## 1. Basic Concepts

2. Introduction
    - 2.1 What is Python?
    - 2.2 About Programs and Programming
    - 2.3 Jupyter Notebooks
    - 2.5 Rendering Code
3. Your First Program
    - 3.1 Hello World
    - 3.2 Printing Text
    - 3.3 Comments
    - 3.4 Storing and Manipulating Data
    - 3.5 Simple Operations
4. Integers and Floats
5. Numerical Operations
    - 5.1 Exponentiation
    - 5.2 Quotient
    - 5.3 Remainder
6. Strings
7. Simple Input & Output
8. String Operations
    - 8.1 Concatenation
    - 8.2 String Operations
9. Type Conversions
    - Casting
    - Operator overloading
10. Variables
    - 10.1 Variable Names
    - 10.2 Reserved Names
11. In-Place Operations (assignment operators)
12. Using an Editor (Optional)

# Workshop Syllabus

## 2. Control Structures & Lists

1. Booleans and Comparison
2. Boolean Logic
3. If, else, elif statement
4. Operator Precedence
5. While loop
6. Break, continue
7. Lists
8. list Operations
9. List methods (append)
10. List functions
11. List versus Range Objects
12. For Loops
13. List comprehensions

## 3A. Functions and Modules

1. Functions
2. Function Arguments
3. Returning from Functions
4. Comments (revisited)

4.1 Docstrings

5. Functions as Objects
6. Modules
7. The Standard Library
8. pip Revisited

## 3B. Exceptions and File Handling

1. Exceptions
2. Common exceptions
3. Exception Handling
    - 3.1 finally
4. Raising Exceptions
5. Assertions
6. Opening Files
7. Reading Files
8. Writing Files
9. Working with files
    - 9.1 Load data from a CSV file
    - 9.2 Comma Separated Values
10. Load CSV Function
11. Convert String to Integers
12. Programming in Pseudo code
13. Extensions

## 4A. More Types and Functionality

1. None
2. Dictionaries
3. Dictionary Functions
4. Tuples
5. List Slices
6. List Comprehensions
7. String Formatting

8.1 String Functions

8.2 Numeric Functions

8.3 List Functions

## 4B Classification and Regression Trees

1. Gini Index
2. Create Splits
3. Evaluate Splits
4. Build Tree
    a. Terminal Nodes
    b. Recursive Splitting
    c. Building the tree (Learning)
5. Model Parameters

6. Making a prediction (Inference)
7. BankNote Case Study

## 5. An end to end Machine Learning project

## 6A. A visualisation primer (MatPlotLib)

1. Simple Plots
2. Instantiating Defaults
3. Changing Colours and line widths
4. Setting Limits
5. Setting ticks
6. Setting tick labels
7. Moving spines
8. Adding a legend
9. Annotating points
10. Types of plot
11. Figures and Subplots
12. Colours, Markers and Line Styles
13. Ticks, Labels and Legends
14. Annotations and drawing on a Subplot
15. Shapes
16. Saving plots to a file
17. Matplotlib Configuration
18. Plotting functions in Pandas (Python Data Analysis Library)

## 6B. NumPy

1. Ndarrays
2. Array creation functions
3. Ndarray datatypes
4. Array opeartions
5. Indexing and Slicing
6. Boolean Indexing
7. Fancy indexing
8. Transposing Arrays
9. Swapping Axes
10. Universal functions
11. Vectorisation
12. Conditional Logic as Array Operations
13. Mathematical functions
14. Sorting Arrays
15. Array set operations
16. Linear Algebraic Functions
17. Random Number Generation
18. Random Walks

## 7A. Introduction to Pandas

1. Series
2. DataFrames
3. Dataframe constructor
4. Index Objects
5. Index Methods
6. Reindexing
7. Dropping entries from an index
8. Indexing, selection and filtering
9. Arithmetic and data alignment
10. Arithmetic values with fill values
11. Broadcasting
12. Sorting
13. Ranking
14. Axis indexes with duplicate values
15. Descriptive statistics
16. Covariance and correlation
17. Unique Values, Value Counts, and Membership
18. Handling Missing Data
19. Filtering Out Missing Data
20. Filling In Missing Data
21. Hierarchical Indexing
22. Reordering and Sorting Levels
23. Summary Statistics by Level
24. Using DataFrame's Columns

## 7B Data Wrangling: Clean, Transform, Merge, Reshape

1. DataFrame Merges
2. Concatenation
3. Combining Data with Overlap
4. Reshaping and Pivoting
5. Pivoting "long" to "wide" format
6. Removing Duplicates
7. Transforming Data Using a Function or Mapping
8. Replacing Values
9. Renaming Axis Indexes
10. Discretization and Binning
11. Detecting and Filtering Outliers
12. Permutation and Random Sampling
13. Computing Indicator/Dummy Variables

## 8. Functional programming

1. Pure/Impure Functions
2. Lambda Functions
3. map and filter functions
4. Generators
5. Decorators
6. Recursion