

Python for scientific research

Flow control

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What we've done so far

- 1 Declare variables using built-in data types and execute operations on them
- 2 **Next:** Controlling the flow of a program

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- **Flow control** commands lets us dictate the **order** in which commands are run:
 - 1 **If-else**: to change what commands are executed under certain conditions
 - 2 **For loops**: to repeat the same thing N times
 - 3 **While loops**: to repeat the same thing until a specific condition is met

- Print whether the integer x is positive, negative or zero

```
1 if x > 0:
2     print("x is positive")
3 elif x < 0:
4     print("x is negative")
5 else:
6     print("x is zero")
```

- Note the lack of `{ }` used in many other languages (R, C/C++); in Python **indentation** is everything!
- Indent by using 4 spaces per indentation level, rather than tabs (see [PEP-008](#))
- Code indented using a mixture of tabs and spaces does not run

For loops

- Print the integers 1 to 5

```
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2     print(x+1)
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- Loop through a list of gene names and print them in upper case

```
1 geneNames = ["Irf1", "Ccl3", "Il12rb1", "Ifng", "Cxcl10"  
               ""]  
2 for gene in geneNames:  
3     print(gene.upper())
```

While loops

- Print the integers 10 to 1

```
1 x = 10
2 while x > 0:
3     print(x)
4     x = x - 1
```

- **Note:**

- 1 Use for loops over while loops where possible
- 2 Ensure that the while condition evaluates to False at some point to avoid an infinite loop

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```

- What if I want to store the upper case gene names in another variable, called `x` for simplicity?

List Comprehensions

① Using for loops:

```
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2 for gene in geneNames:
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3 What if I want to ignore gene Ifng?

```
1 x = [gene.upper() for gene in geneNames if gene != "
    Ifng"]
```

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- Print the index next to upper cased gene name
 - ① Using a standard for loop:

```
1 i = 0 # index counter
2 geneNames = ["a","b","c"]
3 for gene in geneNames:
4     print(f"Gene {i+1} is {gene.upper()}")
5     i = i + 1
```

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```

- 2 Using enumerate:

```
1 for i, gene in enumerate(geneNames):
2     print(f"Gene {i+1} is {gene.upper()}")
```

Iterate over a dictionary

- With a dict there are both keys and values to iterate over
- Use the `dict.items()` method:

```
1 someDict = {"version": "3.7.3", "language": "Python", "
    attempts": 5}
2
3 for key, value in someDict.items():
4     print(f"{key} points at {value}")
5     # version points at 3.7.3 etc"
```

Quitting loops using break

- With a break statement you can end a for or while loop
- Everything below the break statement will not be executed

```
1 for key, value in someDict.items():
2
3     # end the loop when
4     # a certain condition is met
5     if key == "language":
6         break
7
8     print(f"{key} points at {value}")
9
10 # output:
11 # version points at 3.7.3
```

- There is more to break clauses than fits this course: have a look at `for...else` clauses if you are interested.

Skipping items using continue

- With a `continue` statement you can have the loop move on to the next iteration:
- Everything below the `continue` will not be executed during the current iteration of the loop

```
1 for key, value in someDict.items():
2     # continue the loop to the next
3     # iteration if a certain condition is met
4     if key == "language":
5         continue
6
7     print(f"{key} points at {value}")
8
9
10 # output (item involving the "language" label not
11    # printed due to the continue clause)
12 # version points at 3.7.3
13 # attempts points at 5
```