

Welcome to the computational
cognitive modelling workshop!

Part 1: Basic programming

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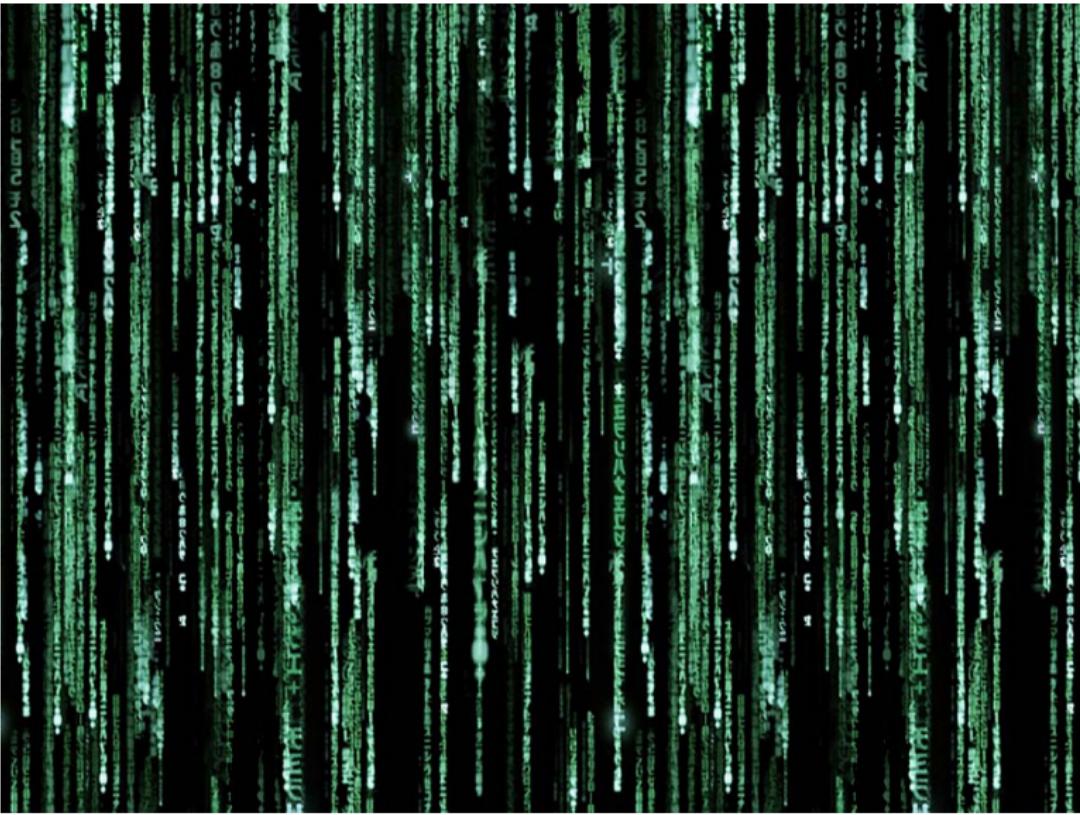
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Chris Brand

Nick Sexton

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What is programming?



It is like use using any other language!

- ▶ Programming = telling a computer what to do
- ▶ You write the recipe, the computer follows it
- ▶ Programming is an art, a craft, or a type of engineering.

Who is a programmer?



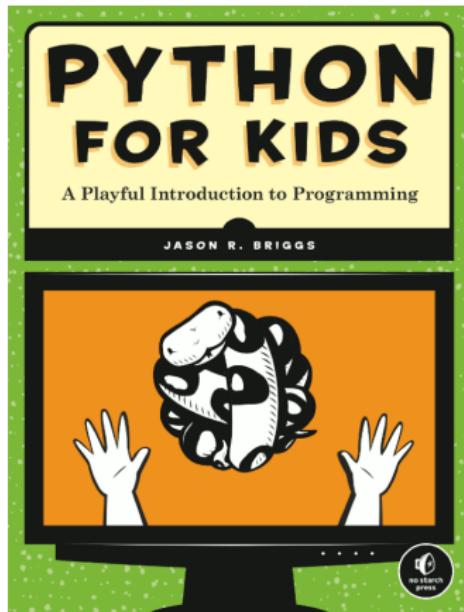
Who is a programmer?

Ada Lovelace, Grace Hopper, Amanda Spann, etc.



Who is a programmer?

Children!



Maddy Petrovich, 14, of Wellesley, Mass. first started learning how to use the programming language Scratch when she was 10 years old.

<http://hereandnow.wbur.org/2012/12/26/computer-programming-kids>

Who is a programmer?

You! Seriously

- ▶ **Anybody can program**
- ▶ But not everybody is Maya Angelou or Jane Austen!
- ▶ But who cares? We can still communicate! We can still code!

Why program?

Why speak or write?

- ▶ Communicate ideas unambiguously
- ▶ Allow your ideas to “live” on their own
- ▶ It is actually fun and definitely addictive
- ▶ Save time by automating repetitive tasks
- ▶ All the cool kids are doing it

What is Python?

Will it eat my mouse?



What is Python?

Not John Cleese, but closer...



What is Python?

Not a snake



- ▶ Named after Monty Python
- ▶ A programming language
- ▶ Not scary
- ▶ Cool

Who created Python?

A Dutch human

DOCTOR FUN

6 Apr 2000



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<http://metalab.unc.edu/Dave/drfun.html>

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Who created Python?

Guido van Rossum

aka Benevolent Dictator For Life

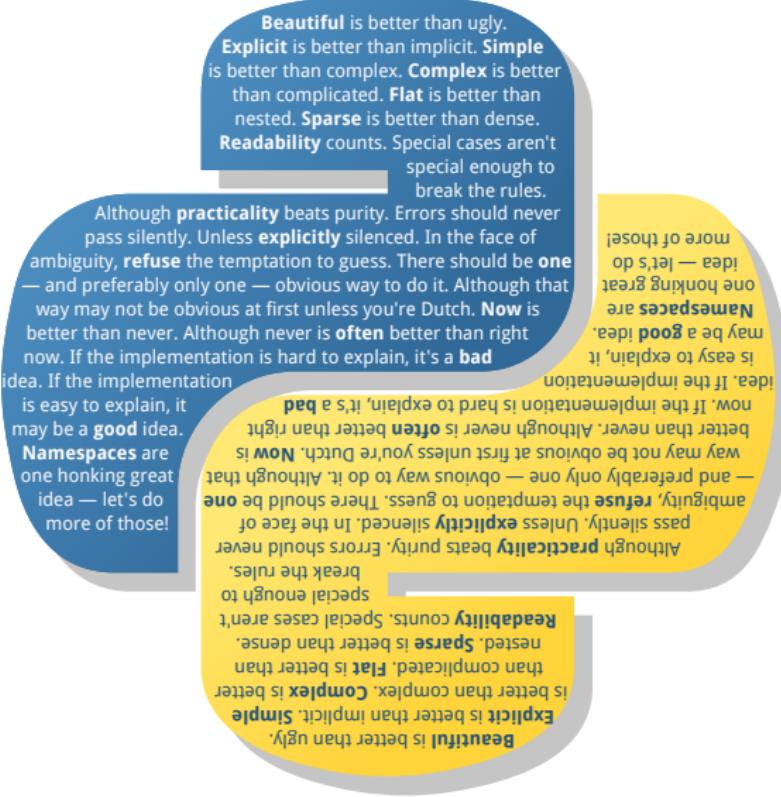


Why use Python?

It was created for you

- ▶ Easy and intuitive
- ▶ Open source and free
- ▶ Close to plain English
- ▶ Lots of help online
- ▶ Even geeks like it

Let's code!

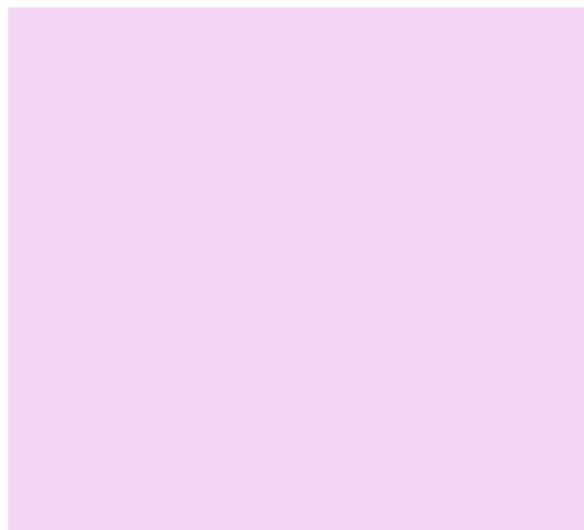


Assignment

Put a value into a variable

Python shell:

- ▶ Does *not* mean equals!
- ▶ Make the variable have the value
- ▶ Read as “assign”, “make”, or “equals”



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```
>>> i = 5  
>>> print i
```

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```
>>> i = 5  
>>> print i  
5  
>>> i + 2
```

Assignment

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```
>>> i = 5
>>> print i
5
>>> i + 2
7
```

Assignment

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```
>>> i = 5
>>> print i
5
>>> i + 2
7
>>> i = i + 1
>>> print i
```

Assignment

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```
>>> i = 5
>>> print i
5
>>> i + 2
7
>>> i = i + 1
>>> print i
6
```

Assignment

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```
>>> i = 5
>>> print i
5
>>> i + 2
7
>>> i = i + 1
>>> print i
6
>>> i += 0.8
```

Assignment

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>>> i = 5
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5
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7
>>> i = i + 1
>>> print i
6
>>> i += 0.8
7.8
```

Basic maths

Arithmetic is fun when you don't have to do it manually!

Python shell:

- ▶ Use Python as a calculator
- ▶ Assign results into variables
- ▶ All your favourites like plus, minus, times, divided by, etc.

```
>>> (41 + 45.87) / 2
```

Basic maths

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>>> (41 + 45.87) / 2  
43.435
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>>> (41 + 45.87) / 2  
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>>> 5**2
```

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```
>>> (41 + 45.87) / 2  
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>>> 5**2  
25
```

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>>> (41 + 45.87) / 2  
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25  
>>> a = 8  
>>> b = a / 2  
>>> c = b**2
```

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>>> (41 + 45.87) / 2  
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25  
>>> a = 8  
>>> b = a / 2  
>>> c = b**2  
>>> print a, b, c
```

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>>> (41 + 45.87) / 2
43.435
>>> 5**2
25
>>> a = 8
>>> b = a / 2
>>> c = b**2
>>> print a, b, c
8 4 6
```

Truth values

Perfectly logical

Python shell:

- ▶ `==` equality
- ▶ `!=` inequality
- ▶ `>=, >, <=, <`
- ▶ and, or, not

```
>>> True and False  
False
```

Truth values

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False  
>>> True or False  
True
```

Truth values

Perfectly logical

- ▶ `==` equality
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Python shell:

```
>>> True and False  
False  
>>> True or False  
True  
>>> not False
```

Truth values

Perfectly logical

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- ▶ `!=` inequality
- ▶ `>=, >, <=, <`
- ▶ and, or, not

Python shell:

```
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>>> True or False  
True  
>>> not False  
True
```

Truth values

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- ▶ `>=, >, <=, <`
- ▶ and, or, not

Python shell:

```
>>> True and False  
False  
>>> True or False  
True  
>>> not False  
True  
>>> 100 == True
```

Truth values

Perfectly logical

Python shell:

- ▶ `==` equality
- ▶ `!=` inequality
- ▶ `>=, >, <=, <`
- ▶ and, or, not

```
>>> True and False  
False  
>>> True or False  
True  
>>> not False  
True  
>>> 100 == True  
False
```

Truth values

Perfectly logical

Python shell:

- ▶ `==` equality
- ▶ `!=` inequality
- ▶ `>=, >, <=, <`
- ▶ and, or, not

```
>>> True and False  
False  
>>> True or False  
True  
>>> not False  
True  
>>> 100 == True  
False  
>>> a != b
```

Truth values

Perfectly logical

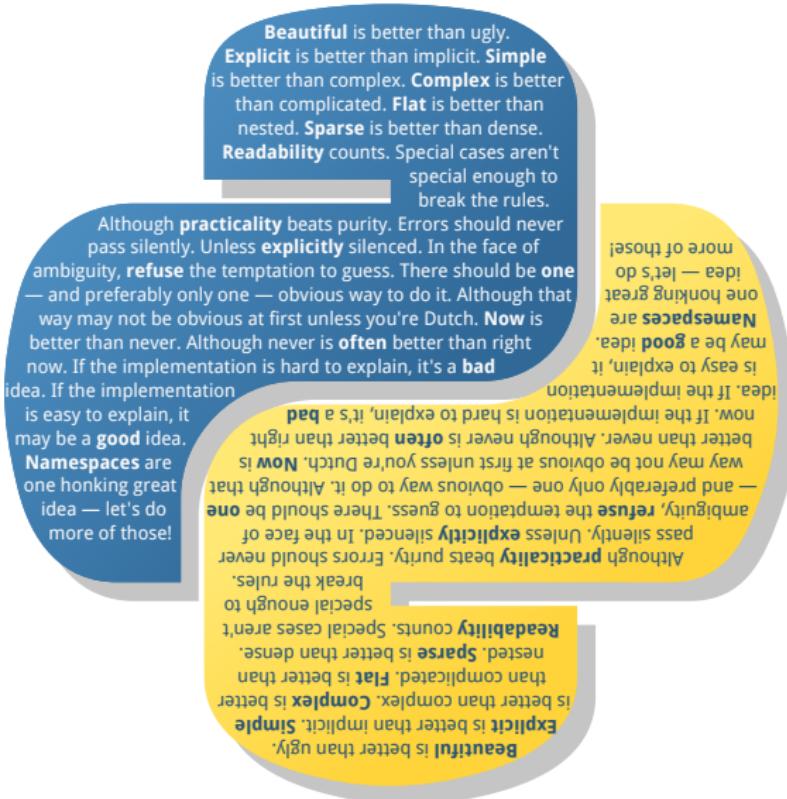
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Python shell:

```
>>> True and False  
False  
>>> True or False  
True  
>>> not False  
True  
>>> 100 == True  
False  
>>> a != b  
True
```

Time to get serious!

Open a text editor



Syntax

Tabs and spaces

- ▶ Syntax is important
- ▶ Very important

```
a = 2
b = 8
if a == b:

    print "equal"
elif a > b:

    print "a is bigger"
else:

    print "b is bigger"
...
```

Syntax

Tabs and spaces

- ▶ Syntax is important
- ▶ Very important
- ▶ Comments also

```
a = 2
b = 8
if a == b:
    # This is a comment!
    print "equal"
elif a > b:
    # Python ignores me!
    print "a is bigger"
else:
    # But you see me!
    print "b is bigger"
...
```

Conditional statements

If, then, else

- ▶ If X is the case, then do Y

```
a = 2  
b = 8  
if a == b:  
    #a and b the same  
    print "equal"
```

Conditional statements

If, then, else

- ▶ If X is the case, then do Y

```
a = 2
b = 8
if a == b:
    #a and b the same
    print "equal"

else:
    #a smaller than b
    print "b is bigger"
```

- ▶ otherwise do Z

Conditional statements

If, then, else

- ▶ If X is the case, then do Y
- ▶ but if A is the case, do B
- ▶ but if C is the case, do D
- ▶ ...
- ▶ otherwise do Z

```
a = 2
b = 8
if a == b:
    #a and b the same
    print "equal"
elif a > b:
    #b smaller than a
    print "a is bigger"
else:
    #a smaller than b
    print "b is bigger"
```

For loops

What sorcery is this?

- ▶ Do something

Text editor:

```
print 1
```

Python output:

For loops

What sorcery is this?

- ▶ Do something
- ▶ do something

Text editor:

```
print 1  
print 2
```

Python output:

For loops

What sorcery is this?

- ▶ Do something
- ▶ do something
- ▶ do something

Text editor:

```
print 1  
print 2  
print 3
```

Python output:

For loops

What sorcery is this?

- ▶ Do something

- ▶ do something

- ▶ do something

- ▶ do something

Text editor:

```
print 1
print 2
print 3
print 4
```

Python output:

For loops

What sorcery is this?

- ▶ Do something

Text editor:

```
print 1
print 2
print 3
print 4
print 5
```

Python output:

For loops

What sorcery is this?

- ▶ Do something

Text editor:

```
print 1
print 2
print 3
print 4
print 5
```

Python output:

```
1
2
3
4
5
```

For loops

What sorcery is this?

- ▶ Use a single command!
- ▶ Do something five times

Text editor:

```
for i in range(1,6):  
    print i
```

Python output:

For loops

What sorcery is this?

- ▶ Use a single command!
- ▶ Do something five times

Text editor:

```
for i in range(1,6):  
    print i
```

Python output:

```
1  
2  
3  
4  
5
```

While loops

More magic!

- ▶ For loop: for each of the 5 slices of pizza, eat them

While loops

More magic!

- ▶ For loop: for each of the 5 slices of pizza, eat them
- ▶ What if you don't know how many times you want to do something?

While loops

More magic!

- ▶ For loop: for each of the 5 slices of pizza, eat them
- ▶ What if you don't know how many times you want to do something?
- ▶ Do something *until* something else happens

While loops

More magic!

- ▶ For loop: for each of the 5 slices of pizza, eat them
- ▶ What if you don't know how many times you want to do something?
- ▶ Do something *until* something else happens
- ▶ While loop: while it's raining, use umbrella

While loops

More magic!

- ▶ For loop: for each of the 5 slices of pizza, eat them
- ▶ What if you don't know how many times you want to do something?
- ▶ Do something *until* something else happens
- ▶ While loop: while it's raining, use umbrella
- ▶ While there are slices of pizza, eat them

While loops

More magic!

Text editor:

```
while True:
```

Python output:

While loops

More magic!

Text editor:

```
while True:  
    n = raw_input("Please enter 'hello':")
```

Python output:

While loops

More magic!

Text editor:

```
while True:  
    n = raw_input("Please enter 'hello':")  
    if n == 'hello':
```

Python output:

While loops

More magic!

Text editor:

```
while True:  
    n = raw_input("Please enter 'hello':")  
    if n == 'hello':  
        break
```

Python output:

While loops

More magic!

Text editor:

```
while True:  
    n = raw_input("Please enter 'hello':")  
    if n == 'hello':  
        break
```

Python output:

```
Please enter 'hello':no
```

While loops

More magic!

Text editor:

```
while True:  
    n = raw_input("Please enter 'hello':")  
    if n == 'hello':  
        break
```

Python output:

```
Please enter 'hello':no  
Please enter 'hello':never
```

While loops

More magic!

Text editor:

```
while True:  
    n = raw_input("Please enter 'hello':")  
    if n == 'hello':  
        break
```

Python output:

```
Please enter 'hello':no  
Please enter 'hello':never  
Please enter 'hello':hi?
```

While loops

More magic!

Text editor:

```
while True:  
    n = raw_input("Please enter 'hello':")  
    if n == 'hello':  
        break
```

Python output:

```
Please enter 'hello':no  
Please enter 'hello':never  
Please enter 'hello':hi?  
Please enter 'hello':hello
```

While loops

More magic!

Text editor:

```
while True:  
    n = raw_input("Please enter 'hello':")  
    if n == 'hello':  
        break
```

Python output:

```
Please enter 'hello':no  
Please enter 'hello':never  
Please enter 'hello':hi?  
Please enter 'hello':hello  
>>>
```

Exercises

Do them!



Put your hand up if you need help!