

# Lecture 9: Introduction to Computer Programming Course - CS1010

DEPARTMENT OF COMPUTER SCIENCE

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02/11/2019



Rensselaer

# Announcements

- Exam 1 scheduled for February 14
- Everything covered until last lecture(Lecture 8)
- Homework 5 will be posted Next Week.
- No Homework this week.

# Goals for today

- Tuples
- Packages and Modules
- Images

# Object Types (Lecture 2)

Name	Type (representation)	Example
Integers	int	Whole Numbers: 1, 5 , 7500
Floating Point	float	Decimal: 2.3, 4.6, 23.15
Strings	str	Ordered sequence of characters: "hello" "Sam" "2000"
Lists	list	Ordered sequence of objects: [10, "hello", 500.5]
Dictionary	dict	Unordered Key Value pairs: {"mykey": "Value", "place": "New York"}
Tuples	tup	Ordered immutable sequence of objects: (100,"Hello", 20.5)
Sets	set	Unordered collection of unique objects: {"a","b"}
Booleans	bool	Logical Value: True, False

# Tuple Data Type

- A Tuple is a collection of Python objects separated by commas.
- In a few ways a tuple is similar to a string in terms of indexing and slicing.
- A tuple is **immutable** i.e. once an element is inside a tuple it cannot be re-assigned.
- You can change the entire tuple but not a part of it.
- We use Parenthesis to denote Tuples:
- E.g. (1,2,3)

# What are Tuples used for?

- Mostly for multiple assignment
- Write functions that return multiple values
- Let's check in python.

# Modules – Modular Programming

- Process of breaking a large programming problem into separate, smaller, more manageable subtasks or **modules**.
- Advantages to **modularizing** code:
  - **Simplicity**: Instead of focusing on an entire problem, a module typically focuses on one relatively small portion of the problem.
  - **Maintainability**: There is a less chance that changes in one module will impact other parts of the program.
  - **Reusability**: The same module can be used by various programs.
  - **Scoping**: Modules typically define a separate **namespace**, which helps avoid confusion between identifiers in different areas of a program.

# Modules

- Collection of Python objects stored in one place/file.
- Syntax
  - `import module_name`
  - `module_name.function(arguments)`
- Problem: We need to calculate the area of a circle, cone, cylinder and sphere.
- Need to use these calculations multiple times



# Packages: PiPy and Pip Install

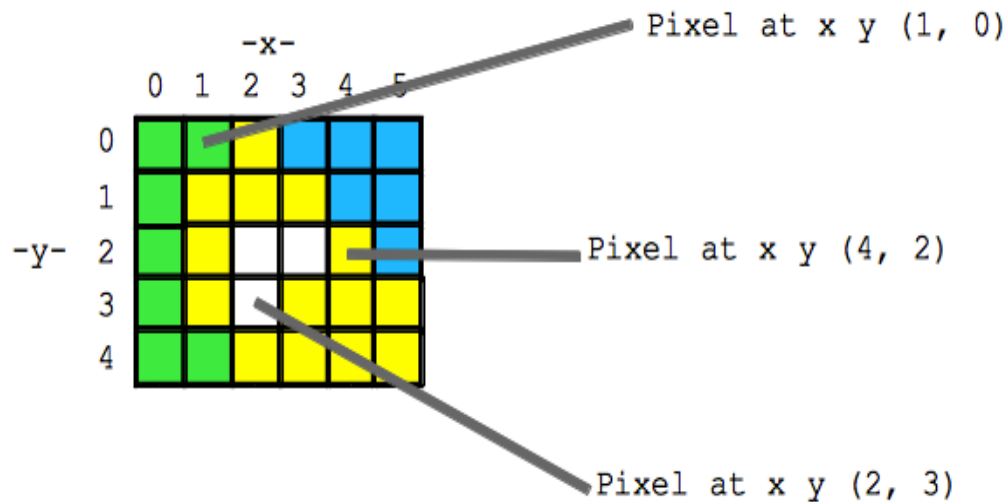
- PiPy is a Python repository for open source third party Python packages.
- We have used libraries that are built-in with Python.
- We can use the libraries that are shared on PiPy (called packages)
- We need to use pip install command (at the command line) to install these packages
- Go to Anaconda prompt and type pip install <package\_name>

# Example

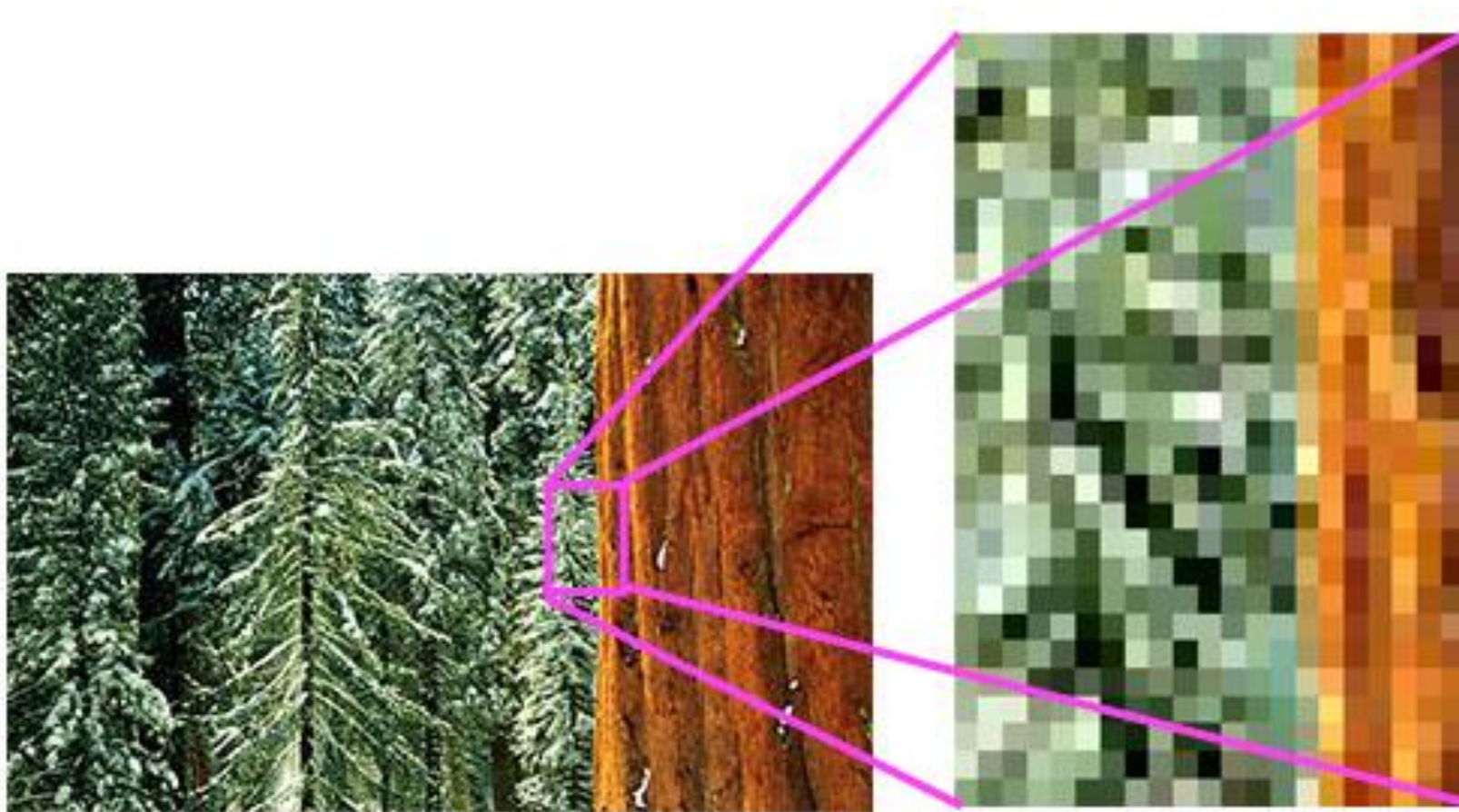
- There are packages already created for almost all use cases you can think of in Python.
- A quick google search will lead you to the PiPy page for the package or the package documentation.
  - Type python package for <function you want>
  - For example for : Python package for excel you will find this link:
  - <http://www.python-excel.org/>
- Windows user can use command prompt.
- Mac Users use Terminal Window

# Images

- The Python Imaging Library is PIL.
- It provides the python interpreter with image editing capabilities.
- An image is a two-dimensional matrix of pixel values.



# Pixel Representation



# Images

- Pixel values stored in an image can be:
- RGB — a “three-tuple” consisting of the red, green, and blue values, all non-negative integers.
- L — a single “gray-scale” integer value representing the brightness of each pixel.

# Images- Basic Colors

Color	(red, green, blue) value
Black	(0, 0, 0)
Red	(255, 0, 0)
Green	(0, 255, 0)
Blue	(0, 0, 255)
White	(255, 255, 255)
Light Gray	(122, 122, 122)

# Operations with Images

- Using the Image Module we can:
- Open an Image from a path
- Save an Image
- Retrieve Size of the Image
- Rotate an Image
- Crop Image
- Resize Image

**From 'Images' folder on Submittity download the 3 Images and save in your working directory.**

# More Operations

- Changing the image:
- The functions we used so far did not change the actual object/image.
- There are methods that change the object:
  - Copy
  - Paste



# Problem 1

- Write a function called `add_tuples` that takes three tuples, each with two values, and returns a single tuple with two values containing the sum of the values in the tuples.
- Test cases
  - `add_tuples( (1,4), (8,3), (14,0) ) : (23, 7)`
  - `add_tuples( (3,2), (11,1), (-2,6) ) : (12, 9)`

# Problem 2

- Get an image (your own or from google) and do the following:
- Read the image into python
- Crop it (Based on the size of the Image crop half – for both x and y coordinates)
- Covert it to grayscale
- Save it in your working folder.

# Next Lecture

- Exam 1