

# Python Application-Layer Network Programming

## CME451 Tutorial 2

Hao Zhang  
(Graduate Teaching Fellow)

Department of Electrical & Computer Engineering  
University of Saskatchewan

Jan 13, 2017

# Review of Lab 1

- ▶ Basic concepts of Python programming:
  - ▶ data types, math operations, string...
- ▶ Extract a substring from an arbitrary string
  - ▶ using `str.find()`
- ▶ Sorting a list with specific rules
  - ▶ using `list.append()`
  - ▶ using `list.sort(key=rule, reverse=True)`

# Lab 2 Objectives

## Part 1: Application-Layer Programming

- ▶ Write simple application-layer program;
- ▶ Perform website data analysis;
- ▶ Retrieve information from a website.

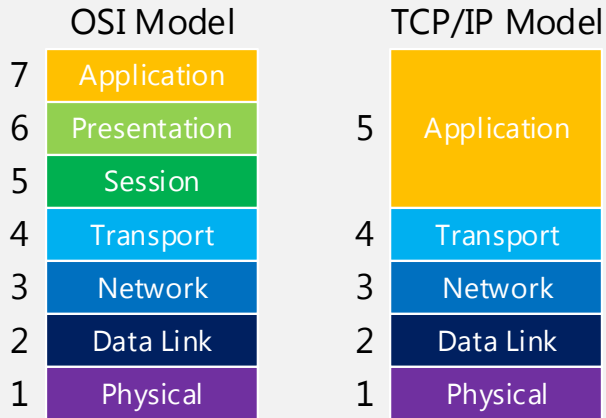
# Network Layers

## OSI model

	Layers	Function
7	Application	Interface, provide service to user
6	Presentation	Translation, compression, and encryption
5	Session	Dialog control and synchronization
4	Transport	Delivery of a message from one process to another
3	Network	Source-to-destination delivery of packets
2	Data Link	Transmission of data over physical link
1	Physical	Physical aspects of transmitting data

# Network Layers

## TCP/IP model



# Application-Layer Programming

Use `urllib.request`

- ▶ `urllib.request` module defines functions and classes that can be used in opening URLs (mostly HTTP)
- ▶ `urllib.request.urlopen(url)`
  - ▶ Open the specified URL and return a request object.
  - ▶ Acquire the content by the `read()` method, read content into a string.
  - ▶ Use decoding method `decode()` to make the content readable.
  - ▶ Analyze the website by processing the string.

```
>>> import urllib.request
>>> data = urllib.request.urlopen('http://www.usask.ca/')
>>> html_content = data.read().decode('utf-8')
>>> print(html_content)
```

# Application-Layer Programming

## HTML Processing

- ▶ Analyze the HTML file content
- ▶ Processing HTML content as a 'large string'

```
>>> jpgIndex = html_content.find('.jpg')  
>>> href = html_content.find('href=')
```

# Application-Layer Programming

## Retrieve Contents

- ▶ `urllib.request.urlretrieve(url, filename)`
  - ▶ Copy a network object denoted by a URL to a local file.

```
>>> urllib.request.urlretrieve('http://www.usask.ca/img/'\
+filename, filename)
```



# Lab 2 Task

- ▶ Extracting .jpg files from department website
- ▶ Retrieving documents from department website
- ▶ Part 2: Socket Programming