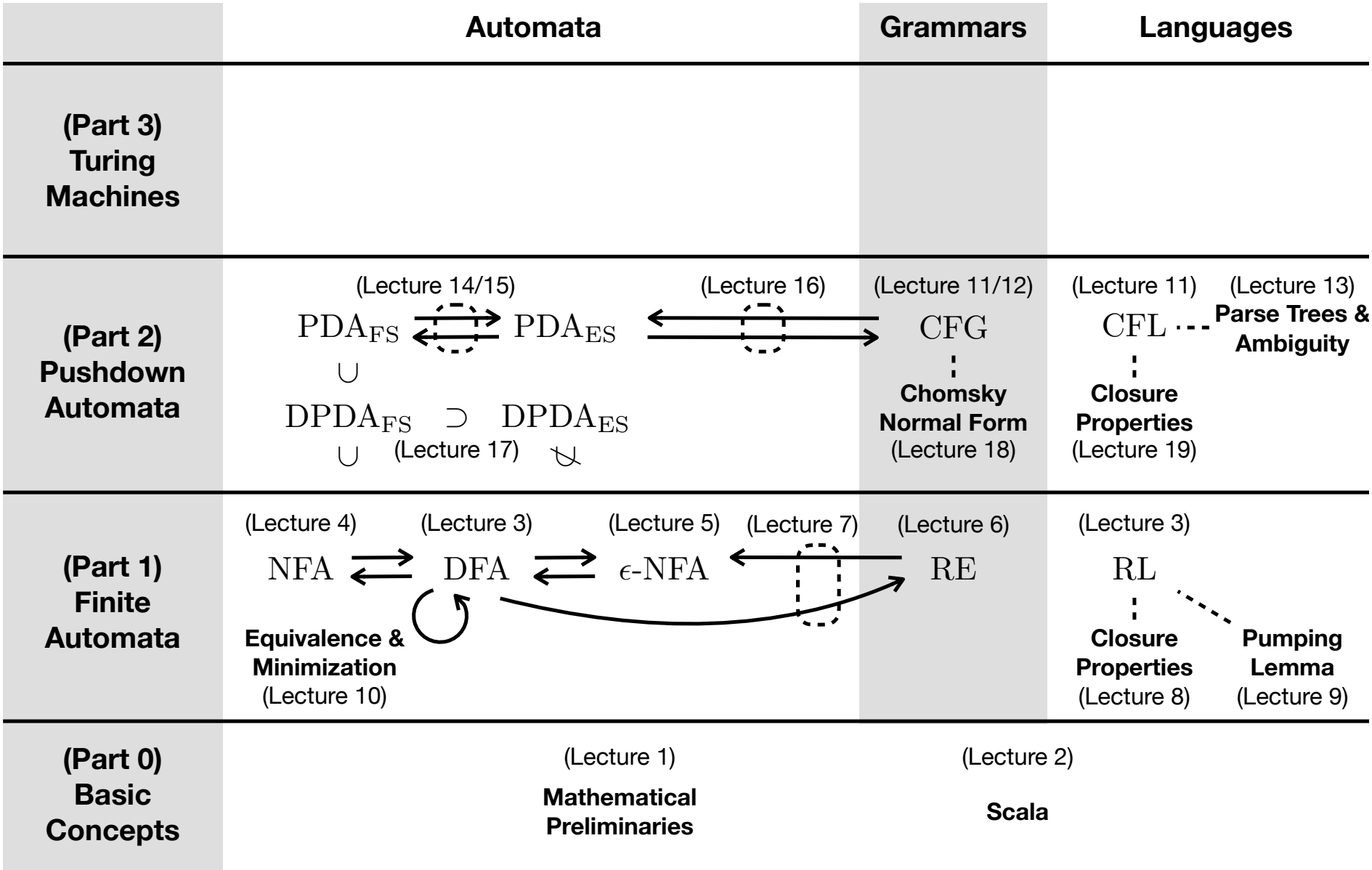
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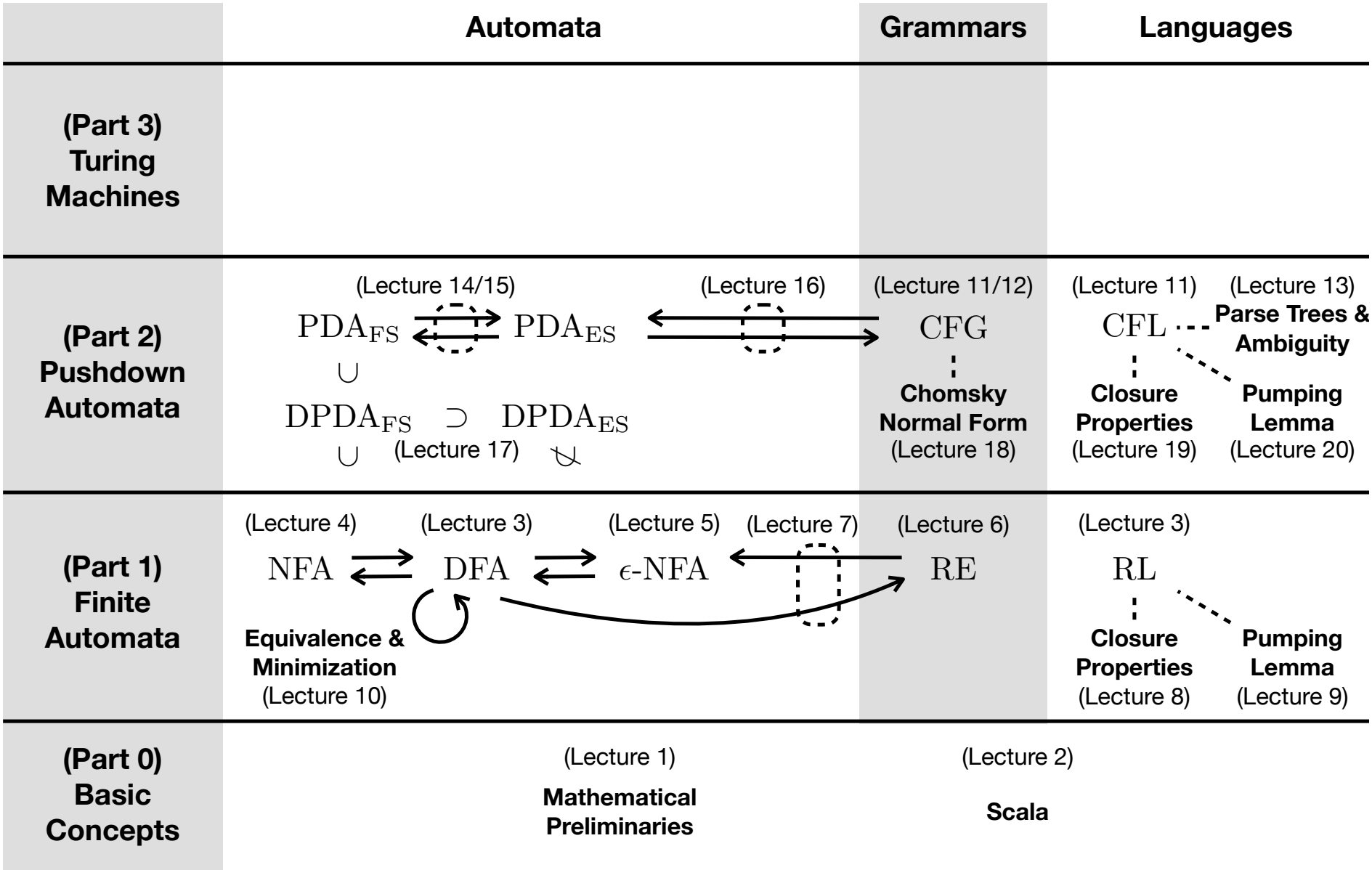
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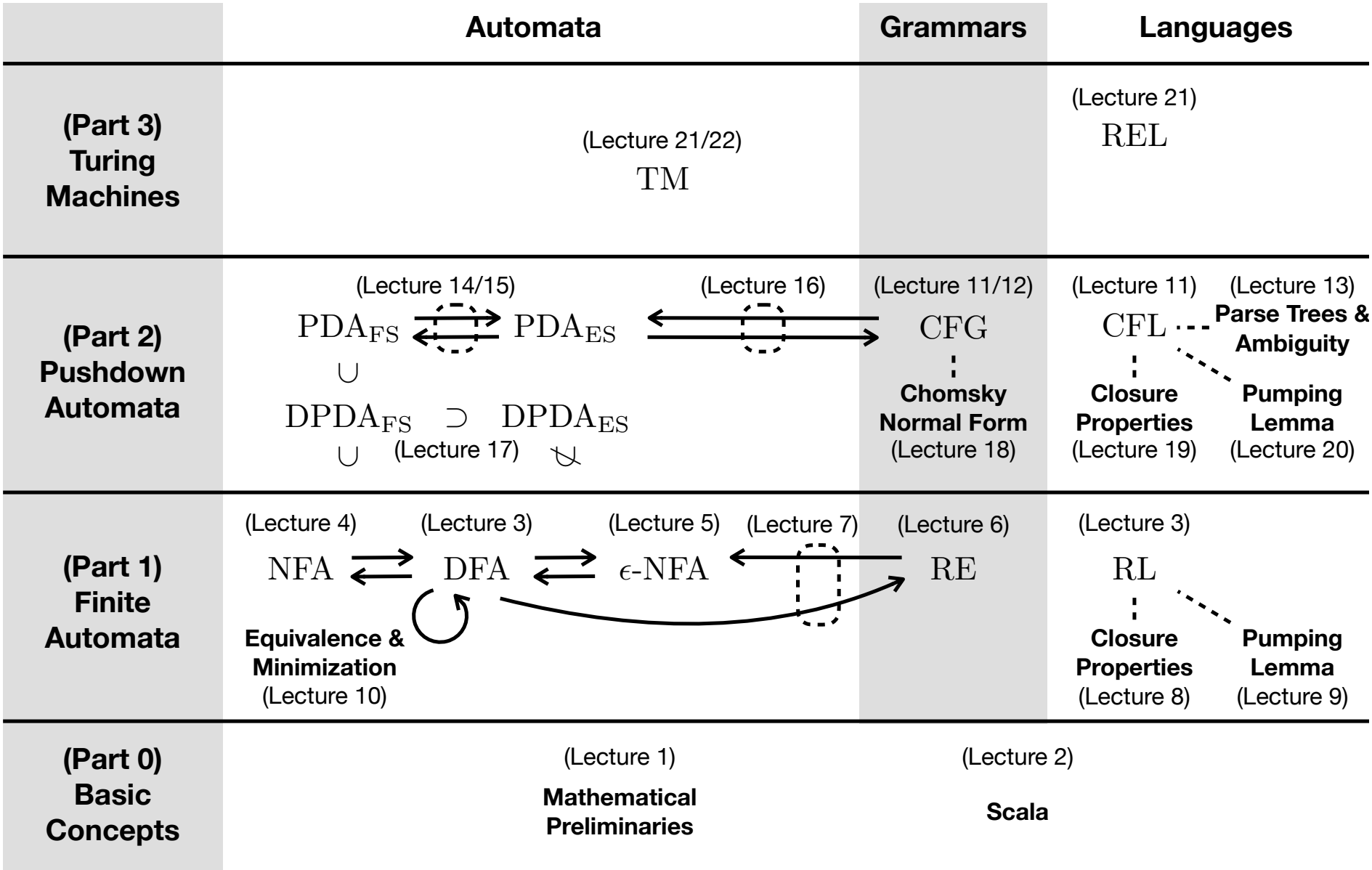
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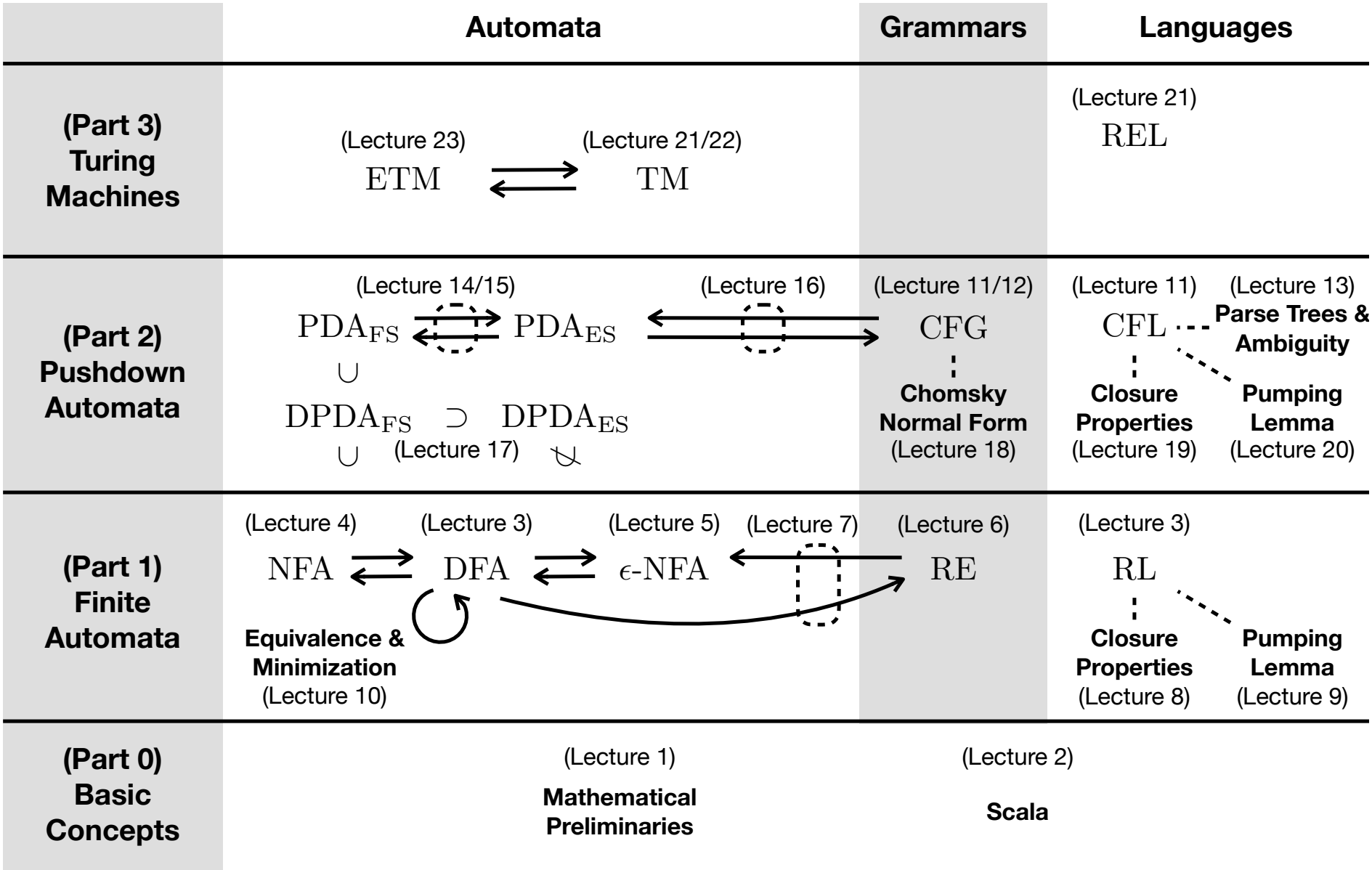
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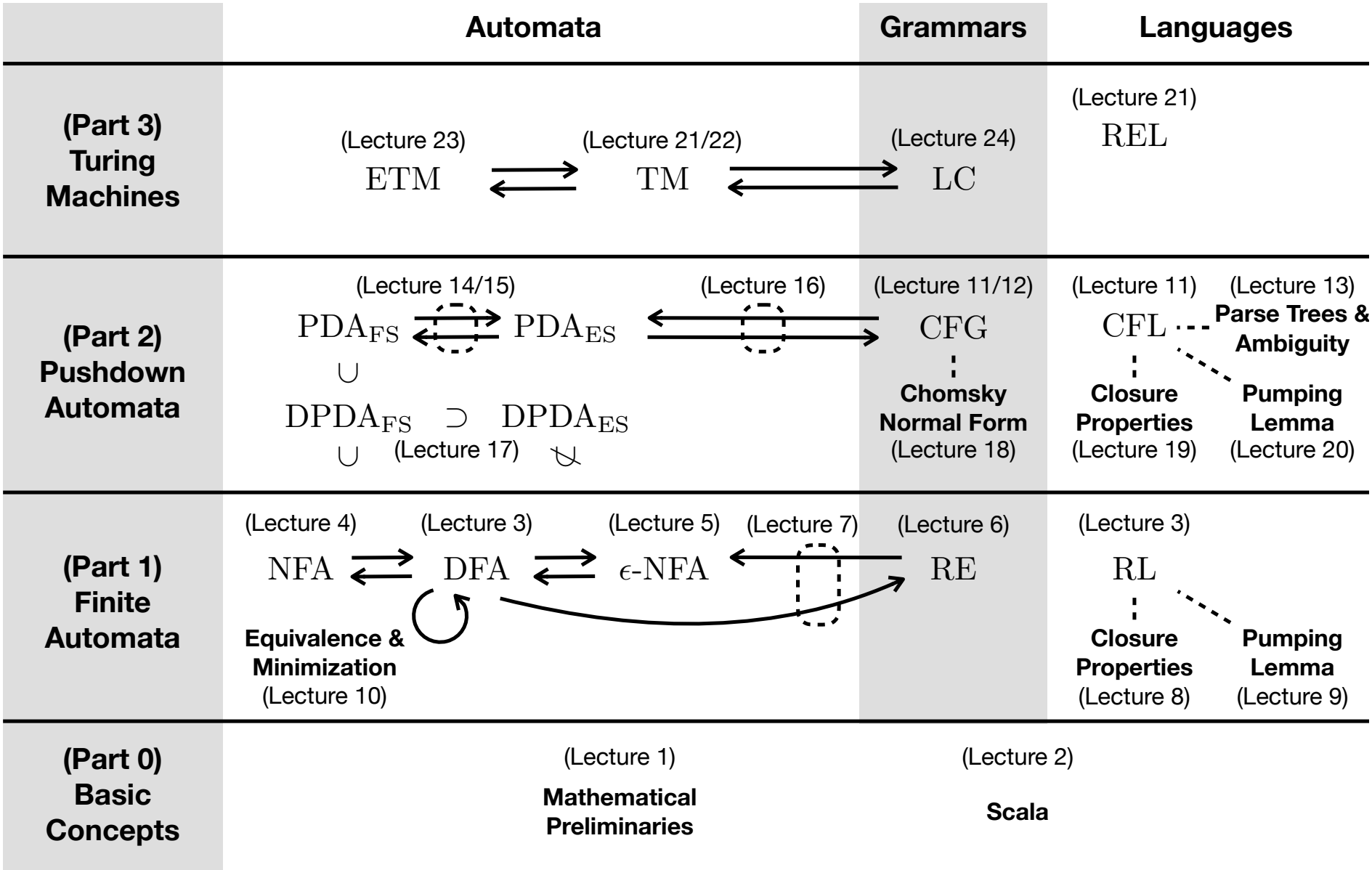
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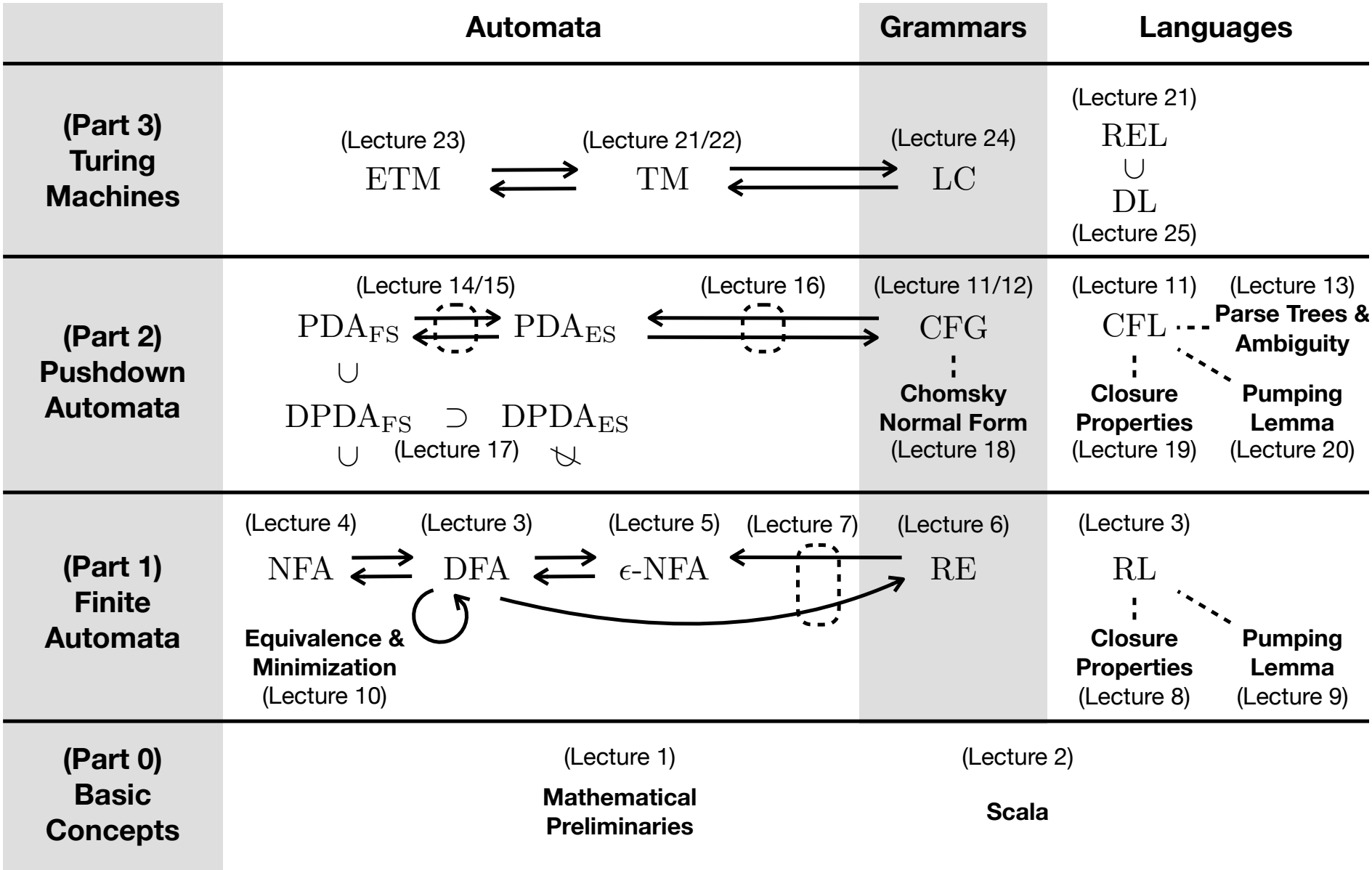
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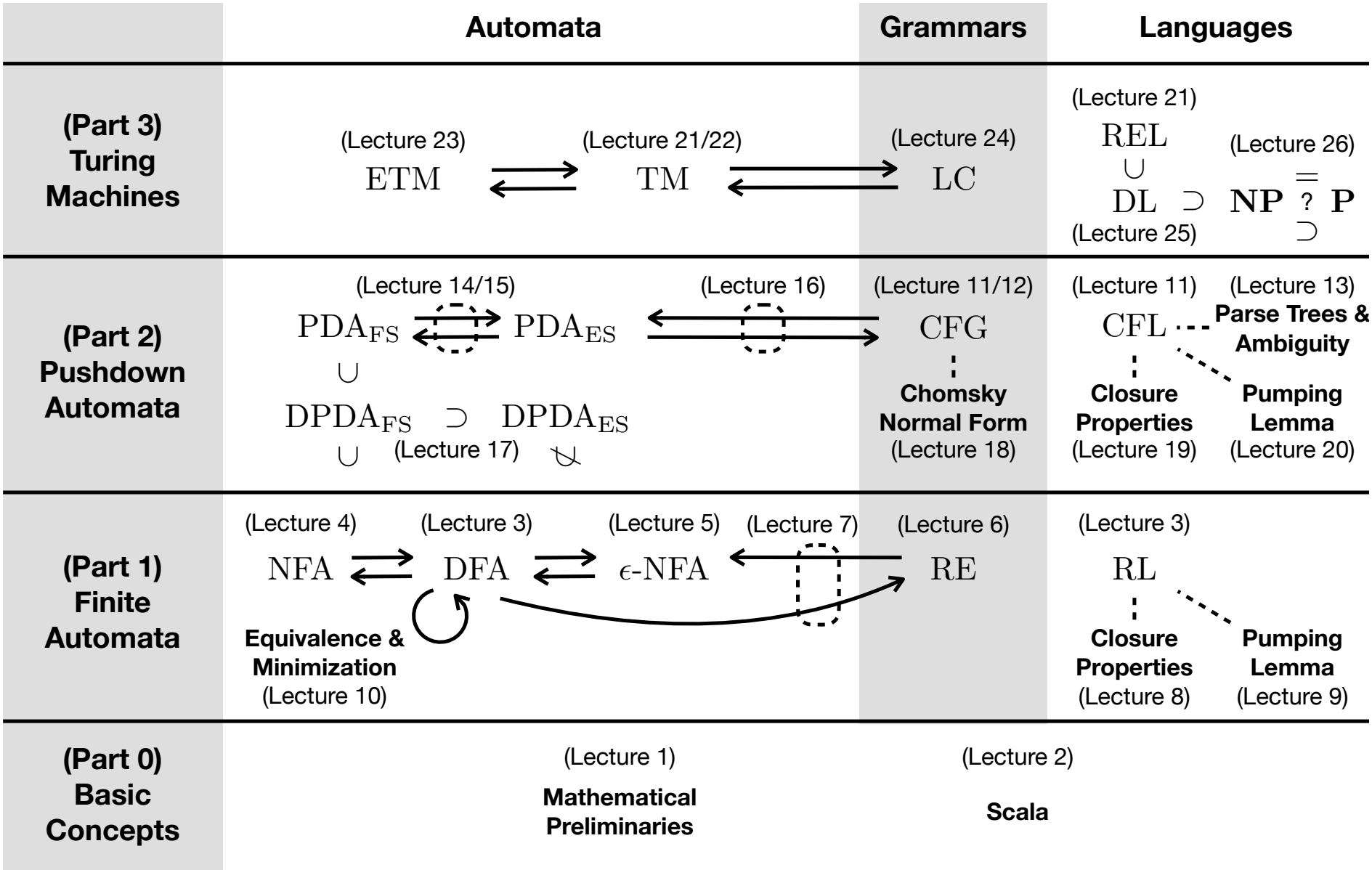
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Final Exam

- The final exam will be given in class.
- **Date:** 13:30-14:45 (1 hour 15 minutes), June 19 (Wed.).
- **Location:** 604, Woojung Hall of Informatics (우정정보관 604호)
- **Coverage:** Lectures 14 – 26
- **Format:** 7–9 questions with closed book and closed notes
  - Filling blanks in some tables, sentences, or expressions.
  - Construction of automata or grammars for given languages.
  - Proofs of given statements related to automata or grammars.
  - Yes/No questions about concepts in the theory of computation.
  - etc.
- Note that there is **no class** on **June 17 (Mon.)**.
- Please refer to the **previous exams** in the course website:

https://plrg.korea.ac.kr/courses/cose215/

- I hope you enjoyed the class!

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https://plrg.korea.ac.kr