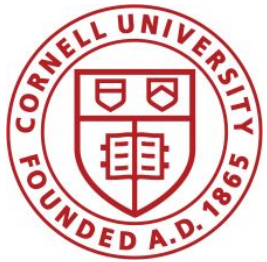


DSFA

Spring 2021

Lecture 4

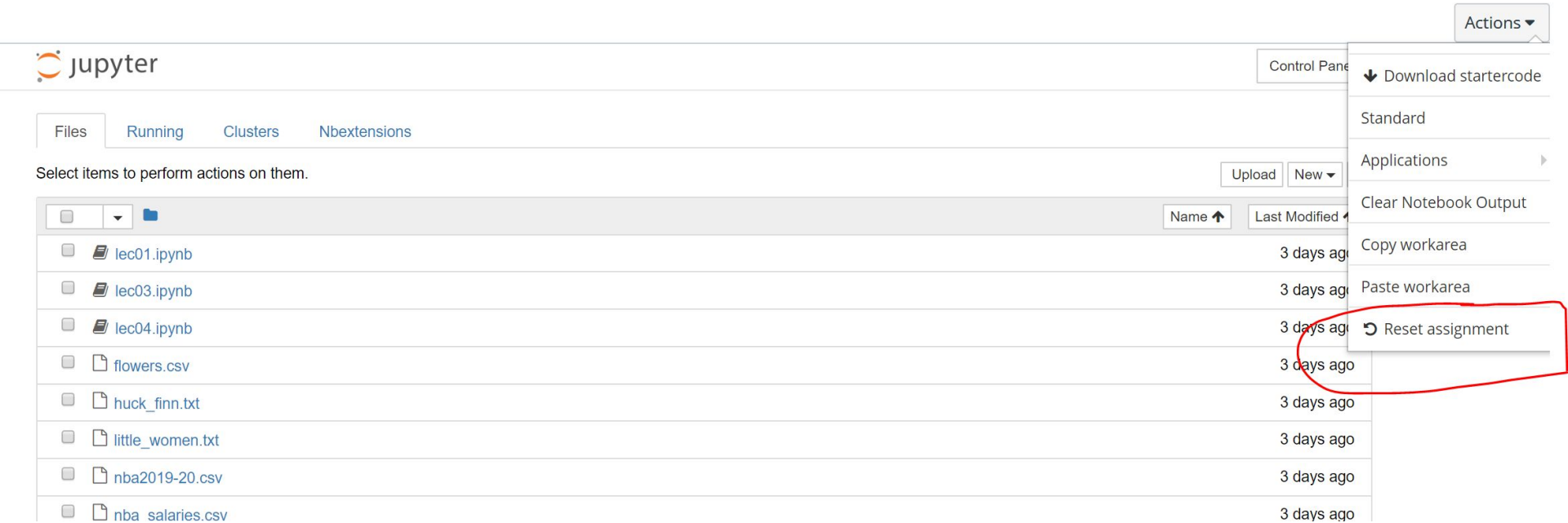
Data Types

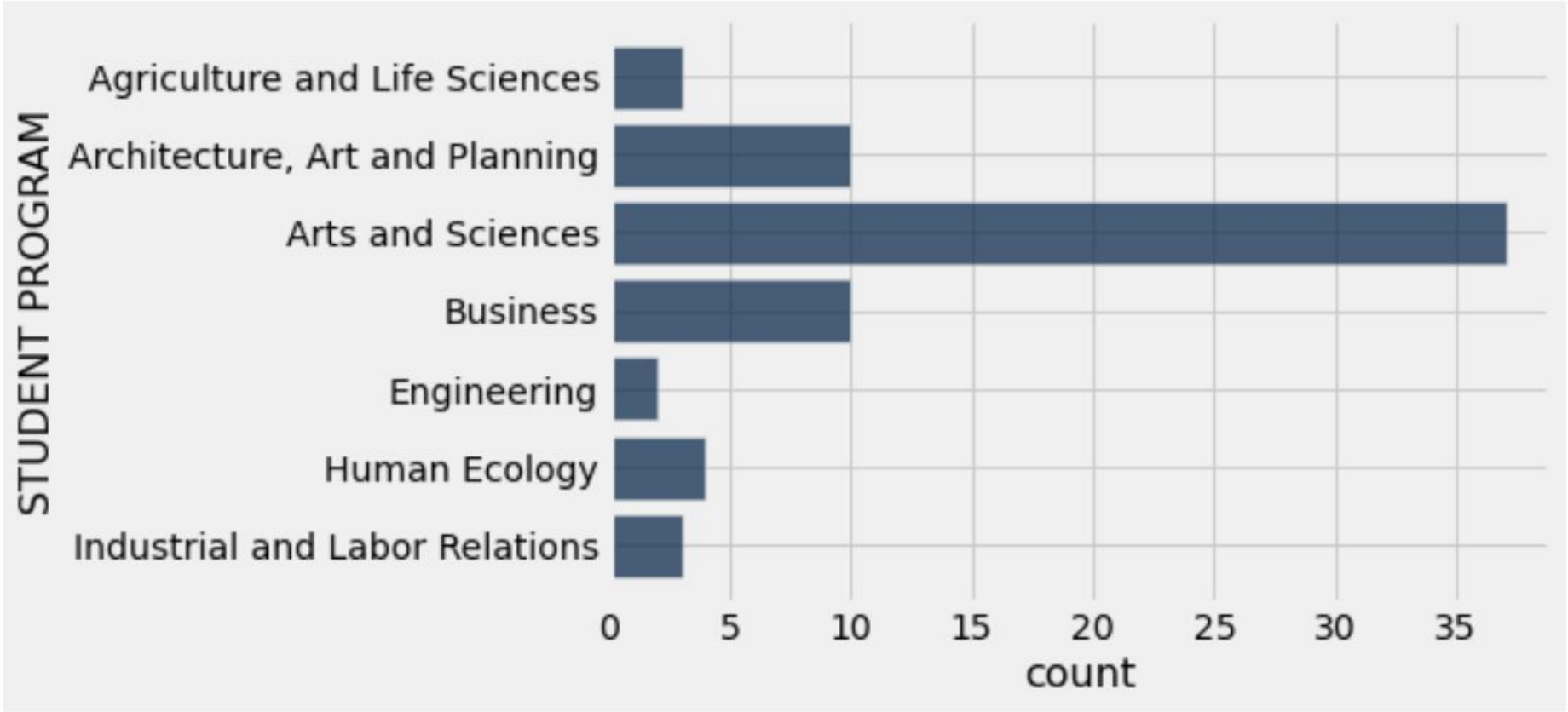
Announcements

- Website: cornell-dsfa.org.
- If you are just joining...
- Reminder: HW 1 out, due Friday by 6PM, bonus point for turn-in on Thursday.
  - Need help? See office hours in Zoom, and Ed Discussions via Canvas.

Announcements

- If you want to follow along for the lecture notebook, go to Canvas->Assignments->Lecture Demos.
  - If lec04.ipynb not there, try clicking “Actions” (upper right corner), “Reset assignment”. Note: this will erase (I think) whatever you had in previous lecture demo notebooks.
  - Note: You need to run the first cell in the demo!


Actions
jupyter
Control Pane
Download startercode
Standard
Applications
Clear Notebook Output
Copy workarea
Paste workarea
Reset assignment
Files
Running
Clusters
Nbextensions
Select items to perform actions on them.
Upload
New
Name
Last Modified
lec01.ipynb
lec03.ipynb
lec04.ipynb
flowers.csv
huck_finn.txt
little_women.txt
nba2019-20.csv
nba_salaries.csv
3 days ago


STUDENT PROGRAM
Agriculture and Life Sciences
Architecture, Art and Planning
Arts and Sciences
Business
Engineering
Human Ecology
Industrial and Labor Relations
0
5
10
15
20
25
30
35
count

Tables

Table Structure

- We organize our data in tables
- A Table is a sequence of labeled columns
- Data within a column should be of the same "type"

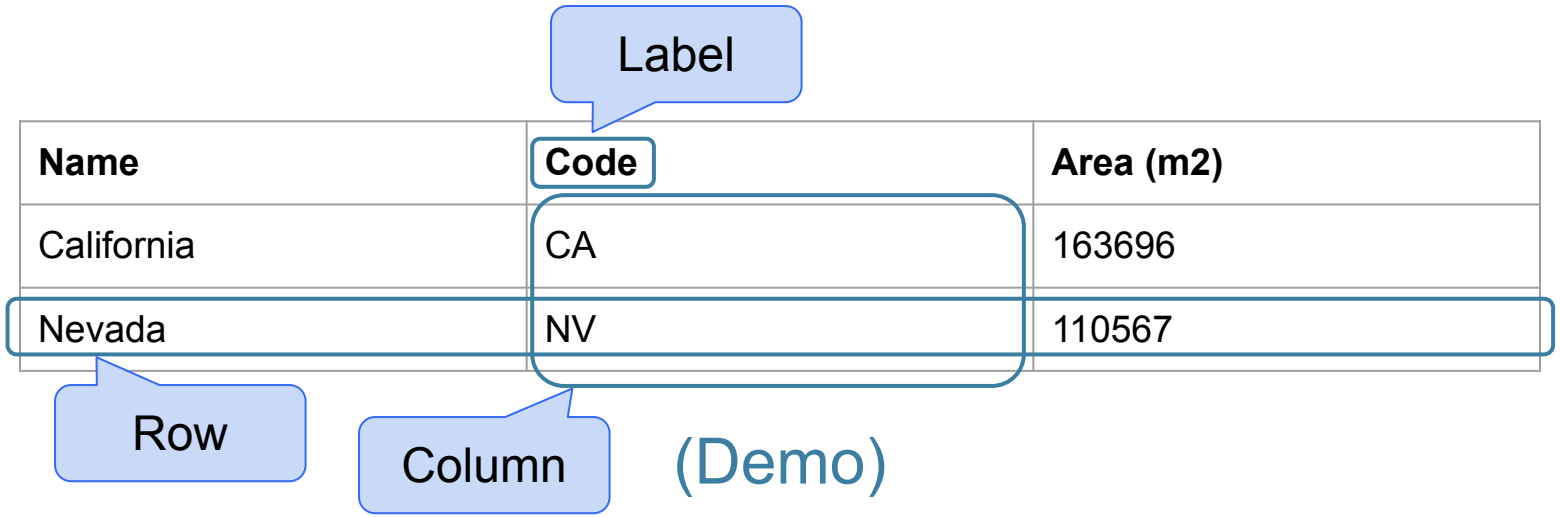


Table Operations

- `t.select(label)` - constructs a new table with just the specified columns
- `t.sort(label)` - constructs a new table, with rows sorted by the specified column

(Demo)

Visualization

- `t.barh(label)` - horizontal bar chart with specified column as the y-axis categories

(Demo)

Table Operations

- `t.where(label, condition)` - constructs a new table with just the rows that match the condition

(Demo)

Arithmetic

Arithmetic Operators

Operation	Operator	Example	Value
Addition	+	2 + 3	5
Subtraction	-	2 - 3	-1
Multiplication	*	2 * 3	6
Division	/	7 / 3	2.66667
Remainder	%	7 % 3	1
Exponentiation	**	2 ** 0.5	1.41421

(Demo)

PEMDAS

( ) | x^2 | x or ÷ | + or -

LEFT TO RIGHT | LEFT TO RIGHT

Penguins Eat Many Donuts After School!

Parentheses
Exponents
Multiplication
Division
Addition
Subtraction

Ints and Floats

Python has two numeric types

- `int`: an integer of any size
- `float`: a number with an optional fractional part

An `int` never has a decimal point; a **float** always does

A `float` might be printed using scientific notation

Three limitations of float values:

- They have limited size (but the limit is huge)
- They have limited precision of 15-16 decimal places
- After arithmetic, the final few decimal places can be wrong

Strings

Text and Strings

A string value is a snippet of text of any length

- `'a'`
- `'word'`
- `"there can be 2 sentences. Here's the second!"`

Strings that contain numbers can be converted to numbers

- `int('12')`
- `float('1.2')`

Any value can be converted to a string

- `str(5)`

(Demo)

Discussion Question

Assume you have run the following statements

```
x = 3
y = '4'
z = '5.6'
```

What's the source of the error in each example?

A. `x + y`
B. `x + int(y + z)`
C. `str(x) + int(y)`
D. `str(x, y) + z`

Arrays and Ranges

Arrays

An array contains a sequence of values

- All elements of an array should have the same type
- Arithmetic is applied to each element individually
- When two arrays are added, they must have the same size; corresponding elements are added in the result
- A column of a table is an array

(Demo)

Ranges

A range is an array of consecutive numbers

- **`np.arange(end)`**:
  An array of increasing integers from 0 up to **`end`**
- **`np.arange(start, end)`**:
  An array of increasing integers from **`start`** up to **`end`**
- **`np.arange(start, end, step)`**:
  A range with **`step`** between consecutive values

The range always includes **`start`** but excludes **`end`**