Discrete Structures: CMPSC 102

Oliver BONHAM-CARTER

Fall 2019
Week 1

Class and lab meeting times

Please read the syllabus before next class!!

- **Lecture, Discussion, Presentations, and Group Work:**
  - Monday, Wednesday, Friday 11:00AM - 11:50AM, Alden Hall, Room 101
- **Laboratory Session:**
  - Wednesday 2:30PM - 4:20PM, Alden Hall, Room 101

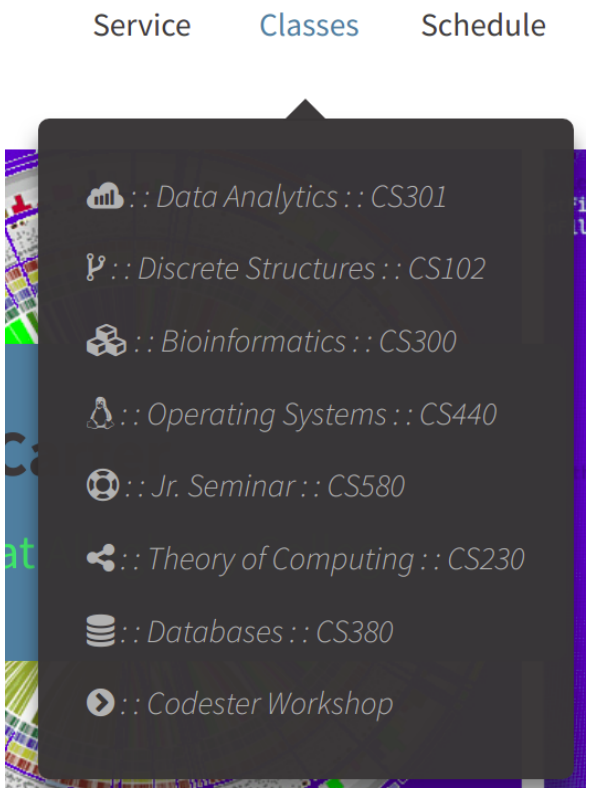
Instructor's Office Hours'

Please make an appointment first!

- Monday and Wednesday: 9:30 am – 10:30am (10 minute time slots)
- Tuesday and Thursday: 1:30pm – 3:30pm (10 minute time slots)

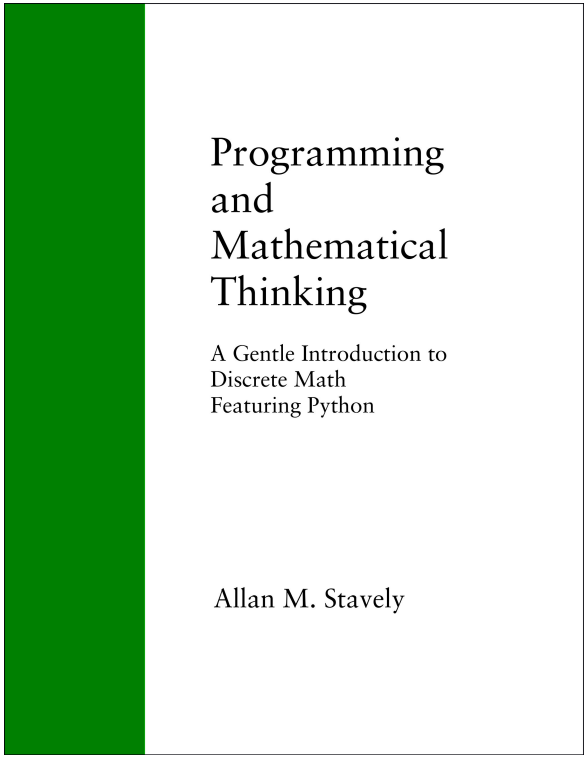
To schedule a meeting with me during my office hours, please visit my Web site and click the "Schedule" link in the top right-hand corner. Now, you can view my calendar or by clicking "schedule an appointment" link browse my office hours and schedule an appointment by clicking the correct link to reserve an open time slot.

Websites



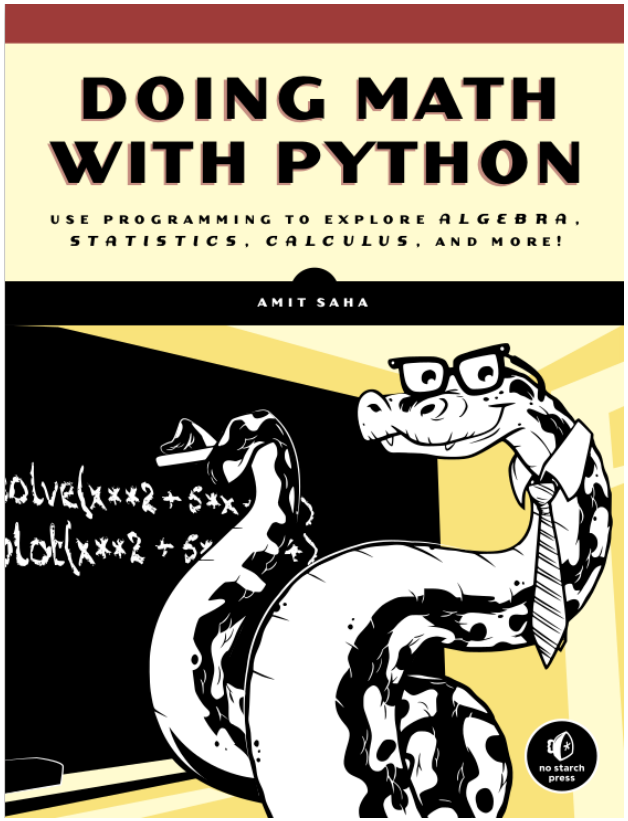
- My website: `http://www.cs.allegheny.edu/sites/obonhamcarter/`
- Course webpage: `http://www.cs.allegheny.edu/sites/obonhamcarter/cs102.html`
- Take a moment to familiarize yourself with these sites.

Textbook



- *Programming and Mathematical Thinking - A Gentle Introduction to Discrete Math Featuring Python* by Allan M. Stavely; ISBN paperback 978-1-938159-00-8 and ISBN ebook: 978-1-938159-01-5

Textbook



- *Doing Math with Python* by Amit Saha; ISBN paperback: 1-59327-640-0

Syllabus

- Please be familiar with the course syllabus.
- Available from the web site:
  `https://www.cs.allegheny.edu/sites/obonhamcarter/cs102/obc_syllabus_102.pdf`

Course Overview: Academic Bulletin Description

An introduction to the foundations of computer science with an emphasis on understanding the abstract structures used to represent discrete objects. Participating in hands-on activities that often require teamwork, students learn the computational methods and logical principles that they need to create and manipulate discrete objects in a programming environment. Students also learn how to write, organize, and document a programs source code so that it is easily accessible to intended users of varied backgrounds. During a weekly laboratory session students use state-of-the-art technology to complete projects, reporting on their results through both written documents and oral presentations. Prerequisite: Knowledge of elementary algebra. Distribution Requirements: QR, SP.

What Will I Learn Here?

> *"An introduction to the foundations of computer science with an emphasis on understanding the abstract structures used to represent discrete objects."*

Wait! What?

What is do you mean by, **discrete**?

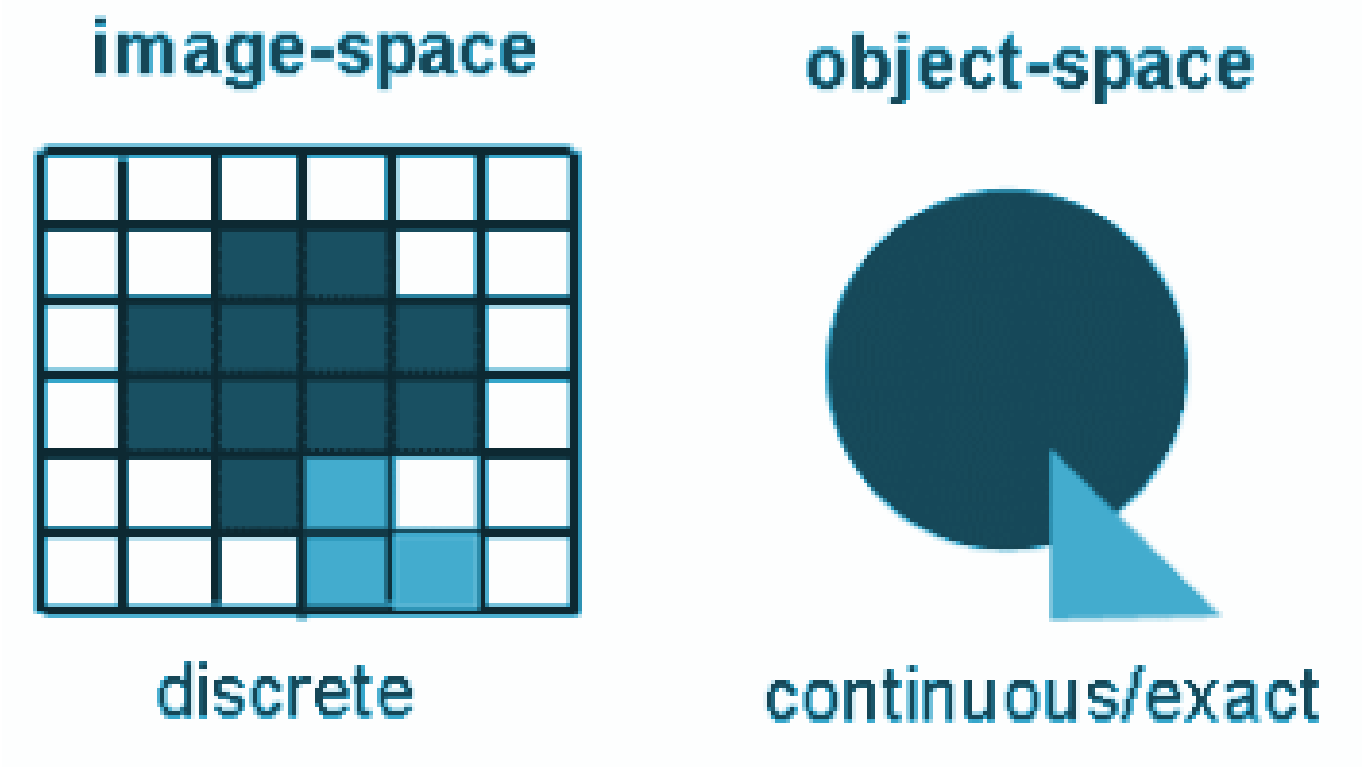
Discreet or *Discrete*

- **Discreet** means *unobtrusive* or *unnoticeable* (not this course!)
- **Discrete** means *separate*, not continuous or *not sharing any common space*

Discrete and *Countable* Objects

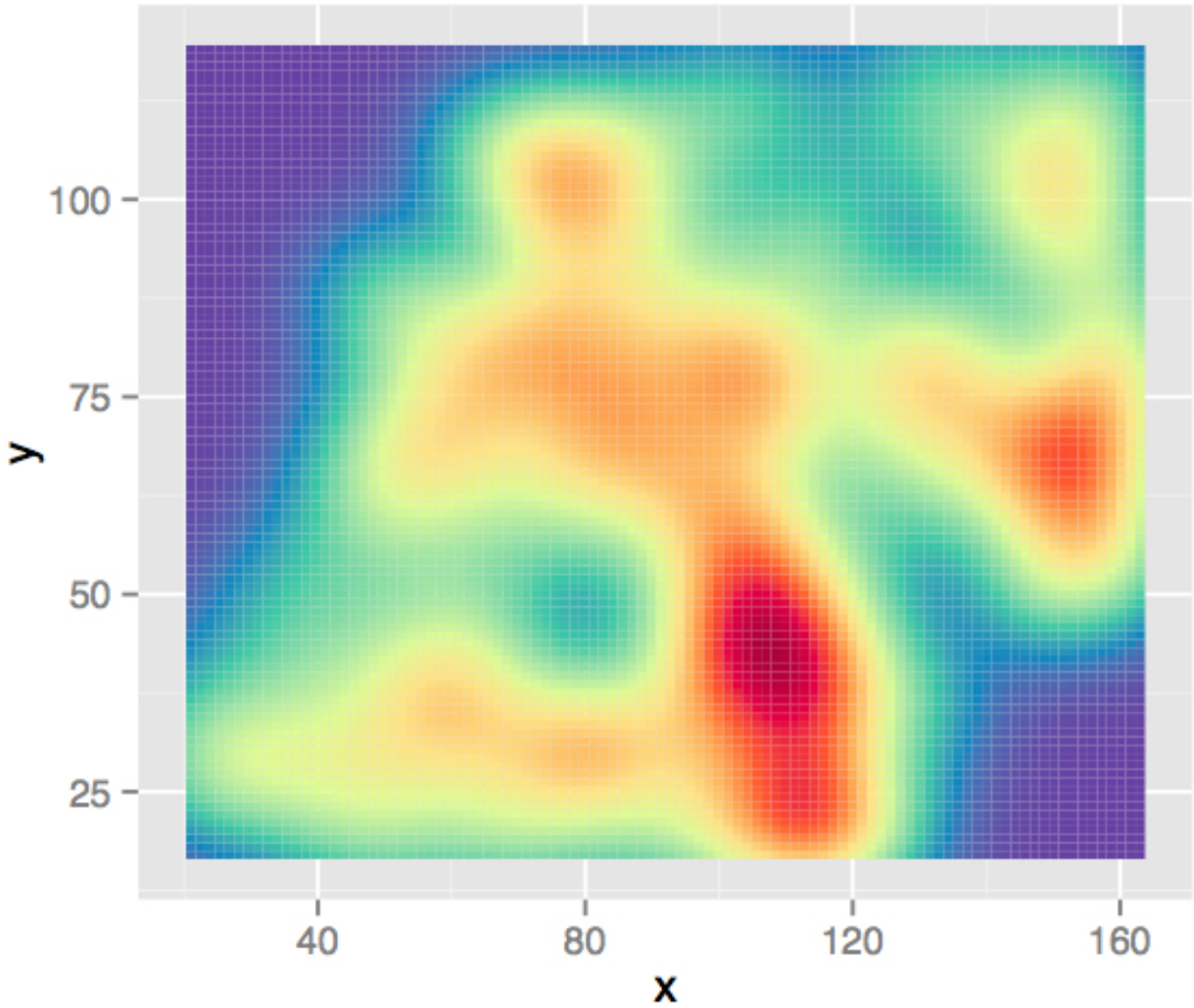
- *Discrete* means "countable"
- We can count the number of animals.

So, Discrete Objects, Then?



- Discrete mathematics involves *countable* things.

... And, Continuous Objects?



- "Overlapping" objects cannot be counted separately.

Non-*Discrete* and *Un-Countable* Objects

- Is the amount of sand on the beach *un*countable?
- Is anything *un*countable at the beach?
- How do we count an uncountable object? Why?

Relationships to Computing

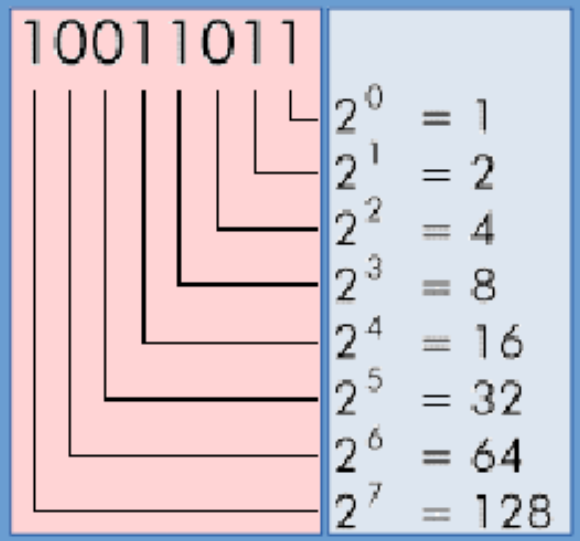
Computer MUST be able to count to compute.

Binary Numbers

In mathematics and digital electronics, a binary number is a number expressed in the base-2 numeral system or binary numeral system, which uses only two symbols: typically, 0 (False, zero) and 1 (True, one).

- Computers use binary to function
- Processes (i.e., memory, computation, networking) are broken down into binary-driven procedures

Binary Numbers



Binary Value	Decimal Representation	Decimal Value
	8 4 2 1	
0 0 0 0	0 + 0 + 0 + 0	0
0 0 0 1	0 + 0 + 0 + 1	1
0 0 1 0	0 + 0 + 2 + 0	2
0 0 1 1	0 + 0 + 2 + 1	3
0 1 0 0	0 + 4 + 0 + 0	4
0 1 0 1	0 + 4 + 0 + 1	5
0 1 1 0	0 + 4 + 2 + 0	6
0 1 1 1	0 + 4 + 2 + 1	7
1 0 0 0	8 + 0 + 0 + 0	8
1 0 0 1	8 + 0 + 0 + 1	9
1 0 1 0	8 + 0 + 2 + 0	10

- Computing implies digital processing
- Computing binary values is a *countable* task.
- Can anything, or any number, that a computer computes be written in binary?

Countable and Not Countable?

- Get into groups and discuss the following. Take notes to report back to the class.
- Can you think of **countable** objects?
- Can you think of **un-countable** objects?
  - Can you think of types of numbers that may fit into each of these above groups?