# Lesson 5 – Data analysis and machine learning

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| 40BThe big picture – why is this relevant? | 41BLearning objectives: |
| This lesson can be used to analyse data using Python. It can be implemented with a sample data set such as the Iris data set or data that has been gathered from one of the Arduino projects. | * Understand how to install libraries within Python * Understand how to use various data analysis libraries within Python * Understand how to train a model * Understand how to use a trained model to make predictions |
| 42BEngagement – how can I engage learners? | 43BAssessment for learning |
| * Learners will enjoy encountering a new programming language which is widely use throughout the world * Learners will understand how to analyse large data sets and how to use them to make predictions * Learners will encounter how to create an AI / ML system which is currently an area of growth within Computer Science | **Expected progress:**   * Learners will understand the purpose of libraries * Learners will understand how to use key code structures (sequence, selection and iteration) within Python * Learners will be able to write a program to import a text file and analyse the data which it contains   **Good progress:**   * Learners will understand how to build an AI / ML application * Learners will be able to create charts to analyse data * Learners will be able to train a model and use it to make predictions   **Exceptional progress:**   * Learners will be able to independently write a program to analyse data * Learners will understand the difference between supervised and unsupervised learning |
| 44BKey concepts: | 45BKey words: |
| * Learners will be able to use the knowledge gained from this lesson to analyse a wide range of data gathered from IoT devices * Learners will be able to use software libraries within Python to analyse data and make predictions * The sample size will have a major impact on the accuracy of the model | * Python * Software library * Learning * Supervised * Unsupervised * Scipy |
| 46BDifferentiation: | 47BResources: |
| More able learners can independently explore different tools which are built into Scipy. They can independently write code to analyse the data using a range of tools. | * .ppt * Python * Scipy library * Sample Iris data set |
| Lesson flow | |
| * Introduce the purpose of AI and ML. Ask learners to write down their initial thoughts and where they have encountered the terms. * Discuss whether computers can have true intelligence. What is intelligence? Can a computer truly be intelligent or does it just make determinations based upon learned behaviour? Is this any different to humans? * Discuss the key differences between supervised and unsupervised learning. Today learners will be creating a model which has labels so it will be following a supervised learning model. * Explain the purpose of libraries. Today learners will be using scipy, numpy, pandas and sklearn. Demonstrate how to import these libraries. Please note that these libraries will need to be installed into the Python IDE. Various IDEs are available. There are also a number of online IDEs such as repl.it which could be used. * Learners should then import the data set into their program. This could be a sample data set such as iris.csv or a dataset that has been gathered from one of the Arduino IoT projects. * Demonstrate to learners how to read the data. * If the Iris data is being used learners should see that each record has a labelled Class. This is determined by a combination of a range of different input variables. Demonstrate how to use your preferred IDE. * Students should then work through the worksheet which will allow them to explore the data, create datasets, create and train a model to make predictions. * If data has been gathered from one of the Arduino projects this could also be incorporated into the model to try to predict relationships between different input and output variables. * More able learners should attempt the Stretch Task which asks them to explore the MLPClassifier. | |
| Making | |
| * There are no making activities in this lesson | |