WASHINGTON STATE UNIVERSITY

SCADS

CptS 317: Automata and Formal Languages

Assefaw Gebremedhin

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Spring 2021

About me

- Name: Assefaw Gebremedhin
  (pronounced “Asse-faw” “Geb-re-me-d-hin”)
- Email: assefaw.gebremedhin@wsu.edu
- Webpage: www.eecs.wsu.edu/~assefaw
- Research interests: Data science, graph algorithms, high performance computing, bioinformatics
- Lab: Scalable Algorithms for Data Science (SCADS) Laboratory (https://scads.eecs.wsu.edu)
- Teaching at WSU:
  - CptS 475/575: Data Science (Fa. 2015--2020)
  - CptS 591: Elements of Network Science (Sp. 2015–2021)
  - CptS 317: Automata and Formal Languages (Sp. 2020)
  - CptS/STAT 424: Data Analytics Capstone (Sp. 2019)

- CptS 317 Spring 2021:
  - **Lectures:** MWF, 10:10--11, via Zoom
  - **Instructor Office Hour**: Wed. 11:30am—12:30pm (or by appointment), via Zoom

  - **Graduate Teaching Assistant:** James Halvorsen
  - **Email:** james.halvorsen@wsu.edu
  - **Office Hour**: TBD

  - **UG Teaching Assistant 1**: Makiah Heinzmann
  - **Email:** makiah.heinzmann@wsu.edu
  - **Office Hour**: TBD

  - **UG Teaching Assistant 2:** TBD
  - **Email:** TBD
  - **Office Hour:** TBD

What I know (so far) about the class

- Enrolled: 118
- Majors:
  - BS in Computer Science: 97
  - BS in Software Engineering: 10
  - BA in Computer Science: 3
  - BS in Data Analytics: 2
  - BS in Electrical Engineering: 1
  - BS in Computer Engineering: 1
  - BS in Mechanical Engineering: 1
  - BA in Business: 1

Course management system

- Everything will be done on Canvas
  - Syllabus
  - Lecture notes/slides
  - Zoom Recordings
  - Homework posting
  - Homework submission
  - Announcements
  - Messages (emails)
- Make sure to work you on your Canvas setting
  - Time zone
  - Notification frequency

Course Objectives

- Introduce concepts in automata theory and theory of computation
- Identify different formal language classes and their relationships
- Design grammars and recognizers for different formal languages
- Prove or disprove theorems in automata theory using its properties
- Determine the decidability and intractability of computational problems

Major Course Topics (Modules)

1. Introduction
2. Regular Languages
3. Context-free Languages
4. Church-Turing Thesis
5. Decidability
6. Reducibility
7. Time Complexity

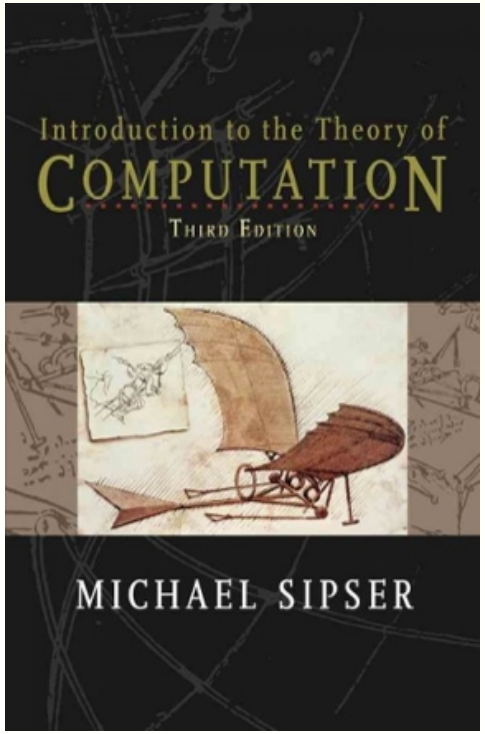
Pre-requisites

- CptS 122/132: Data Structures
- Math 216: Discrete Structures

Textbook

Textbook (required):

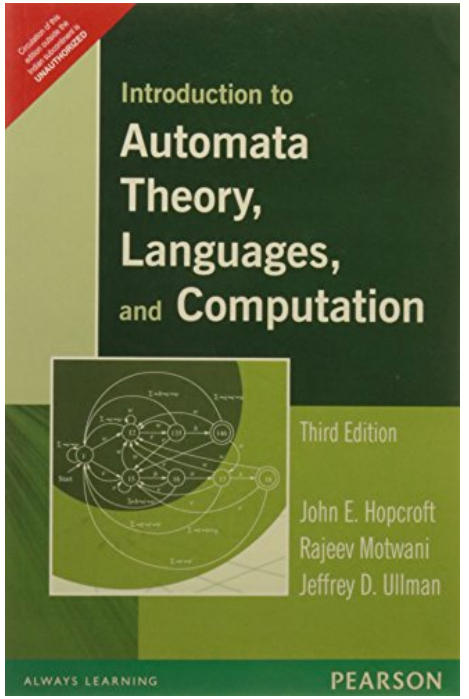
- Introduction to the Theory of Computation, 3rd Edition
  - By Michael Sipser



Textbook

Optional reference:

- Introduction to Automata Theory, Languages and Computation, 3rd Ed.
  - By J.E. Hopcroft, R. Motwani, J.D. Ullman



Optional reference:

Coursework and grading

- 8 homeworks (58%) – best 7 out of 8 will be used toward final grade
- 2 midterms (20%)
- 1 final exam (20%)
- Class participation (2%)

- Exam formats not decided yet, likely to be take-home

- Final letter grade based on ranges (see syllabus)

Homework submission policy

- Solutions submitted electronically on Canvas
  - Type up and generate PDF, or
  - Scan hand-written solution
- No late submissions allowed (unless there was prior permission)
  - Permission is given only under extraordinary circumstances
- Homeworks will be posted on Canvas.
- A HW will be posted a week before it is due, typically on a Wed

Homework policy

- All homework must be done individually

- Cheating:
  - Helping others, getting help, looking up website for solution, etc
  - Students caught cheating will be awarded an F grade, and will be subjected to the WSU academic dishonesty policy
  - If something is not clear, on what constitutes cheating and what does not, please consult the instructor in advance

Exam policy

- 2 midterms and 1 final exam
- Likely take-home, creative, will require reflection, challenging, fun

- Make-ups happen only under extraordinary circumstances
- Seek prior permission from instructor (at least two weeks in advance)

Weekly schedule

Week	Topics	Assignments/comments
01 (Jan 18)	Intro to course	HW0 (survey) out; NO CLASS 1/18–MLK
02 (Jan 25)	Intro to automata theory	HW0 in, HW1 out
03 (Feb 01)	Finite Automata	HW1 in, HW2 out
04 (Feb 08)	Regular Expressions	HW2 in, HW3 out
05 (Feb 15)	Nonreguar Languages	HW3 in, HW4 out; NO CLASS 2/15
06 (Feb 22)	Context-free Grammars	HW4 in
07 (Mar 01)	Pushdown Automata	Mid-Term 1
08 (Mar 08)	Non-Context-Free Languages	HW5 out
09 (Mar 15)	Turing Machines	HW5 in, HW 6 out; NO CLASS 3/17
10 (Mar 22)	The Definition of Algorithm	HW 6 in
11 (Mar 29)	Decidable Languages	Mid-Term 2
12 (Apr 05)	Undecidability	HW7 out
13 (Apr 12)	Reducibility	HW7 in, HW8 out
14 (Apr 19)	Time Complexity	HW8 in
15 (Apr 26)	NP-Completness	
16 (May 03)	Finals Week	Final Exam

Lecture basics

- Classes will mostly be based on Slides but occasionally may involve "Board" writing
- Lecture slides will be posted on Canvas immediately after class
- Take your own notes in class (can't stress this enough), even if slides are posted afterwards

In conclusion…

- Welcome to this course again
- This is going to be a fun semester
- Put in your best effort
- You will be rewarded
- Class begins sharp at 10:10, login at least a few minutes early
- Thanks for today and see you in class on Friday!