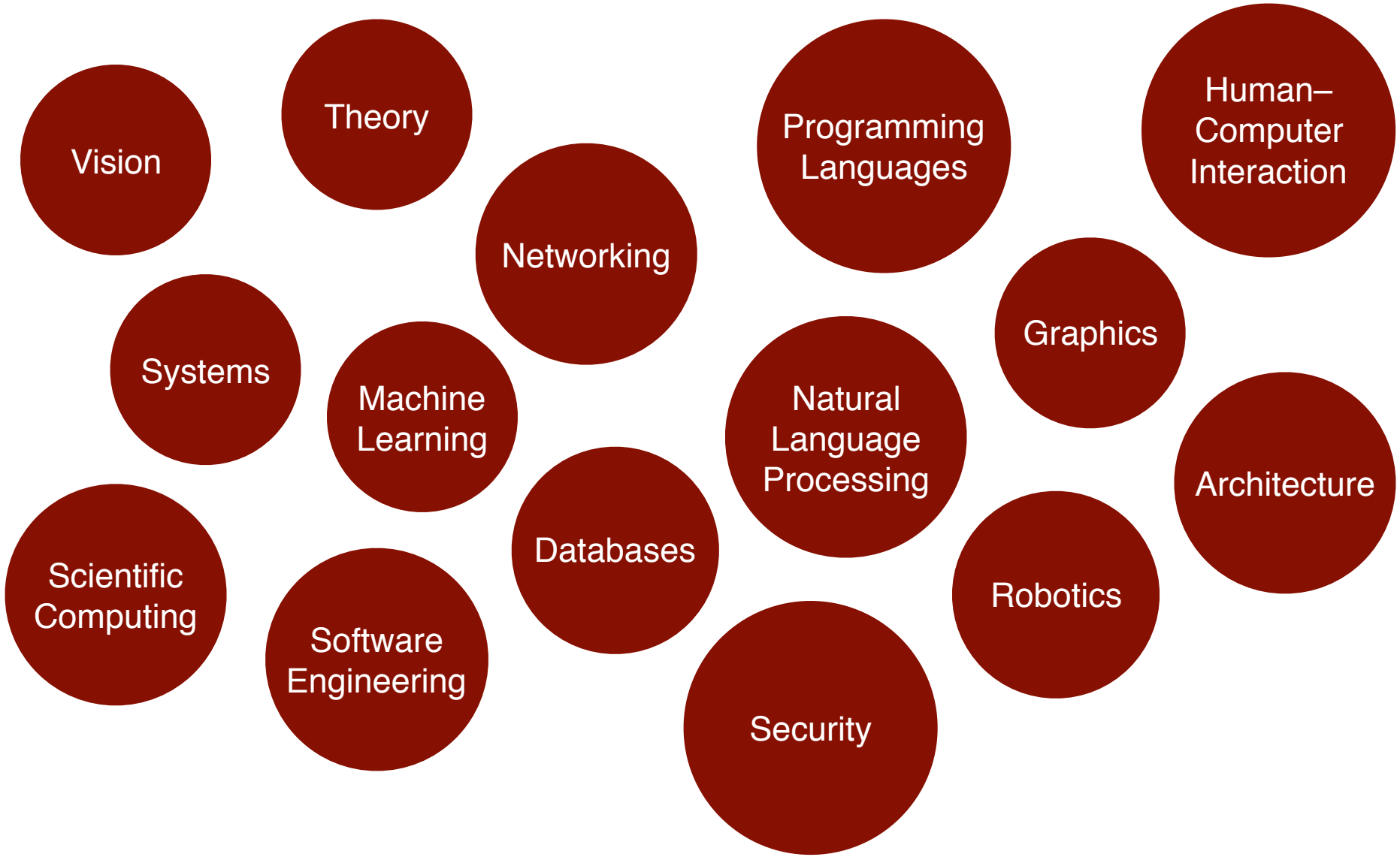
Lecture 0: Introduction to Computer Science

CS 51P

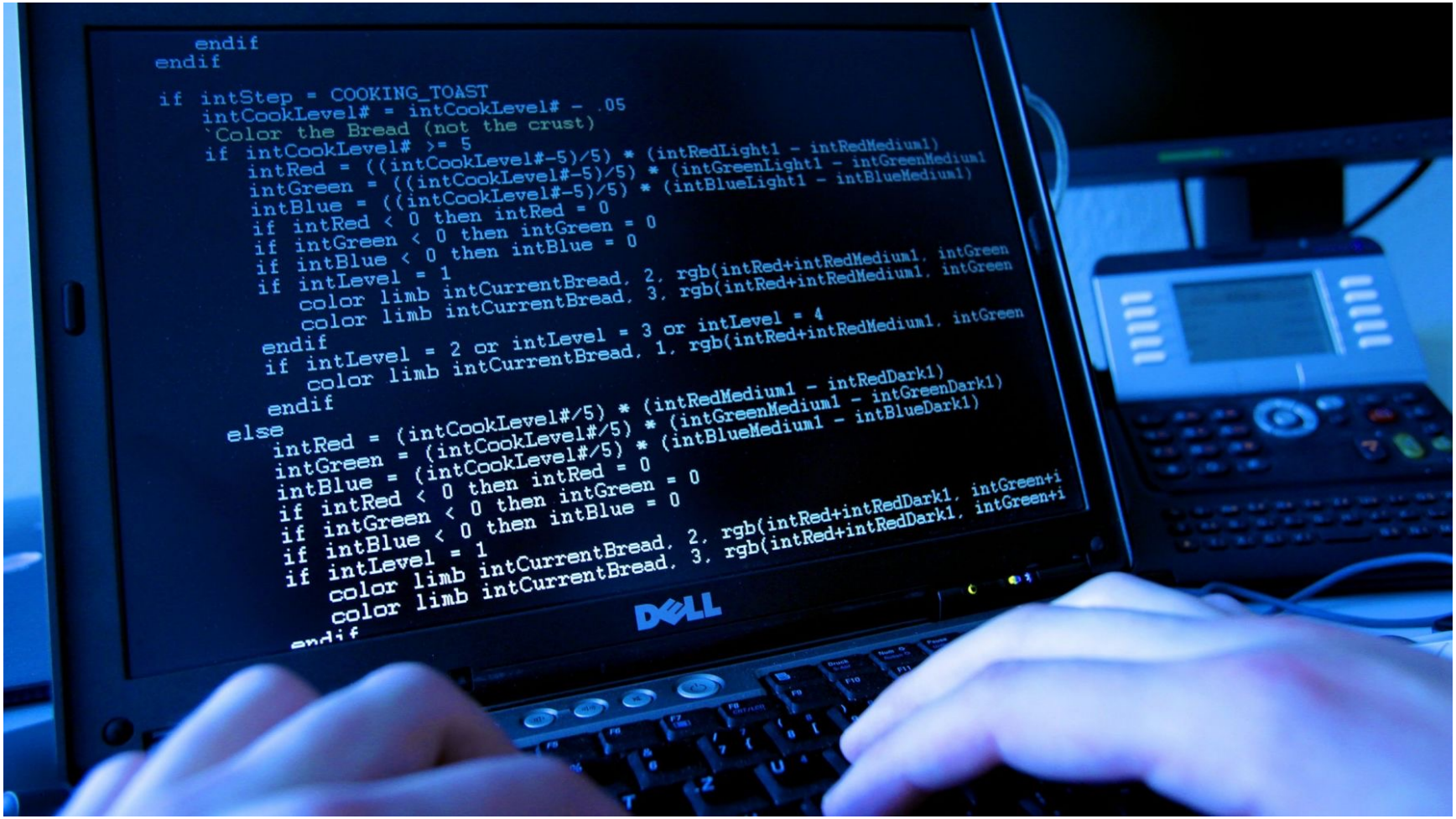
August 29, 2022

Computer Science



Computational Thinking

Programming

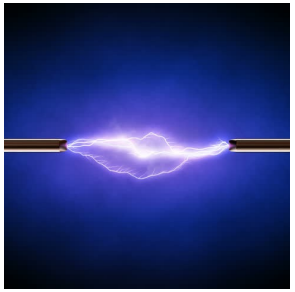


Bits

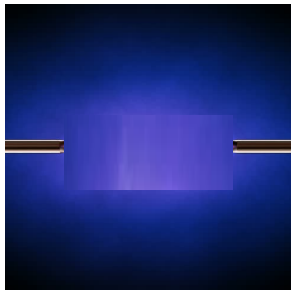
- a **bit** is piece of data that can have two possible values
- can be physically represented with a two state device





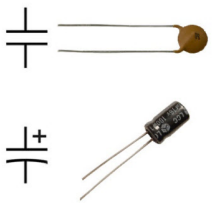




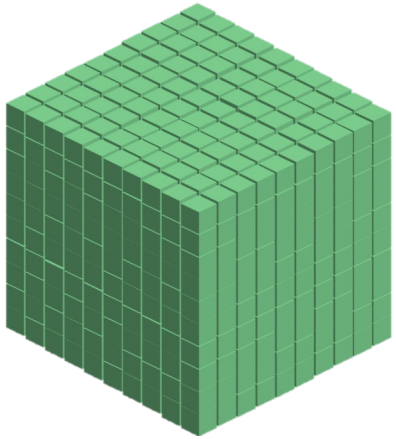
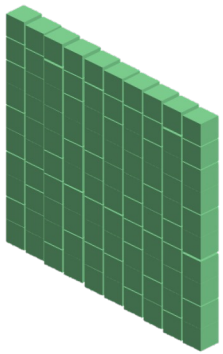



Storing bits

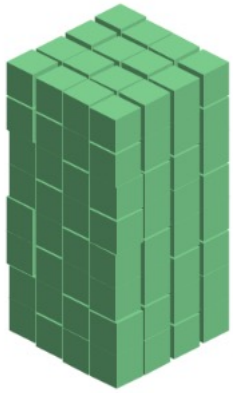
- Dynamic Memory (DRAM): stores each bit of data in a capacitor, which stores energy in an electric field (or not)
- Magnetic Disk: regions of the platter are magnetized with either N-S polarity or S-N polarity
- Optical Disk: stores bits as tiny indentations (pits) or not (lands) that reflect light differently
- Flash Disk: electrons are stored in one of two gates separated by oxide layers



"Normal" Integers (aka Base-10 Integers)

1000 (10^3)	100 (10^2)	10 (10^1)	1 (10^0)
			
0	0	0	5
0	0	4	7
2	0	2	2

Binary Numbers (aka Base-2 Integers)

128 (2^7)	64 (2^6)	32 (2^5)	16 (2^4)	8 (2^3)	4 (2^2)	2 (2^1)	1 (2^0)
							
0	0	0	0	0	1	0	1
0	0	1	0	1	1	1	1
1	1	1	1	1	1	1	1

Binary Numbers

- "Normal" (Base-10):

$$1101$$

$$= 1 \cdot 10^3 + 1 \cdot 10^2 + 0 \cdot 10^1 + 1 \cdot 10^0$$
$$= 1101$$

- Binary (Base-2):

$$1101$$

$$= 1 \cdot 2^3 + 1 \cdot 2^2 + 0 \cdot 2^1 + 1 \cdot 2^0$$
$$= 13$$

Exercise 1: Binary Numbers

Consider the following four-bit binary values. What is the integer interpretation of these values?

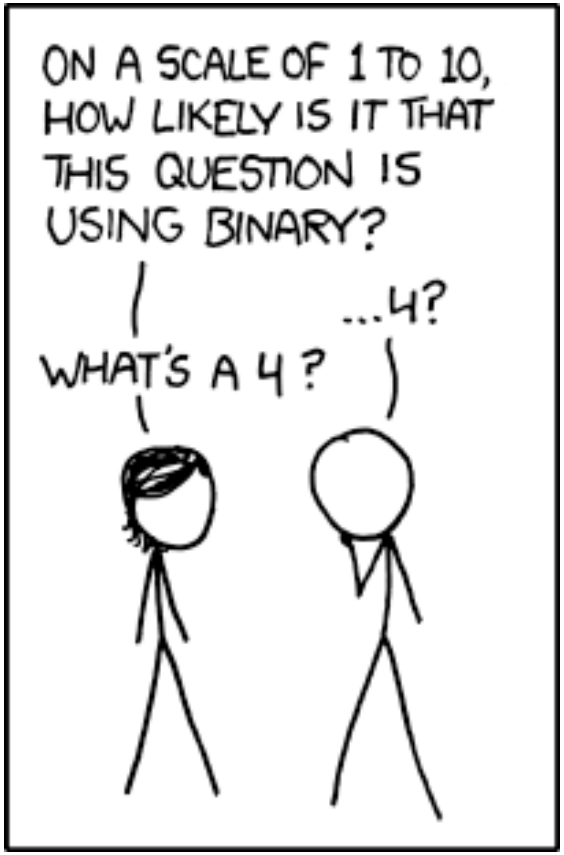
1. 0001
2. 1010
3. 0111
4. 1111

Exercise 2: Binary Numbers

Consider the following integer values. What is the 4-bit binary representation of each of these values?

1. 2
2. 12
3. 13
4. 14

Binary Numbers



There are
10 types
of people
in the world:

Those who
understand binary,
and those
who don't.

ASCII characters

Ch	Dec	Binary	Ch	Dec	Binary	Ch	Dec	Binary	Ch	Dec	Binary	Ch	Dec	Binary
!	33	00100001	1	49	00110001	A	65	01000001	Q	81	01010001	a	97	01100001
"	34	00100010	2	50	00110010	B	66	01000010	R	82	01010010	b	98	01100010
#	35	00100011	3	51	00110011	C	67	01000011	S	83	01010011	c	99	01100011
$	36	00100100	4	52	00110100	D	68	01000100	T	84	01010100	d	100	01100100
%	37	00100101	5	53	00110101	E	69	01000101	U	85	01010101	e	101	01100101
&	38	00100110	6	54	00110110	F	70	01000110	V	86	01010110	f	102	01100110
'	39	00100111	7	55	00110111	G	71	01000111	W	87	01010111	g	103	01100111
(	40	00101000	8	56	00111000	H	72	01001000	X	88	01011000	h	104	01101000
)	41	00101001	9	57	00111001	I	73	01001001	Y	89	01011001	i	105	01101001
*	42	00101010	:	58	00111010	J	74	01001010	Z	90	01011010	j	106	01101010
+	43	00101011	;	59	00111011	K	75	01001011	[	91	01011011	k	107	01101011
,	44	00101100	<	60	00111100	L	76	01001100	\	92	01011100	l	108	01101100
-	45	00101101	=	61	00111101	M	77	01001101	]	93	01011101	m	109	01101101
.	46	00101110	>	62	00111110	N	78	01001110	^	94	01011110	n	110	01101110
/	47	00101111	?	63	00111111	O	79	01001111	_	95	01011111	o	111	01101111
0	48	00110000	@	64	01000000	P	80	01010000	`	96	01100000	p	112	01110000

Exercise 3: ASCII Characters

Consider the following words. How would we represent each of these words in binary?

1. `a`
2. `I`
3. `Hello`

Interpreting Binary

What is the following value?

01000001

Types

A **type** is a set of values and plan for representing/interpreting those values in binary

int	string
• Values: 0, 1, -10, 34022, …	• Values: "Hi!", "", "2.0",…

All values have types
Common types: int, float, str, bool

You can determine the type of a value using the command `type(<value>)`

You can switch types (aka cast) using commands like `int(<value>)` and `str(<value>)`

Variables

- A variable is a name that refers to a value
  - names should be meaningful
  - by convention words separated by an underscore
  - names cannot be a keyword (e.g. *print*), cannot include spaces, must begin with a letter

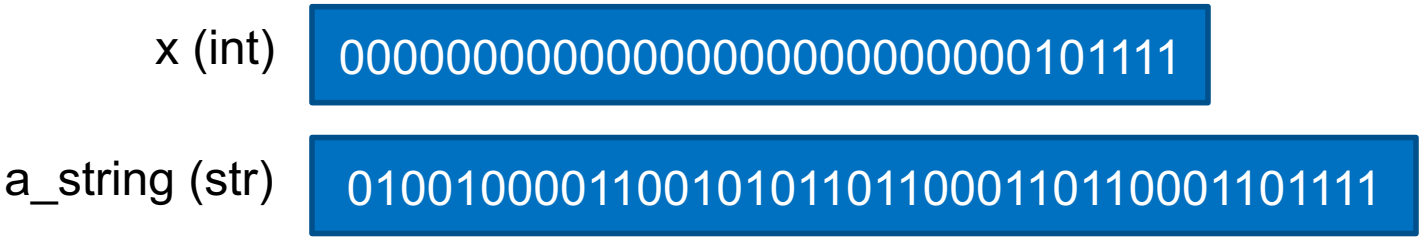
and	del	from	not	while
as	elif	global	or	with
assert	else	if	pass	yield
break	except	import	print	
class	exec	in	raise	
continue	finally	is	return	
def	for	lambda	try	

Assigning variables

- Can assign a value to a variable

```
x = 47

a_string = "Hello"
```

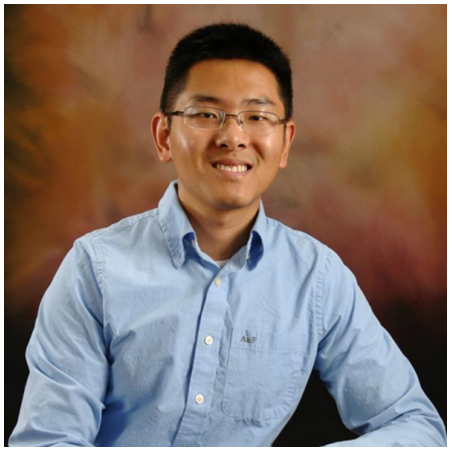


LOGISTICS

Course Logistics

Prof. Eleanor Birrell

Prof. Thomas Yeh



Prof. Zilong Ye

- **Class Meetings:**
  - Monday and Wednesday, 1:15-2:30pm or 2:45-4pm in Sev. Com. 102
- **Lab:**
  - Wednesday or Thursday, 7-9:50pm in Edmunds 219/229

Course Work

- Homework Assignments (35%)
  - Approximately 10 assignments
  - Mostly individual, some may be done in pairs
  - Assignments will be started in Lab
- Final Project (15%)
  - Use what you've learned!
- Checkpoints (30%)
  - Two checkpoints (October 10 and November 21, in class)
- Final Exam (20%)
  - Tuesday, December 13, 2022 at 7-10pm in Edmunds 101/114

- All assignments will be due Tuesdays at 11:59pm PT

Course Website

All information is on the Course website:

https://cs.pomona.edu/classes/cs51p/

51p communications, community, q&a, etc. on slack:

#cs51p-2022fa

CS Community

- Slack (Everyone!) pomonacs.slack.com
- BBICS
- WACM