Lecture 3: Lists, arrays, and optimisation with NumPy

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July 15, 2019

Aim

This lecture will introduce lists, arrays, and show how the NumPy library can be used to make your code faster.

1 Lists

The Python programming language natively includes the ability to group together a series of objects. These are `lists` and are one of the most powerful Python objects. A list is defined as follows,

```
# Making a list

elements = ["Hydrogen", "Helium", "Lithium", "Beryllium",
    "Boron", "Carbon", "Nitrogen", "Oxygen"]
```

Having defined the list, it is then possible to select individual items of the list by using the following syntax,

```
# Printing some items

print(elements[0], elements[4], elements[-1])
```

Note, that Python starts counting from the number 0, and using the minus sign we can ask Python to count from the end. This means that the above code should print, `"Hydrogen", "Boron", "Oxygen"`. This counting from 0 means that in the above list, the string `"Hydrogen"` would be referred to as the zeroth object in the list, while `"Helium"` would be the first.

In addition to making use of single objects from within a list, it is also possible to create sublists, for example,

```
# Just the first 4 elements

print(elements[0:4])
```

Note that above, the numbers on either side of the colon the list indices. However, rather strangely, the sublist created is **inclusive** of the first number and **exclusive** of the second. Additionally, it is possible to select non-consecutive objects from a list by placing commas between the indices,

```
# Just the gases

print(elements[0, 1, 6, 7])
```