

**BOWEN UNIVERSITY, IWO**

**COLLEGE OF COMPUTING AND COMMUNICATION STUDIES**

**DEPARTMENT OF COMPUTER SCIENCE**

**CIT 404- MACHINE LEARNING WITH PYTHON**

**LECTURE NOTE 1**

**1. Python Machine Learning: Concepts**

Machine learning (ML) is a subset of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Python has become the de facto language for machine learning due to its simplicity and versatility. Here are some key concepts:

* **Algorithms**: At the heart of ML are algorithms, which are sets of rules and techniques used to make predictions or decisions based on data. Common algorithms include linear regression for regression problems and convolutional neural networks for image recognition tasks.
* **Data Preprocessing**: Before feeding data into an ML model, it often needs to be cleaned, normalized, and transformed. This might involve handling missing values, encoding categorical variables, or scaling features.
* **Feature Engineering**: This involves selecting the most relevant features or creating new features from existing data to improve model performance.
* **Model Evaluation**: After training a model, it's essential to assess its performance using metrics like accuracy, precision, recall, and the confusion matrix for classification tasks, or mean squared error for regression.

**2. Environment Setup**

Setting up a Python environment for machine learning involves several steps:

* **Python Installation**: Download and install Python from the official website or use a distribution like Anaconda, which includes Python and a suite of other tools.
* **Virtual Environment**: It's good practice to create a virtual environment for each project to manage dependencies. You can use venv (built-in) or conda environments (with Anaconda).
* **IDE or Text Editor**: Choose an Integrated Development Environment (IDE) like PyCharm or a text editor such as Visual Studio Code for writing your code.
* **Installation of Libraries**: Install Python libraries essential for ML, such as NumPy, Pandas, Matplotlib, Scikit-learn, TensorFlow, and Keras. This can be done using pip (Python's package installer) or conda commands.

**3. Types of Learning**

Machine Learning can be broadly categorized into three types:

* **Supervised Learning**: The algorithm learns from labeled training data, trying to predict outcomes for unseen data based on this training. Examples include regression and classification problems.
* **Unsupervised Learning**: The algorithm learns patterns from unlabelled data without guidance. Examples include clustering and association problems.
* **Reinforcement Learning**: An algorithm learns to perform an action from experience by maximizing some notion of cumulative reward. It's used in various applications, including robotics, gaming, and navigation.