Applications Systems Development for Business Analytics

BT3103 - Week 1
2019/2020 Semester 2

Instructor
Thangamani R

Thangamani Career Journey

1999

Started career journey

2003

Designing Software Applications, UML & Rational Rose, Insurance Domain

2005

IT Project Manager Insurance Domain

2010

IT Project Manager HR & Payroll

2018

IT Project Manager Insurance

NUS

React Applications, Cloud Databases, AWS & Learning Analytics

Thangamani Educational Background/ Skill Sets

Education

- Masters in Business Analytics

Certifications

- Project Management Professional(PMP)

Skill Set

- IT Design & Development, Project Management, Business Analytics

Hobbies

- Urban Gardening

Contact Details

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- Office : COM2 02-47

- Please include “BT3103” in email subject

Course Contents

- Software Development Lifecycle (SDLC)
- User Requirement gathering and analysis
- Data Visualization(Python libraries)
- UI Design & Prototyping(Vue js)
- Version control (Github)
- CI / CD Tools
- Agile Methodology(SCRUM)
- AWS Lambda functions
- Intro to AWS services

Assessment

Evaluation:

- Mid-Sem Project Submission (Week 7)
- Presentation on final project work(Week 11)
- Final Project Submission(Week 13)
- Intermediate Assessments(Quiz, short written tests)

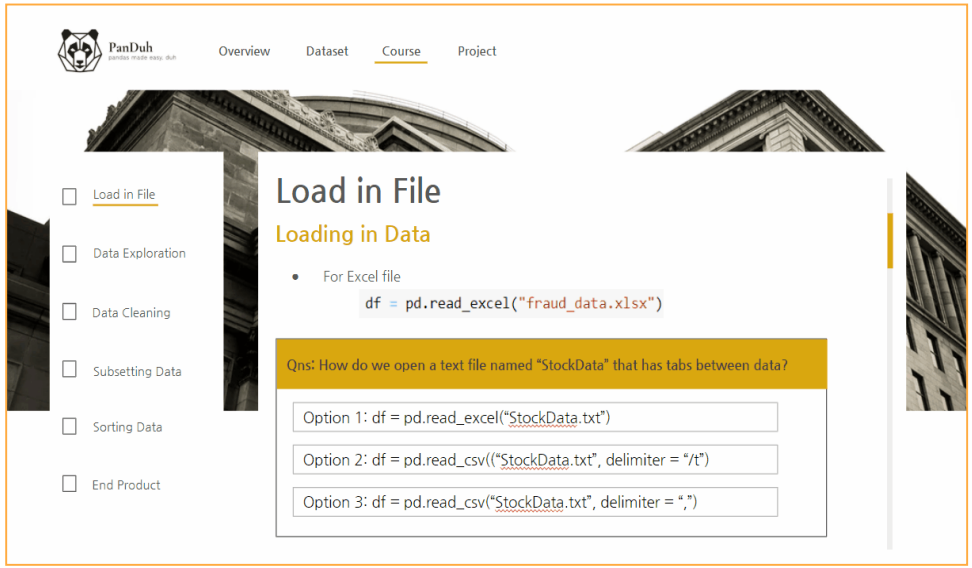
Assessment:

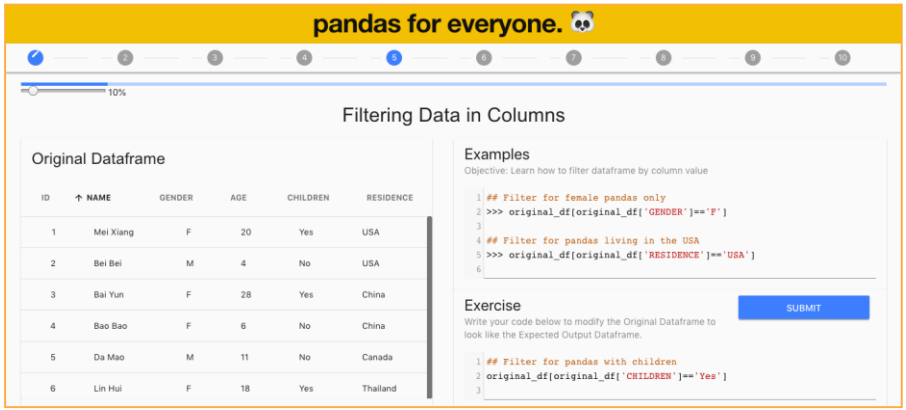
- 20% for participation in class and completing class activities
- 20% for quizzes and assignments
- 20% Mid Sem Project Submission
- 30% Final Project Submission
- 10% Final Project Presentation

Hands on

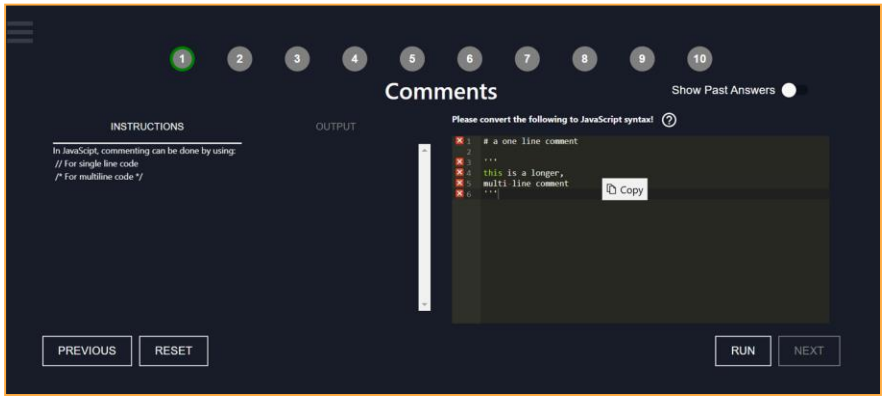

Programmers While Coding
It Doesn't Work..... Why?
It Work..... Why?
©IndianFunnyPicture.com

Applications developed in previous semesters





Applications developed in previous semesters



Week 1

- NUS Discovery Tool
- Jupyter notebooks & Google Colaboratory
- Phases of SDLC
- Python Pandas Library
- Python Matplotlib
- Hands on exercises using Discovery tool
- Register for AWS Educate account

Tools used in class

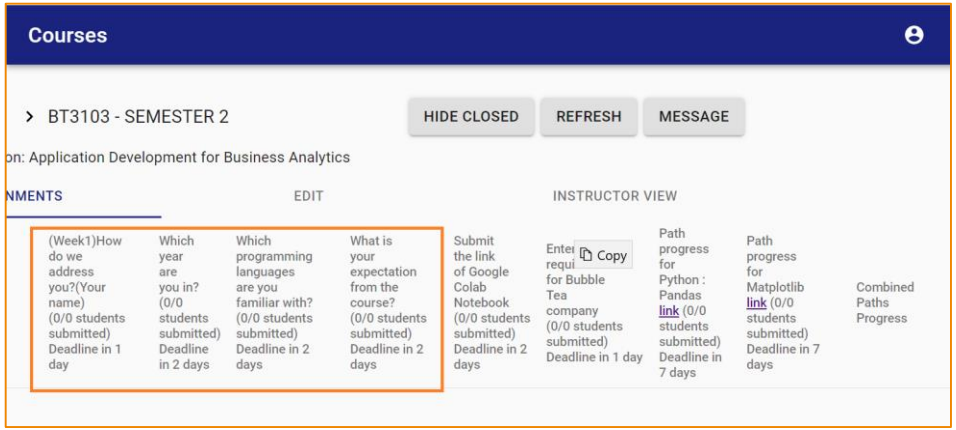
- NUS Discovery
- Jupyter Notebook
- Google Colab

NUS Discovery

- Get started -Documentation: http://bit.ly/NUS-Discovery
- Click on the link below to **Join course**
- http://bit.ly/NUS_bt3103

NUS Discovery

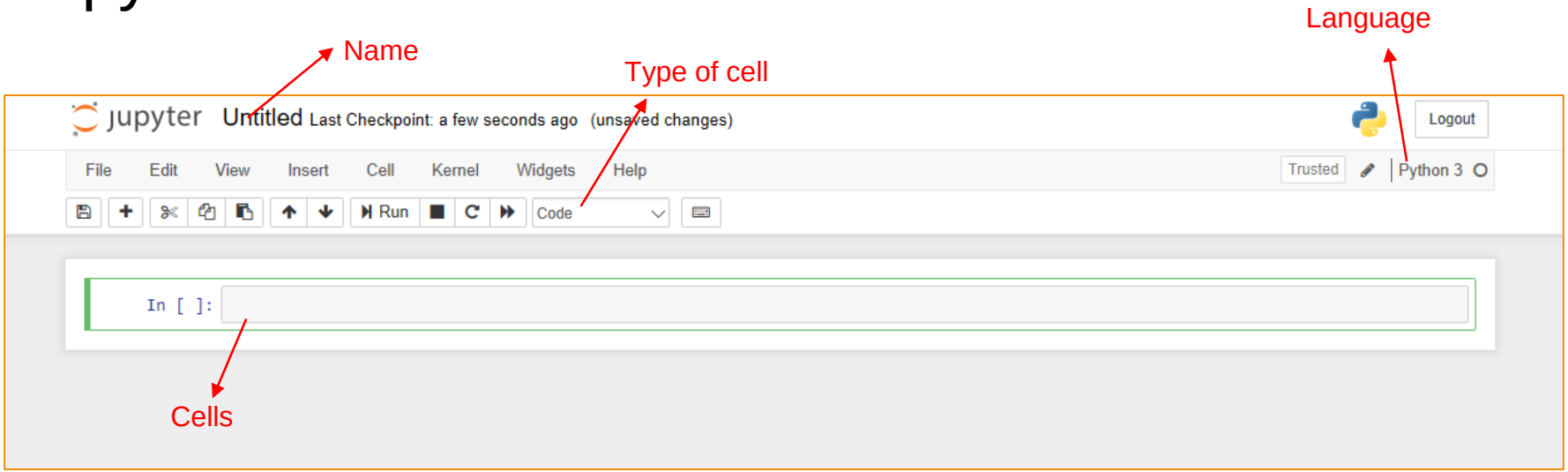
- In the course submit answers to the following questions
  - How do we address you ?
  - Which year are you in?
  - Which programming languages are you familiar with?
  - What is your expectation from the course?



Jupyter Notebooks

- Open-source web application that allows you to create and share documents that contain live code, equations, visualizations and narrative text.
- Uses include: data cleaning and transformation, numerical simulation, statistical modeling, data visualization, machine learning

Jupyter Notebooks



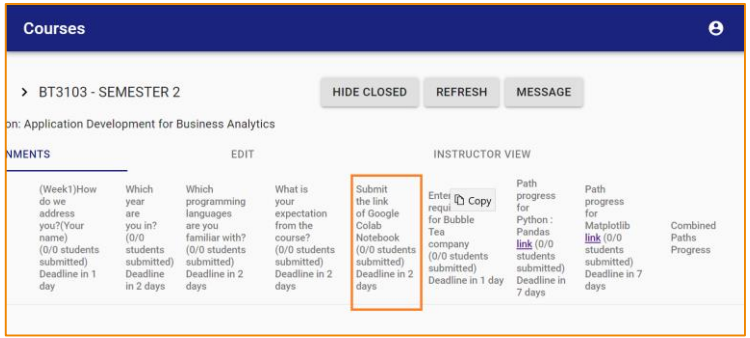
- Select cell and execute

Google Colaboratory

- Colaboratory is a free Jupyter notebook environment that requires no setup and runs entirely in the cloud.
- With Colaboratory you can write and execute code, save and share your analyses, and access powerful computing resources, all for free from your browser.
- https://colab.research.google.com/

Google Colaboratory

- Visit Colab website https://colab.research.google.com/
- Create a Python 3.0 Jupyter notebook in Colab website
- Print Hello World
- Execute the cell
- Post the link to the Discovery activity : http://bit.ly/NUS_bt3103



Software Development life cycle

- Discuss with your partner on SDLC

Software Development life cycle

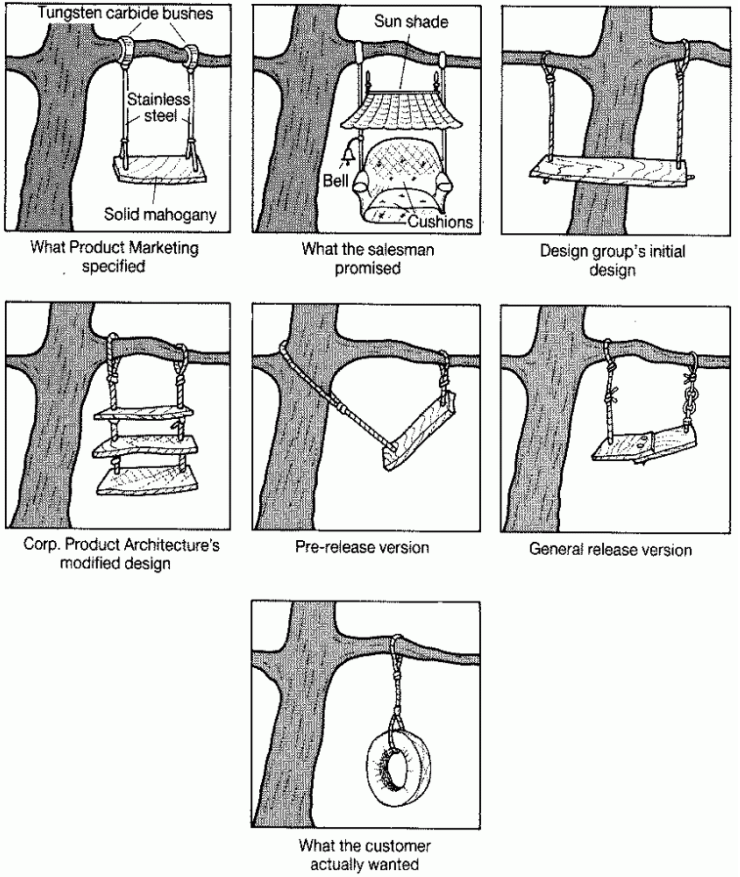
- Framework defining tasks performed at each step in the software development process.
- Various stages in the software development and delivery.
- Pre-defined Structure and is tweaked as per Organization needs
- Detailed plan describing how to develop , deliver and maintain software

Phases of Software Development life cycle (SDLC)

Phases of SDLC

- Requirement Analysis
- Design
- Implementation
- Testing
- Evolution

Requirements Gathering



Requirements Gathering

Requirement Analysis

- Understanding user requirements and expectations
- Feasibility study(What is doable & not)
- Security considerations
- User groups for products
- Problem you are trying to solve
- Limitations are also covered.
- Ambiguities are resolved.
- *“What”* questions are discussed

Requirement Analysis

- Requirement Gathering and Analysis is a crucial phase in SDLC to ensure:
  - Client Expectations are met.
  - Mitigate risks
  - Keep projects on track
- All stakeholders are involved
- Business Analysts, Subject Matter Experts(SME’s) , Users

Requirement Analysis

- Functional & Non-functional requirements
- Functional :
  - Requirements describe how a project must behave
  - Features and functions
  - All the Project Stakeholders need to be on the same page on this.

Requirement Analysis

- Non-Functional:
  - Defines system attributes such as security, reliability, performance, maintainability, scalability, and usability
  - Also known as *quality attributes*
  - Proper definition and implementation is critical for the success of the system.
  - Must be stated with objective, measurable and testable criteria.

Requirement Analysis

- Common formats of requirement documentation:
  - Requirements Document(Software requirement specifications document).
  - Use cases
  - User stories
  - Prototypes
  - Work Breakdown Structure
  - Models and diagrams

Requirement Analysis

- Feasibility Study:
  - Conducted during requirements phase
  - To define limitations on the system if any
  - System limitations need to be clearly documented as well.

Requirement Analysis

- *A customer wants to have an application which involves money transaction.*
  - What kind of application?
  - What money transactions are involved?
  - Who are the users of the application?
  - How will the money transactions be done?
  - Which currency will the transactions be done?

Requirement Analysis

- *A customer wants to have an application which involves money transaction.*
  - What are the security features that needs to be considered?
  - Transaction speed considerations
  - Features application cannot support

Requirement Analysis

- A bubble tea company has approached you to develop a sales dashboard for their products.
- Discuss with your partner on the requirements for this application.

Requirement Analysis

- List down the top 5-8 requirements

  (include Functional , non-Functional,

  Limitations if any)

- Key in your requirements to Discovery link.

Requirement Analysis

Design

- Based on the user requirements and the analysis done the new application is designed.
- *“What”* questions translate to “*How*” questions
- Architecture of the system is developed
- New system starts taking shape
- Database , software to be used is decided.
- Decide data input and output and data flow is determined.

Implementation

- This is the phase when the development team is involved to write code.
- Design is translated to code
- All the components are implemented.

Python beginners

- Discovery path - Python for Beginners
- Data Structures : Lists ,Dictionaries
- Numpy - Array manipulations

Pandas Library

- Python Data Analysis Library
- To read data from sources like files , databases etc.
- Main packages
  - Dataframes
  - Series

Pandas Library - DataFrame

- Two dimensional labeled data structure
- Columns of different data types
- Similar to a spreadsheet or SQL table.
- Most commonly used Pandas object

- Reference : https://pandas.pydata.org/pandas-docs/stable/reference/api/pandas.DataFrame.html

Creating DataFrames

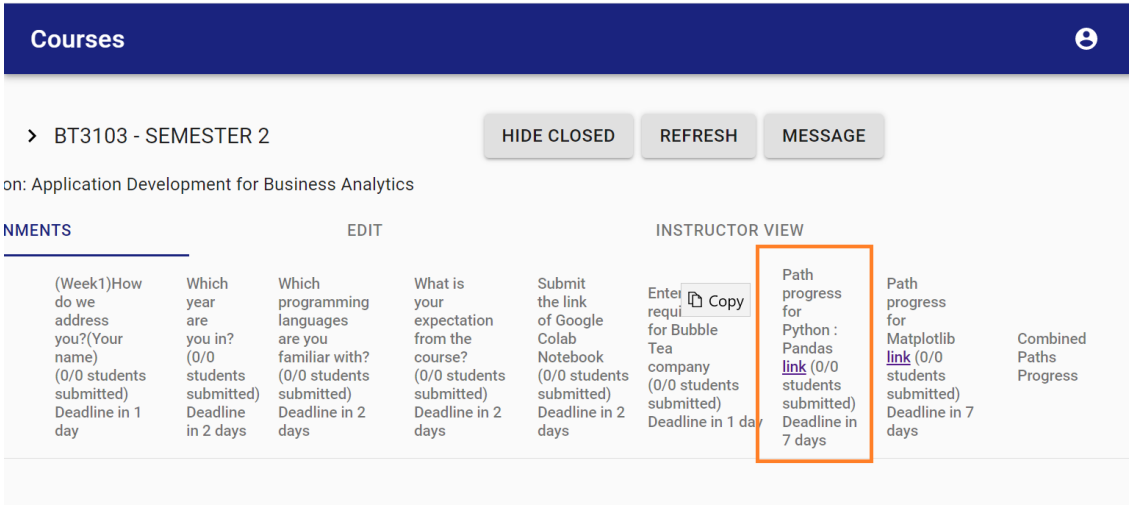
- DataFrames are created by loading the datasets from files , SQL databases .
- They are also created from other data structures like Lists and dictionaries.

DataFrame : Methods

Method	Description
df.info()	Print a concise summary of dataframe
df.describe()	Generate descriptive statistics that summarize the central tendency, dispersion and shape of a dataset’s distribution, excluding NaN values.
df.head()	Returns the first n rows, 5 rows by default
df.tail()	Returns the last n rows , last 5 rows by default
df.isna()	Detects missing values
df.dropna()	Remove missing values

DataFrame Activities

- Try out the activities posted on Discovery
- http://bit.ly/NUS_bt3103
- You can discuss the exercises with your peer.



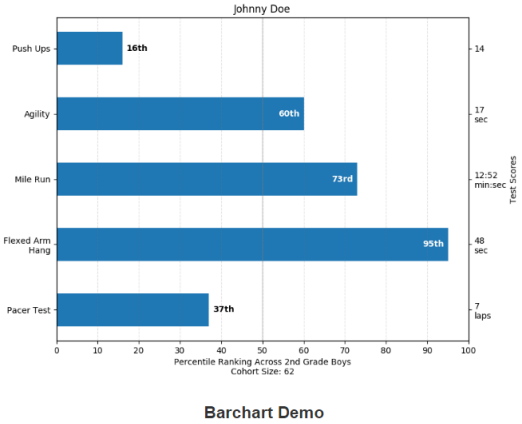
About Matplotlib

- Matplotlib is a Python 2D plotting library which produces publication quality figures in a variety of hard copy formats and interactive environments across platforms.
- It can be used in Python scripts, the Python and IPython shells, the Jupyter notebook, web application servers, and for graphical user interface toolkits.

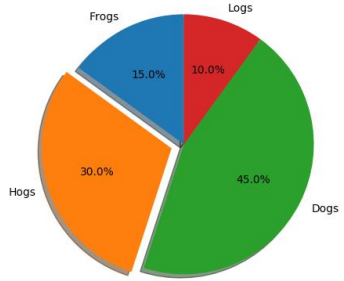
About Matplotlib

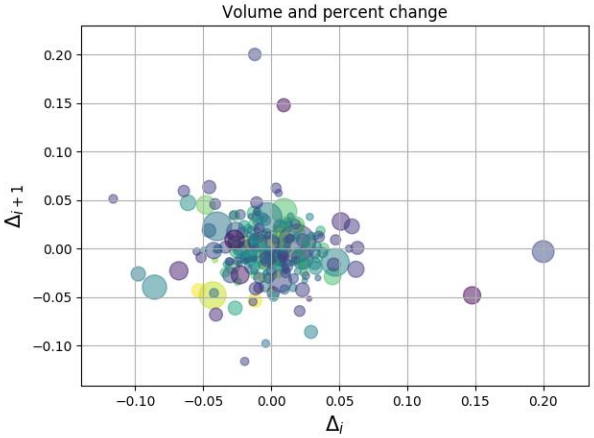
- You can generate plots, histograms, power spectra, bar charts, error charts, scatterplots, etc., with just a few lines of code.
- Reference: https://matplotlib.org/

About Matplotlib

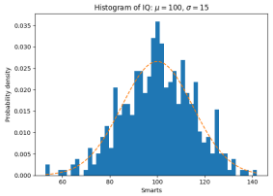
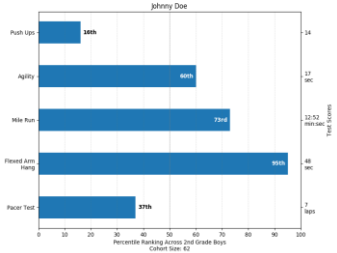


Barchart Demo

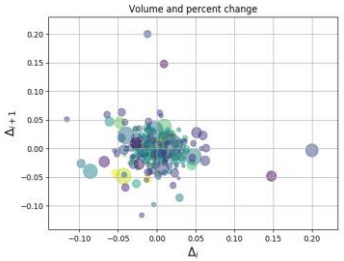
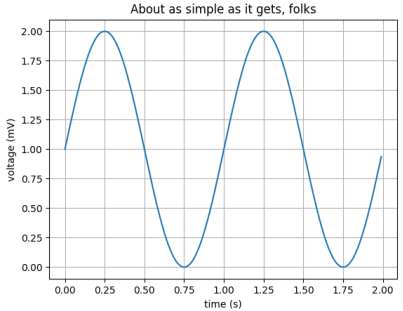




Matplotlib Plots

Methods	Description	Sample Plots
matplotlib.pyplot.hist	Plot a histogram.Compute and draw the histogram of *x*.	
matplotlib.pyplot.bar	Make a bar plot. The bars are positioned at x with the given alignment. Their dimensions are given by width and height. The vertical baseline is bottom (default 0).	

Matplotlib Plots

Methods	Description	Sample Plots
matplotlib.pyplot.scatter	A scatter plot of y vs x with varying marker size and/or color.	
matplotlib.pyplot.plot	Plot y versus x as lines and/or markers.	

Matplotlib – Setting Axes name & Title

Methods	Description
plt.xlabel(“x axis”)	Display X-Axis name
plt.ylabel(“y axis”)	Display Y-Axis name.
plt.title(“Plot Title”)	To display the plot title
%matplotlib.inline	When using the 'inline' backend, your matplotlib graphs will be included in your notebook, next to the code

Matplotlib Exercises

- Try out the exercises posted on Discovery
- You can discuss the exercises with your peer.
- In addition ,
  - Use %matplotlib.inline to view the plots
  - Set the labels for x-axis and y-axis.
  - Set the plot title

AWS Educate Account

Sign up for AWS Educate Account:

a. AWS Educate is Amazon's global initiative to provide students and educators with the resources needed to accelerate cloud-related learning.
b. Sign up AWS Educate Account

Wrap up:

What was covered:

a. Module Introduction
b. Introduction to SDLC
c. Requirements Gathering
d. Python Data Types
e. Python Data Frames
f. Matplotlib
g. Got introduced to another student

Homework Problems

1. **Submit Colab Link:**
    a. Install Jupyter notebook in your local machine.
    b. Create a notebook with a gist of the commands discussed in the class today.
    c. Use a new dataframe
        i. Load & Explore DF
        ii. Create plots
    d. Upload the Jupyter notebook to Google Colab
    e. Share the colab URL in the link (Don’t forget to share your colab notebooks , else it wouldn’t be visible)

Homework Problems

2. **Requirements Gathering:**
    a. Come up with 5 problems related to education that students encounter at NUS and which can be solved by developing applications.
    b. Key in your problems at Discovery link