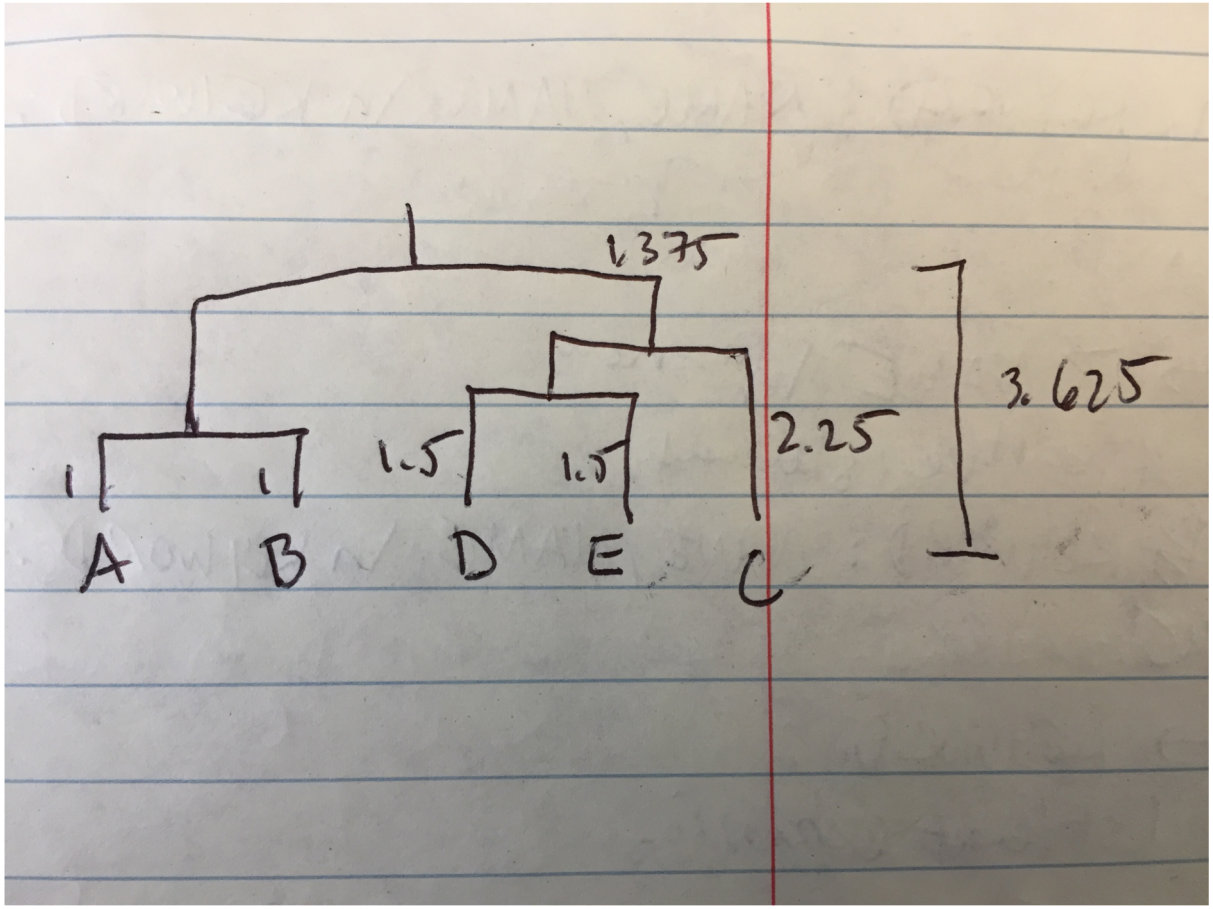
Genome Informatics Quiz section week 3

April 12, 2018

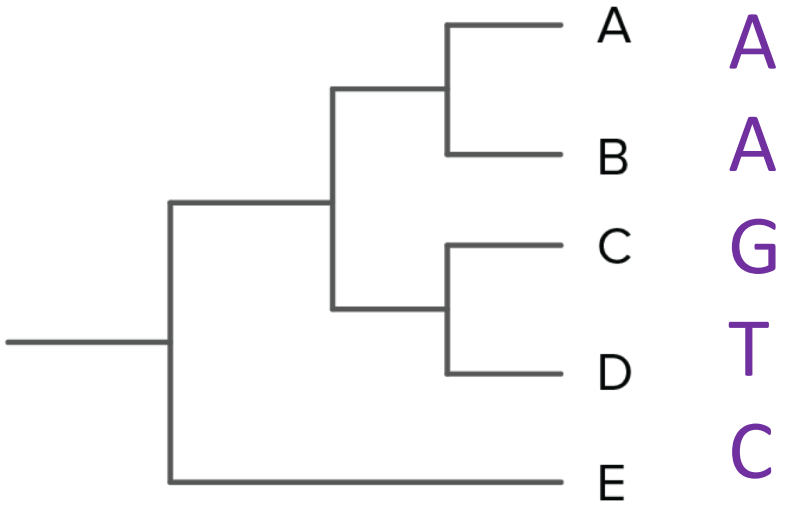
UPGMA

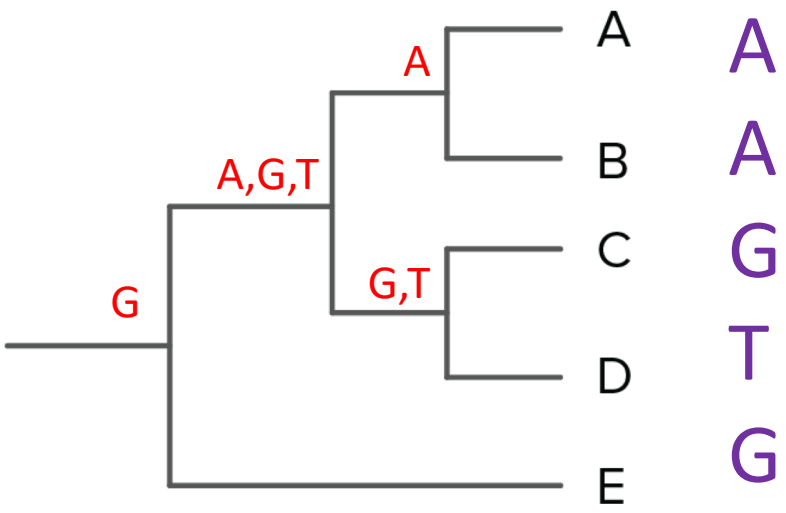
	A	B	C	D	E
A	0				
B	2	0			
C	6	5	0		
D	10	9	4	0	
E	9	8	5	3	0


1.375
3.625
2.25
1
1
1.5
1.0
A
B
D
E
C

Fitch algorithm: What are we doing?

- The *small* parsimony problem
- Analyzing a *single* tree
  - Min changes required (parsimony score)
  - Parsimonious assignment of internal node traits





Parsimony score: 2

A few missed questions:

- Scoping – (if you don't know what it is, ignore me for a moment, we'll discuss again later) – in Python, there is no block-level scope, variables declared in loops and conditionals are in the same scope as surrounding code

- String find all – short answer, no built-in function for this, but you could easily build your own after we discuss loops!

`for` loops

`for` loops let you repeatedly apply the same code to all elements in a list

```
>>> l = [1, 2, 3]
>>> print l[0]
>>> print l[1]
>>> print l[2]
```

`for` loops

`for` loops let you repeatedly apply the same code to all elements in a list

```
>>> l = [1, 2, 3]
>>> for item in l:
...     print item
1
2
3
```

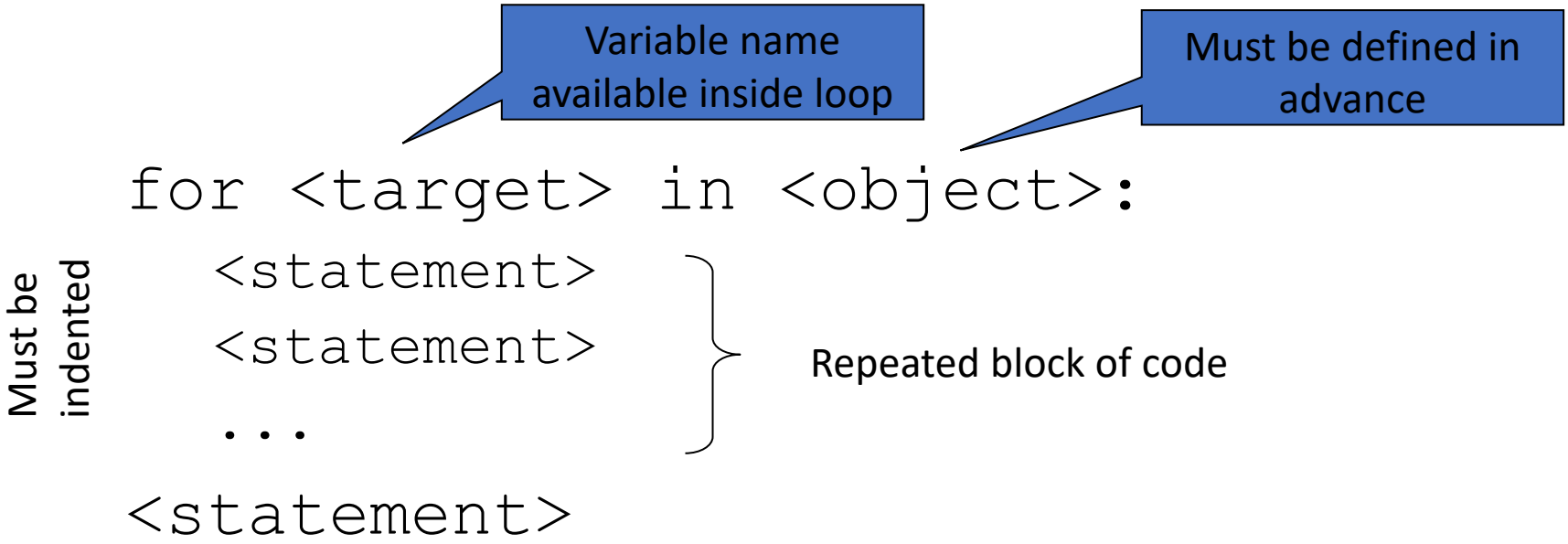
Also works for strings

```
DNA = 'actg'
for i in DNA:
    print i
```

```
a
c
t
g
```

`for` loop

- Allows you to perform an operation on each element in a list.



For loop examples:

```
DNA = 'AGTCGA’

base 0 is A
base 1 is G
base 2 is T
base 3 is C
base 4 is G
base 5 is A
```

Solution

```
>>> index = 0
>>> for base in DNA:
...     print "base", index, "is", base
...     index = index + 1
...
```

For loop examples:

```
num_list = [2, 3, 4, 5]

sum of all numbers?
```

For loop examples:

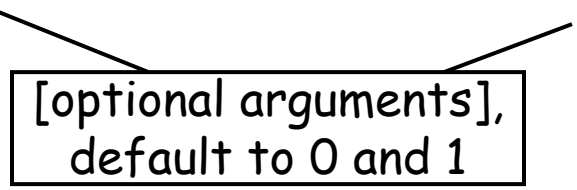
```
num_list = [2, 3, 4, 5]

sum of all numbers?

sum = 0
for v in num_list:
    sum = sum + v
print 'The sum is:', sum
```

The range() function returns a list of integers covering a specified range

```
range([start,] stop [,step])
```




```
range(5)
[0, 1, 2, 3, 4]
range(2,8)
[2, 3, 4, 5, 6, 7]
>>> range(-1, 2)
[-1, 0, 1]
```

```
>>> range(0, 8, 2)
[0, 2, 4, 6]
>>> range(0, 8, 3)
[0, 3, 6]
>>> range(6, 0, -1)
[6, 5, 4, 3, 2, 1]
```

Range can be useful in a for loop

```
num_list = [0,1,2,3,4,5,6]
# print only every other number:
for i in range(0, 7, 2):
    print num_list[i]
```

Nested loops

```
nucs = 'ACGT'
for i in nucs:
    for j in nucs:
        print i,j
```

Terminating a loop

```
break # jumps out of the most
      # internal loop

>>> for integer in range(0,3):
...   if (integer == 1):
...     break
...   print integer
...
Output?
```

Terminating a loop

```
continue # skips to end of current
         # iteration of the loop

>>> for integer in range(0,3):
...   if (integer == 1):
...     continue
...   print integer
...
```

Sample problem

Write a program `add-arguments.py` that reads any number of integers from the command line and prints the cumulative total for each successive argument.

```
> python add-arguments.py 1 2 3
1
3
6
> python add-arguments.py 1 4 -1
1
5
4
```