

## Machine Learning for Neuroscience

Slides and notebooks: <https://github.com/PBarnaghi/ML4NS>

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### **Tutorials: Introduction to *Python* and a quick introduction to basic concepts in machine learning**

Following on from lecture 1, the following two tutorials and corresponding formative assessment aims to introduce you to the practical methodology of basic machine learning concepts.

Tutorial 1, *Python* for Beginners, aims to build your familiarity with Python and some of the core Python libraries relevant to machine learning, including those used for data analytics and data visualisation.

First, we introduce basic Python syntax, which includes creating and assigning variables and applying functions. We then expand on this knowledge to discuss different types of data structures. We also introduce commonly used Python libraries for data analytics, such as *Pandas* and *NumPy*. For these libraries, we demonstrate key data handling and processing techniques. Finally, we review the complementary data visualisation packages *Matplotlib* and *Seaborn* and demonstrate how to develop different explainable and communicable plots based on your data.

Tutorial 2, Machine Learning for Beginners, aims to demonstrate the key techniques for machine learning development, including data pre-processing, building a model and model evaluation. First, we redefine the different types of machine learning approaches. We also introduce the machine learning library *scikit – learn*. In this tutorial, we focus on supervised learning (classification and regression) and unsupervised learning (clustering). We then expand on each of these three learning concepts, providing worked examples of machine learning development for each. We explain the importance of feature scaling and model evaluation in the process of machine learning development. Finally, we consider the importance of understanding and explaining the results of our models.

A corresponding assessment, Machine Learning for Beginners Assessment, will help you to evaluate your understanding of the practical methodology of basic machine learning concepts and demonstrate the skills you have learnt so far. This assessment is split into three parts: part 1 assesses your understanding of key data pre-processing techniques, part 2 assesses your knowledge of different types of machine learning approaches and model development and evaluation, and part 3 asks you to work through a problem, responding to specific questions, using one of the three learning concepts worked through in the Machine Learning for Beginners tutorial.