CSCI 2270: Data Structures

Lecture 01: Introduction

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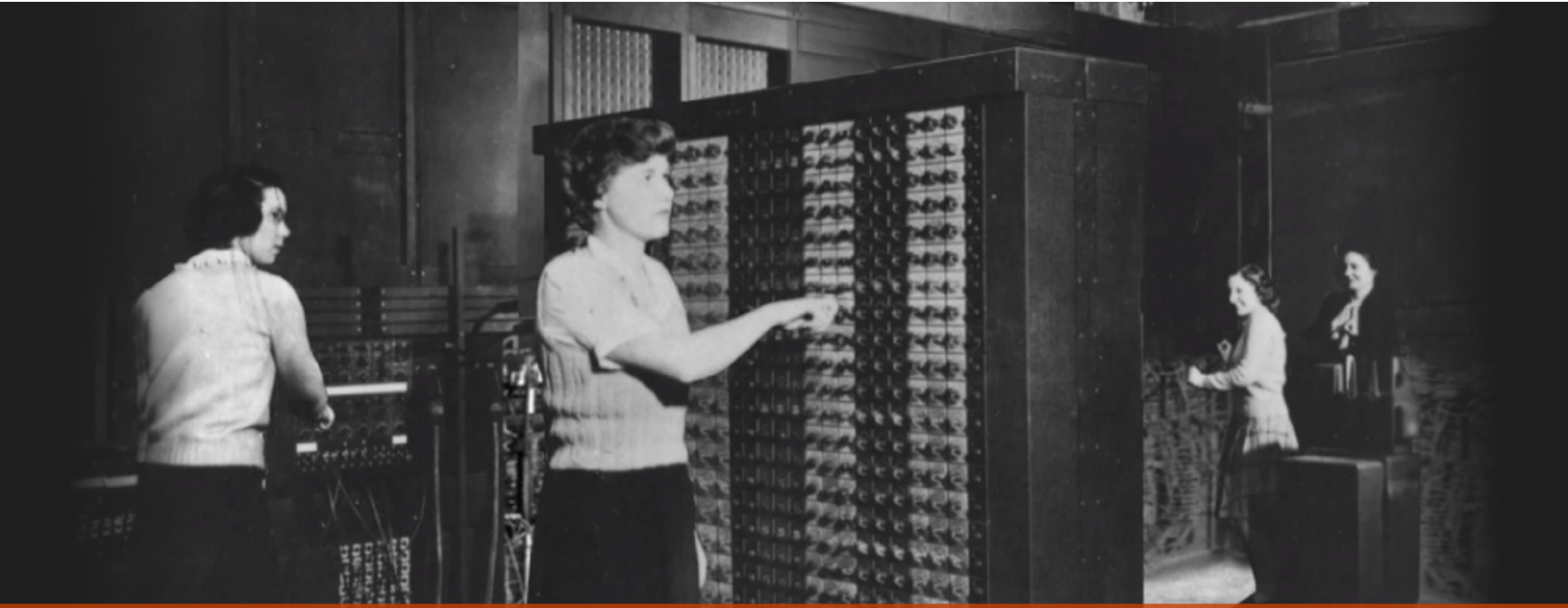


"We were sure that this machine could do anything we wanted it to do. We were very cocky about that."

Marlyn Wescoff Meltzer, *ENIAC Programmer*

“Programming is programming. If you get good at programming, it doesn't matter which language you learned it in, because you'll be able to do programming in any language. The hard part of programming is the same regardless of the language. And if you have a talent for that, and you learned it here, you can take it over there.”

Richard Stallman
Founder of the Free-Software Movement

“ The best way to prepare [to be a programmer] is to write programs, and to study great programs that other people have written. In my case, I went to the garbage cans at the Computer Science Center and fished out listings of their operating system.”

Bill Gates
Principal founder of Microsoft Corp.

“It has often been said that a person does not really understand something until after teaching it to someone else. Actually a person does not really understand something until after teaching it to a computer, i.e., expressing it as an algorithm.”

Don Knuth
1974 Turing Award Winner


48
mph
MENU
INFORMATION
Autonomous
Mode
NETWORK
DRIVER

Data Structures

How to abstractly represent physical world to enable efficient problem solving?

Algorithms

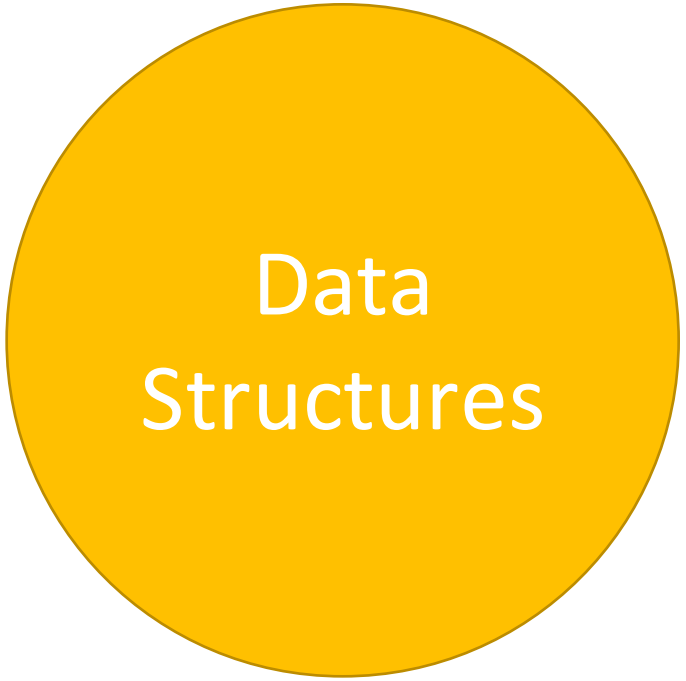
Bio Sketch of Your Instructor

- Born in *India* in 1979
- Got introduced to Data-Structures (and Pascal) in 1997
- PhD from University of Warwick in 2009
- Joined the CS department as an Assistant Professor in 2017
- Research interests
  - Automata Theory, Logic, and Games
  - Formal methods for verification and synthesis
  - Safety in AI

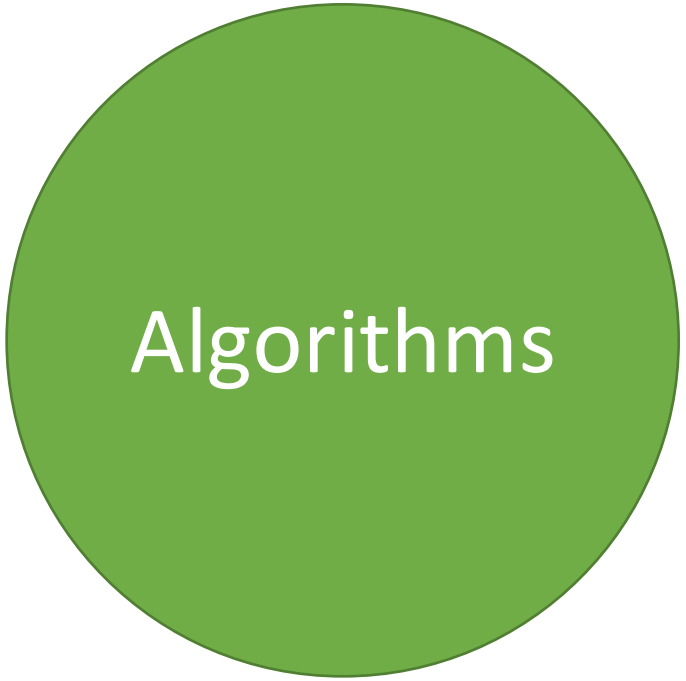
Data Structures

How to abstractly represent physical world to enable efficient problem solving?

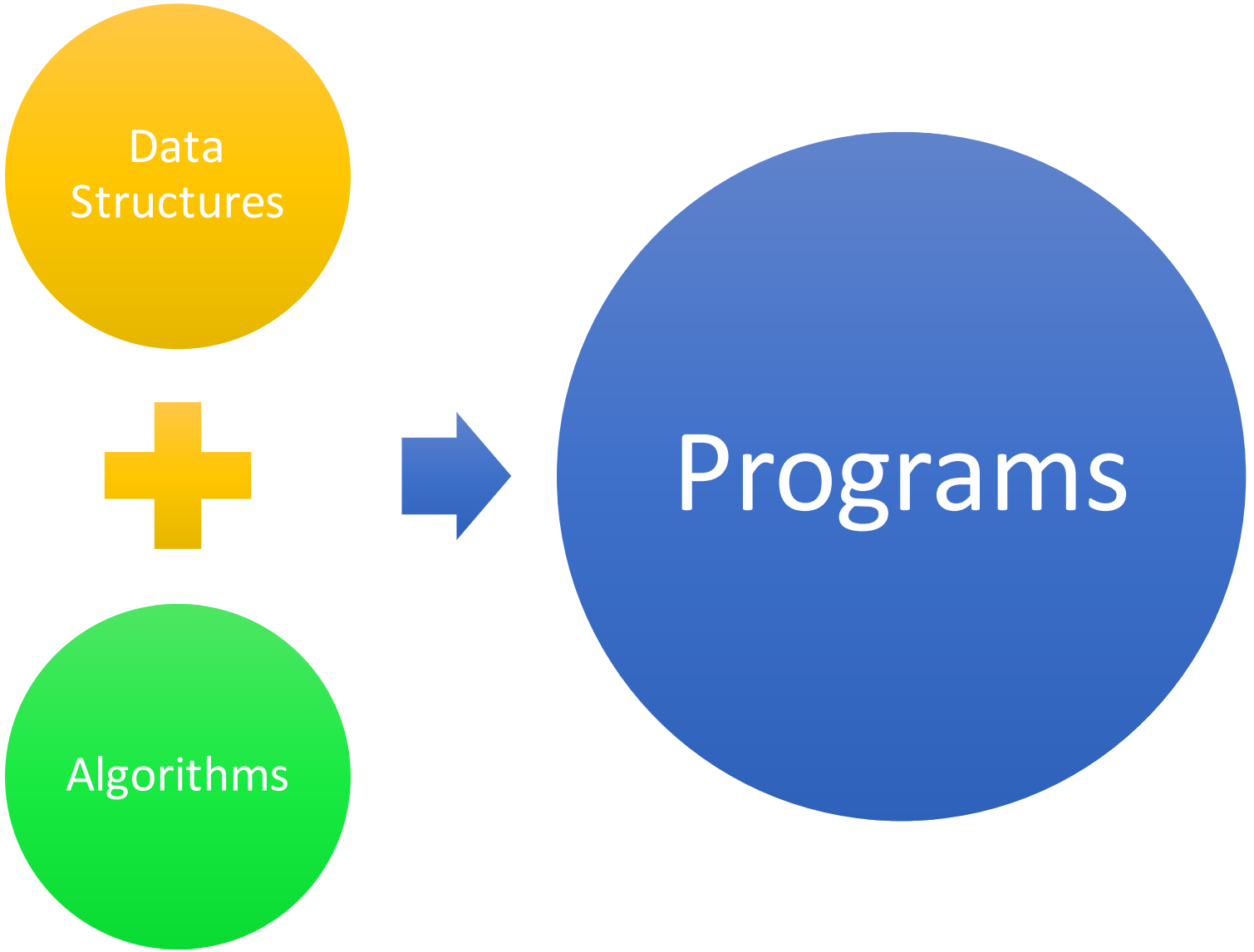
Algorithms



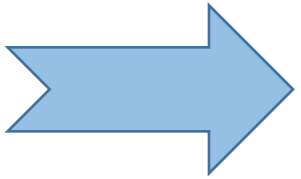
Abstract representation of problem data for computational problem-solving

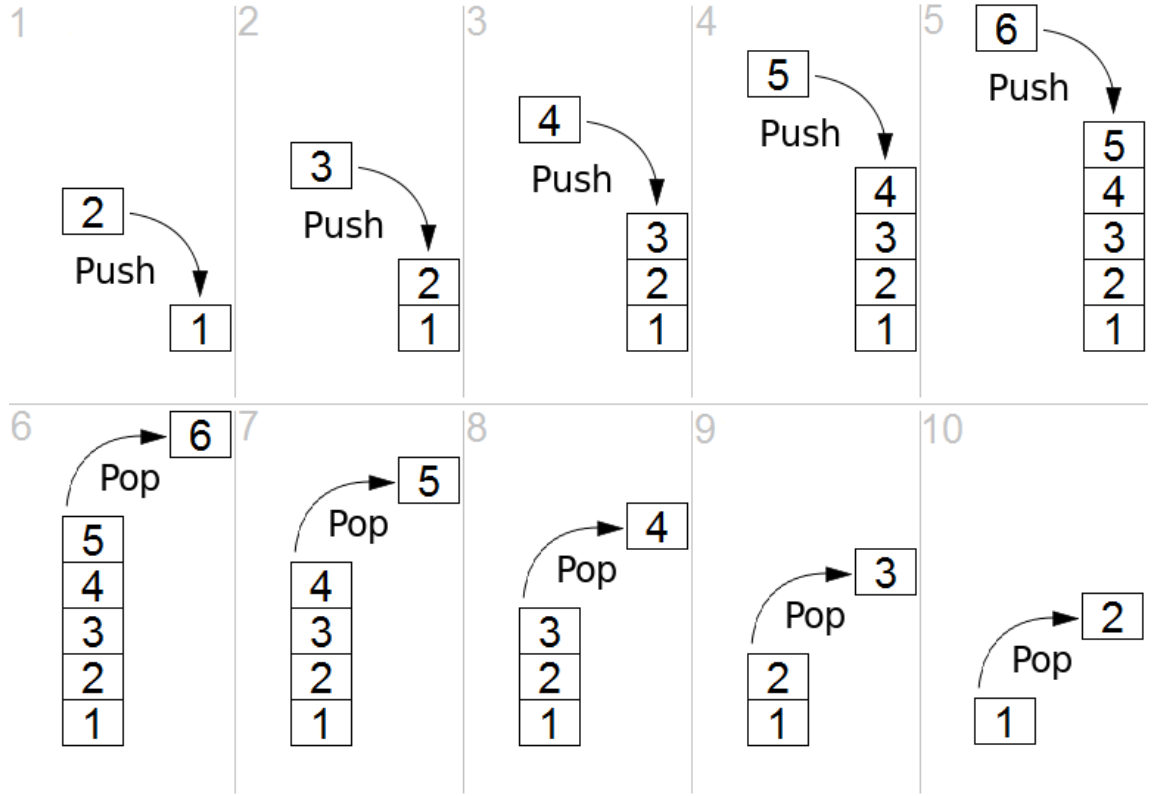


Abstract Recipe to manipulate data
for computational problem solving

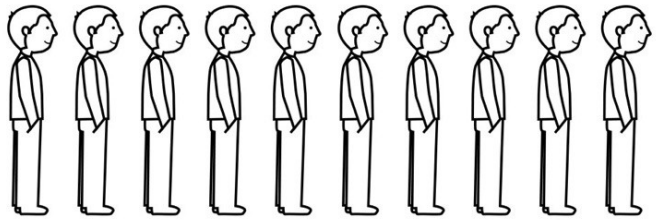

Data Structures
Algorithms
Programs

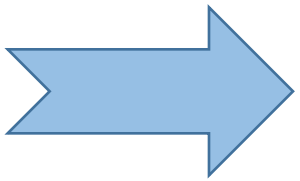
Examples of Data-Structures: Stacks

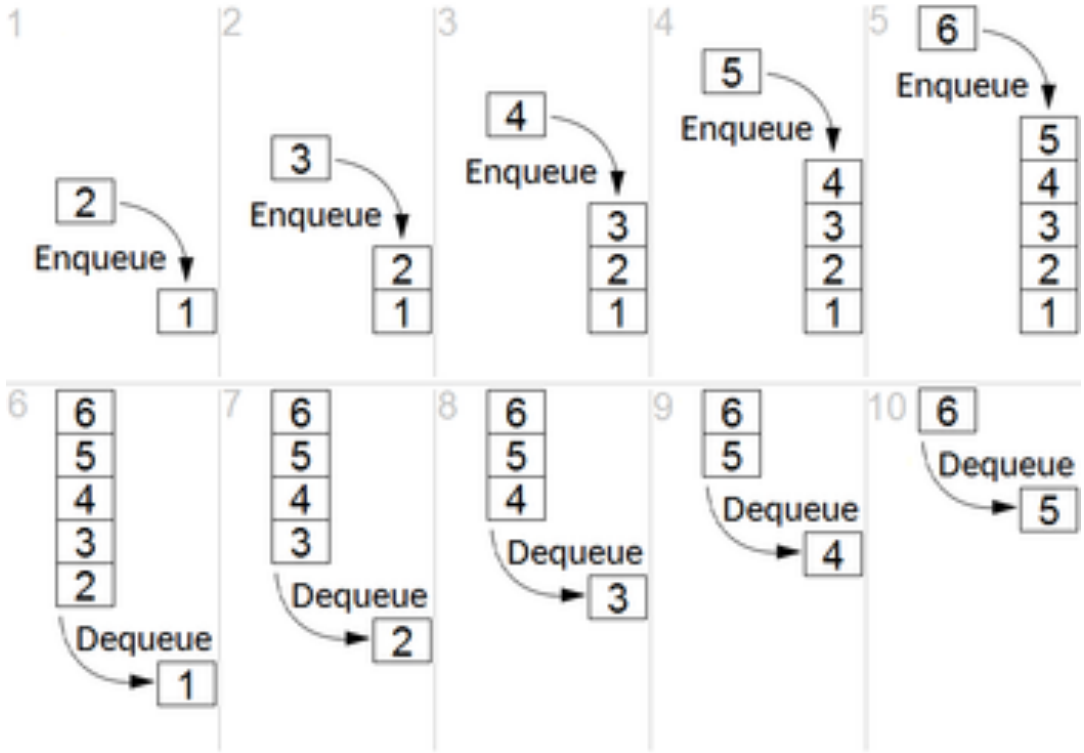




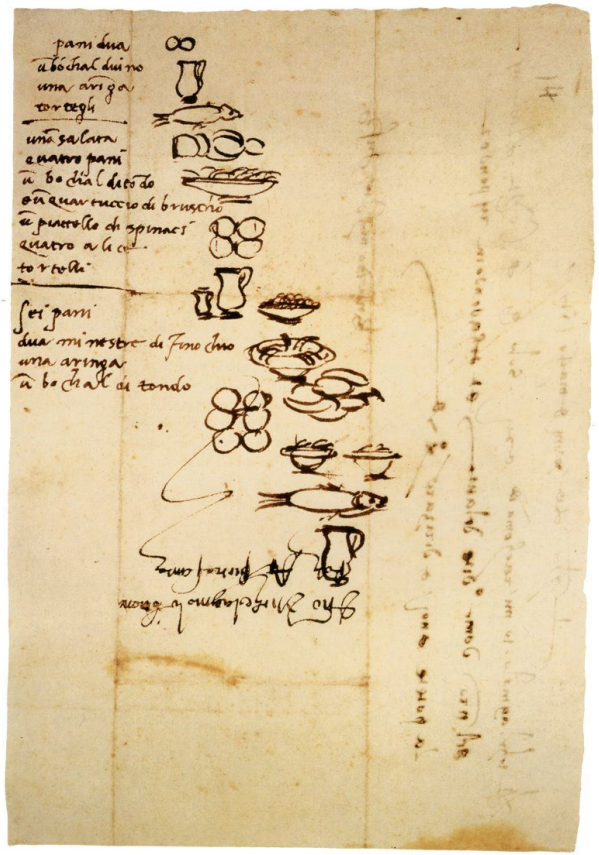
Examples of Data-Structures: Queues

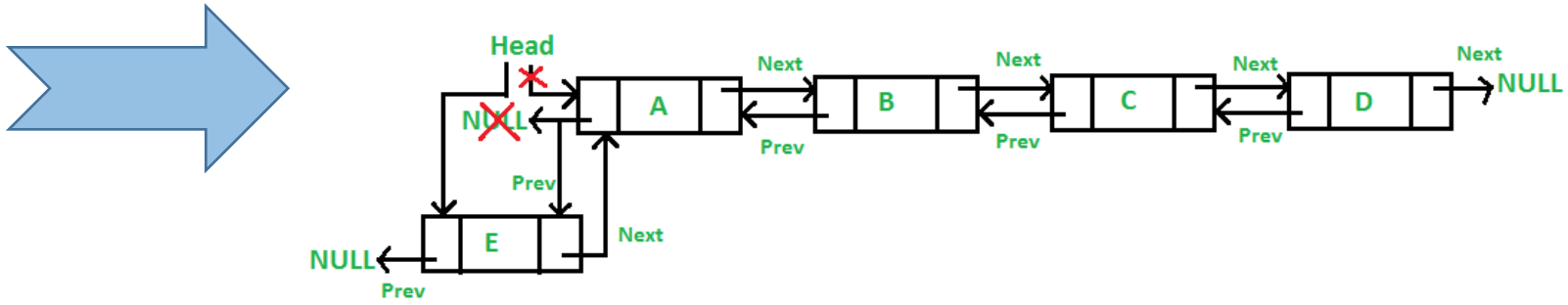




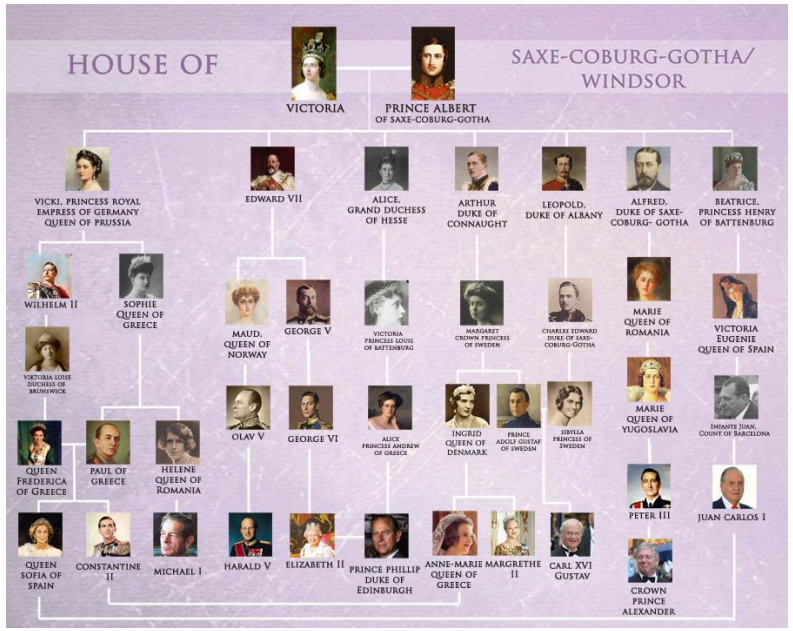


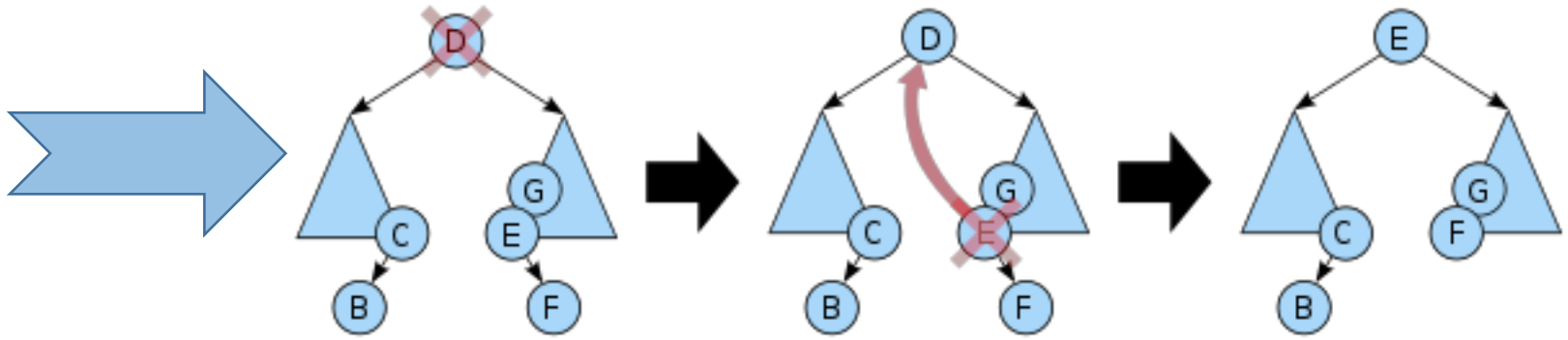
Examples of Data-Structures: Lists



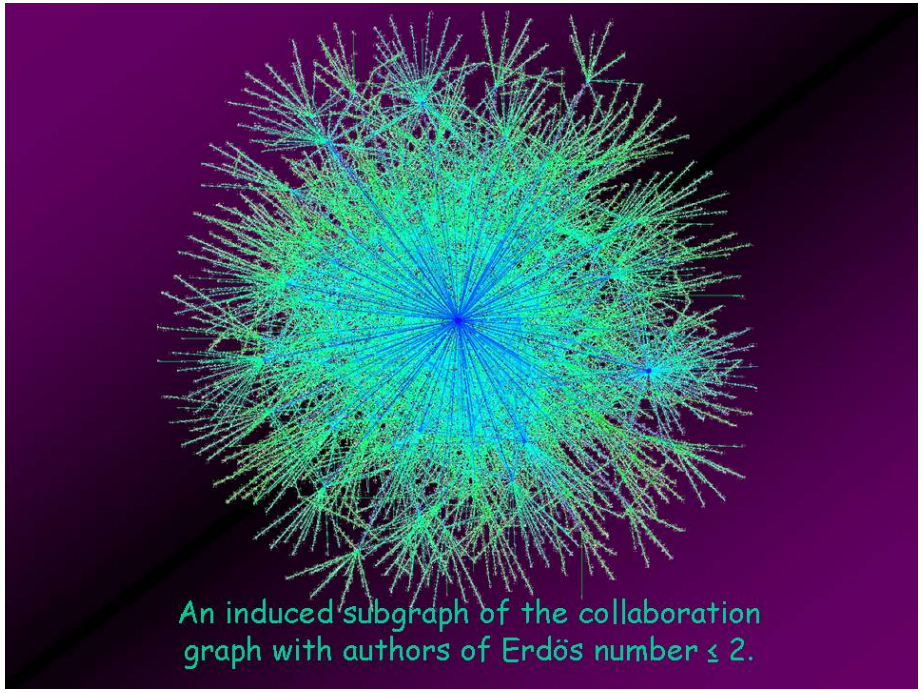


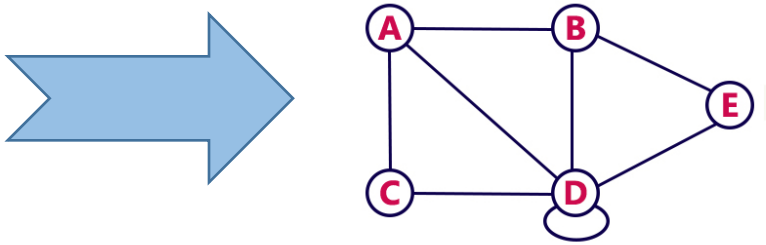
Examples of Data-Structures: Trees





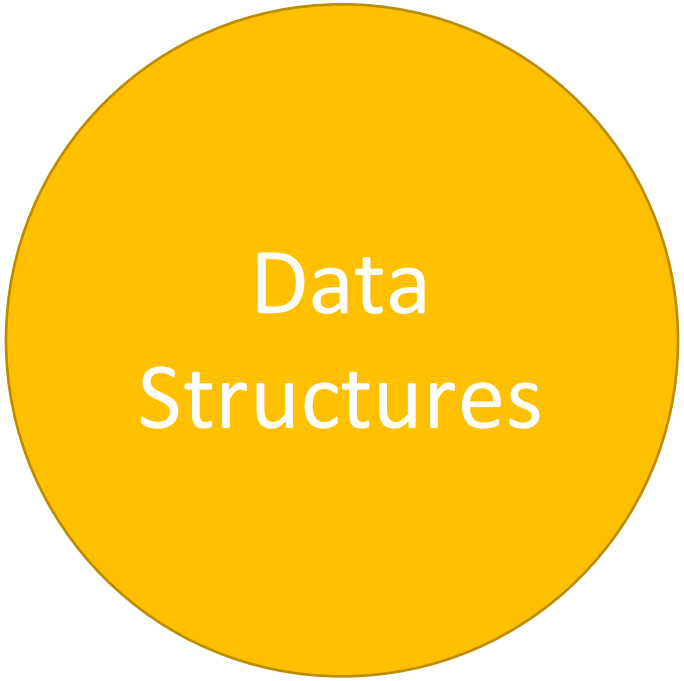
Examples of Data-Structures: Graphs





	A	B	C	D	E
A	0	1	1	1	0
B	1	0	0	1	1
C	1	0	0	1	0
D	1	1	1	1	1
E	0	1	0	1	0

In this course, you will:



1. study well-known data abstractions (e.g., stacks, queues, lists, trees) and their representation techniques (e.g., linking, arrays);

2. learn concepts used in algorithm design and analysis including criteria for selecting data structures to fit their applications.

Logistics

Logistics

- Web-page: https://tinyurl.com/csci2270-s19
- **Moodle**: CSCI 2270 - Gupta, Trivedi, Zagrodzki - CS2: Data Structures
  - Login with you CU identikey and password. Enrollment Key: **datastruct**
  - All three sections share Moodle resources: look for instructor name (Trivedi) for Section 100 specific lecture notes.
  - Use Piazza for discussions. Link on Moodle pages.
- Instructor and Teaching Assistants
  - Ashutosh Trivedi (ashutosh.trivedi@colorado.edu)
  - Prashil Bhimani (prashil.bhimani@colorado.edu)
  - Yu-Ju Lee (yuju.lee@colorado.edu)
  - Prathyusha Gayam (prathyusha.gayam@colorado.edu)
  - Avimita Chatterjee (amivita.chatterjee@colorado.edu)
- Lectures
  - Monday-Wednesday-Friday (10:00am—11:50am)
  - Venue VAC 1B20
- Office hours
  - Monday (12:30pm—2:00pm) Friday (12:30am—1:30pm)
  - By appointment
- Venue
  - Class: VAC 1B20 and Office hours: ECCE 1B11

Logistics (Contd.)

- Prerequisite (One of the following with C- minimum grade)
  - CSCI 1300/1310/1320 or ECEN 1030/1310
  - APPM 1345/1350 or MATH 1300/1310
  - Proficient in a Programming Language (preferably C++)
  - Resources for learning C++
    - Online C++ Textbook http://www.cplusplus.com/files/tutorial.pdf
    - C++ videoTutorials (links available from Moodle)
- Textbook
  - [VDS] Hoenigman, R. 2015. Visualizing Data Structures. Lulu Press.
  - The VDS eBook, Course materials, such as lecture notes, assignments, and quizzes will be made available in electronic form on the Moodle.

Logistics (Contd.)

- **Introduces** fundamentals of data-structures
- Introduces pseudo-code and implementations
- Bring your **laptop** as well as **pencil-and-paper**

- Weekly 75-minute recitation with course-TAs
- **Reinforces** the ideas discussed in class
- Opportunity to ask questions, get clarification on lectures/notes

- Weekly programming assignments to **apply** concepts discussed in the lecture
- Problem sets assignment weekly, due the following week

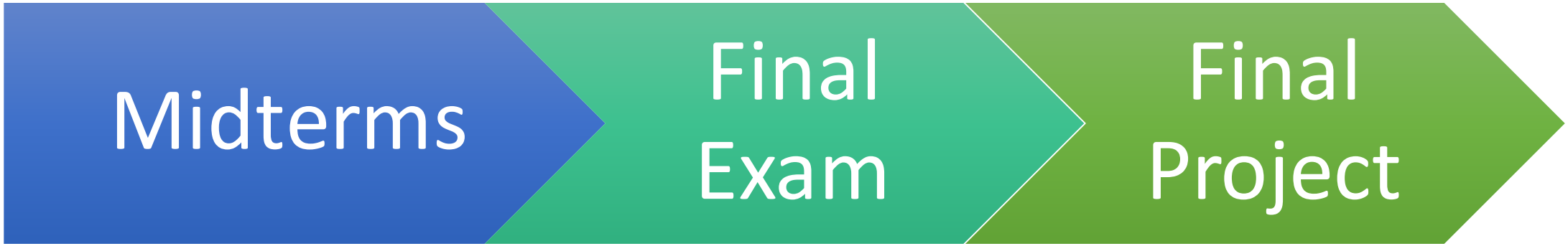
- Lecture quizzes (online questions) at the end of every week to **refresh** the concepts

Logistics (Contd.)

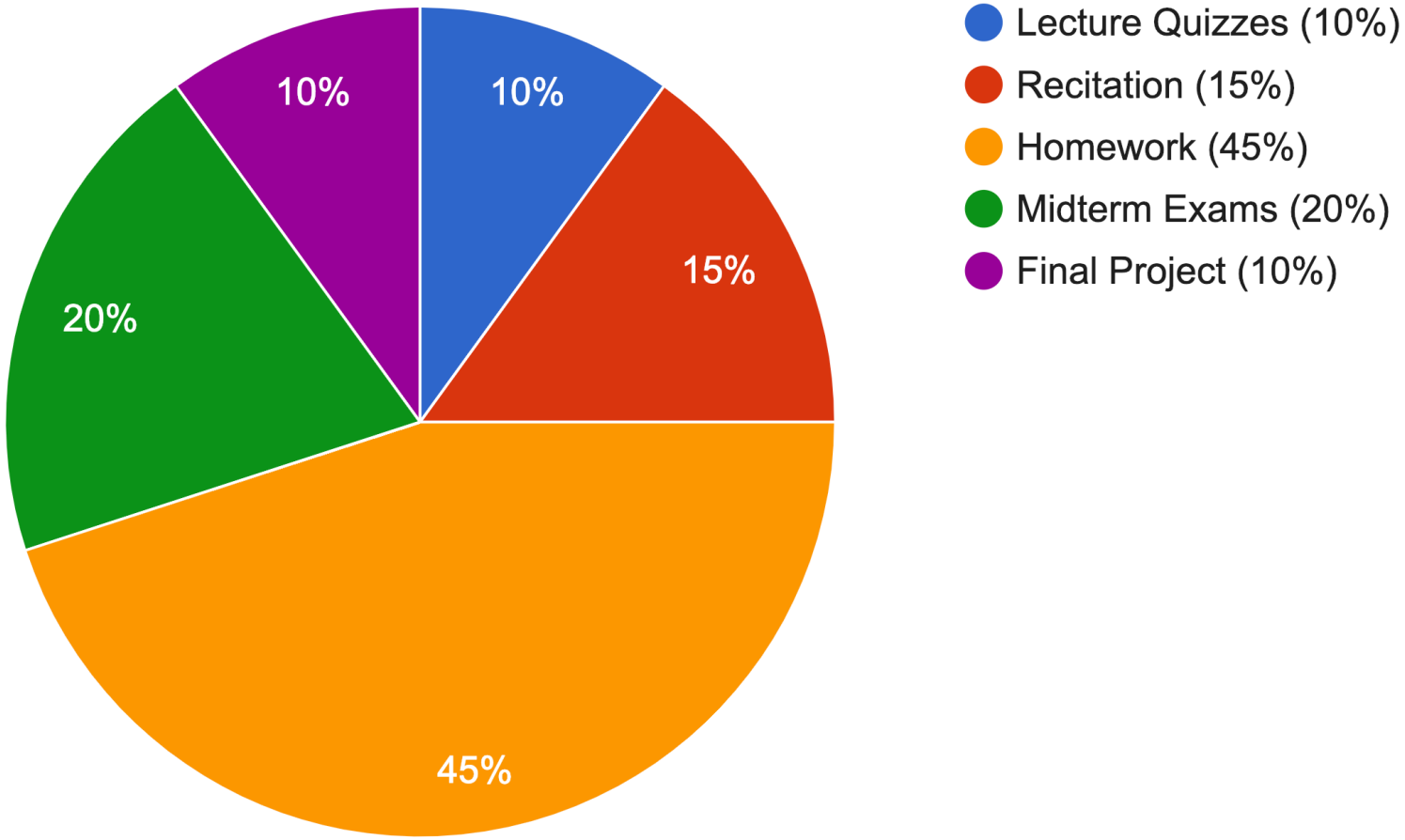
- **Two** midterms (evening exams)
- Must have 60% average on the exams to get better than a D+ in the class, regardless of other grades
- A grade of C- in this class is required to take the next class in the Computer Science sequence

- The **optional** Final Exam can be used to replace your lowest midterm grade.

- In the final project you get an opportunity to demonstrate your overall **understanding** of data-structure and your ability to **apply** them in real world scenarios.



Logistics: Grading



Recitation this week

- Get prepared for the semester:
  - Polish your favorite text editor: Emacs, Vim, Atom, Sublime, etc.
  - Install a C++ compiler on your machine.
  - Please read the syllabus carefully (on Moodle) with special focus on classroom behavior and collaboration policies.
- Create a **Moodle** account (Enrollment key: **datastruct**).
- Create a **Piazza** account.
- Recitations are graded, so please attend them.