

PEP Scala (2)

Email: christian.urban at kcl.ac.uk
Office: N7.07 (North Wing, Bush House)

Slides & Code: KEATS

Office Hours: Thursdays 12:00 – 14:00
Additionally: (for Scala) Tuesdays 10:45 – 11:45

Scala 2.13.1

```
$ scala
```

```
Welcome to Scala 2.13.1 (Java HotSpot(TM)  
64-Bit Server VM, Java 9). Type in expressions  
for evaluation. Or try :help.
```

```
scala>
```

With older versions you will get strange results with my reference implementation.

Reference

Implementation

Keep your implementation and my reference implementation separate.

```
$ scala -cp collatz.jar
```

```
scala> CW6a.collatz(6)  
res0: Long = 8
```

```
scala> import CW6a._  
scala> collatz(9)  
res1: Long = 19
```

Preliminary Part 7

$$\text{overlap}(d_1, d_2) = \frac{d_1 \cdot d_2}{\max(d_1^2, d_2^2)}$$

where d_1^2 means $d_1 \cdot d_1$
and so on

Discussion Forum

“Since we can't use **vars** I was wondering if we could use a stack?”

My `collatz` and `collatz_max` functions are 4 loc each.

Email: Hate 'val'

Subject: **Hate 'val'**

01:00 AM

Hello Mr Urban,

I just wanted to ask, how are we suppose to work with the completely useless **val**, that can't be changed ever? Why is this rule active at all? I've spent 4 hours not thinking on the coursework, but how to bypass this annoying rule. What's the whole point of all these coursework, when we can't use everything Scala gives us?!?

Regards.

« deleted »

Subject: **Re: Hate 'val'**

01:02 AM

*« my usual rant about fp...
concurrency bla bla... better programs yada »*

PS: What are you trying to do where you desperately want to use var?

Right now my is_legal function works fine:

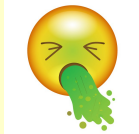
```
def is_legal(dim: Int, path: Path)(x: Pos): Boolean = {  
  var boolReturn = false  
  if(x._1 > dim || x._2 > dim || x._1 < 0 || x._2 < 0) {  
  else { var breakLoop = false  
    if(path == Nil) { boolReturn = true }  
    else { for(i <- 0 until path.length) {  
      if(breakLoop == false) {  
        if(path(i) == x) {  
          boolReturn = true  
          breakLoop = true  
        }  
      }  
    } else { boolReturn = false }  
  } else breakLoop  
  }  
  }  
  boolReturn  
}
```

...but I can't make it work with boolReturn being val. What approach would you recommend in this case, and is using var in this case justified?

Right now my is_legal function works fine:

```
def is_legal(dim: Int, path: Path)(x: Pos): Boolean = {  
  var boolReturn = false  
  if(x._1 > dim || x._2 > dim || x._1 < 0 || x._2 < 0) {  
  else { var breakLoop = false  
    if(path == Nil) { boolReturn = true }  
    else { for(i <- 0 until path.length) {  
      if(breakLoop == false) {  
        if(path(i) == x) {  
          boolReturn = true  
          breakLoop = true  
        }  
      }  
    } else { boolReturn = false }  
  } else breakLoop
```

Me:



turn

...but I can't make it work with boolReturn being val. What approach would you recommend in this case, and is using var in this case justified?

Subject: **Re: Re: Re: Hate 'val'**

01:06 AM

OK. So you want to make sure that the x-position is not outside the board....and furthermore you want to make sure that the x-position is not yet in the path list. How about something like

```
def is_legal(dim: Int, path: Path)(x: Pos): Boolean =  
  ...<<some board conditions>>... && !path.contains(x)
```

Does not even contain a `val`.

(This is all on one line)

Subject: **Re: Re: Re: Re: Hate 'val'**

11:02 AM

THANK YOU! You made me change my coding perspective. Because of you, I figured out the next one...

Subject: **Re: Re: Re: Re: Hate 'va1'**

11:02 AM

THANK YOU! You made me change my coding perspective. Because of you, I figured out the next one...

Me:



Assignments

Don't change any names or types in the templates!

Avoid at all costs:

var

return

ListBuffer

mutable

.par

I cannot think of a good reason to use stacks.

For-Comprehensions Again

```
for (n <- List(1, 2, 3, 4, 5)) yield n * n
```

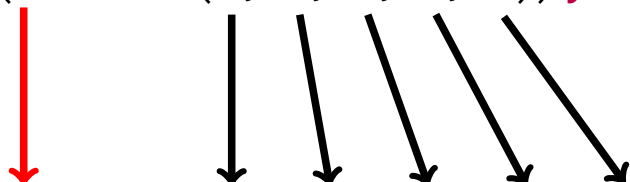
For-Comprehensions Again

```
for (n <- List(1, 2, 3, 4, 5)) yield n * n
```

$n * n$: List(1, 4, 9, 16, 25)

For-Comprehensions Again

```
for (n <- List(1, 2, 3, 4, 5)) yield n * n
```



$n * n$: List(1, 4, 9, 16, 25)

This is for when the
for-comprehension
yields / produces a result.

For-Comprehensions Again

```
for (n <- List(1, 2, 3, 4, 5)) yield n*n
```

VS

```
for (n <- List(1, 2, 3, 4, 5)) println(n)
```

The second version is in case the for
does not produce any result.

Find something below 4 in a list.
What do you think Scala answers?

```
List(7,2,3,4,5,6).find(_ < 4)
```

```
List(5,6,7,8,9).find(_ < 4)
```

Find something below 4 in a list.

What do you think Scala answers?

```
List(7,2,3,4,5,6).find(_ < 4)  
res: Option[Int] = Some(2)
```

```
List(5,6,7,8,9).find(_ < 4)  
res: Option[Int] = None
```

Option Type

if the value is present, you use

`Some(value)`

if no value is present, you use

`None`

e.g. `Option[Int]`, then `Some(42)` and
`None`
good for error handling

Option Type

```
Integer.parseInt("1234")
```

```
// vs.
```

```
def get_me_an_int(s: String) : Option[Int] =  
  Try(Some(Integer.parseInt(s))).getOrElse(None)
```

in the Scala code it is clear from the type I
that have to deal with the None-case; no
JavaDoc needed

Higher-Order Functions

In Scala, functions can take other functions as arguments and can return a function as a result.

```
List(7,2,3,4,5,6).find(_ < 4)
```



Higher-Order Functions (2)

```
def even(x: Int) : Boolean = x % 2 == 0
```

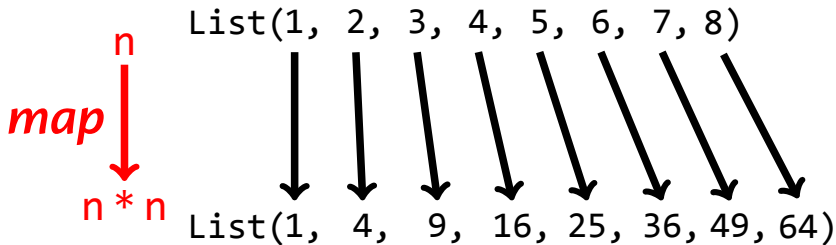
```
List(1, 2, 3, 4, 5).filter(even)  
res : List[Int] = List(2, 4)
```

```
List(1, 2, 3, 4, 5).count(even)  
res : Int = 2
```

```
List(1, 2, 3, 4, 5).find(even)  
res: Option[Int] = Some(2)
```

map (lower case)

applies a function to each element
of a list (and more)



```
List(1,2,3,4,5,6,7,8).map(n => n * n)
```


For-Comprehensions are maps

```
for (n <- List(1,2,3,4,5,6,7,8))  
  yield n * n
```

// is just syntactic sugar for

```
List(1,2,3,4,5,6,7,8).map(n => n * n)
```

Map (upper case)

a type, representing a key-value
association datastructure

```
val ascii =  
    ('a' to 'z').map(c => (c, c.toInt))
```

```
val ascii_Map = ascii.toMap
```

```
ascii_Map.get('a')    // -> 97
```

Pattern Matching

...on pairs:

```
def fizz_buzz(n: Int) : String =  
  (n % 3, n % 5) match {  
    case (0, 0) => "fizz buzz"  
    case (0, _) => "fizz"  
    case (_, 0) => "buzz"  
    case _ => n.toString  
  }
```

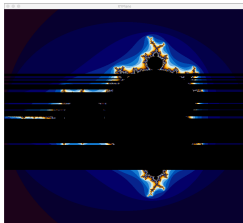
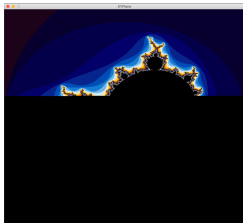
Recursion

```
def fib(n: Int) : Int = {  
  if (n == 0 || n == 1) 1  
  else fib(n - 1) + fib(n - 2)  
}
```

Recursion

```
def my_flatten(xs: List[Option[Int]]): List[Int] =  
  xs match {  
    case Nil => Nil  
    case None :: rest => my_flatten(rest)  
    case Some(v) :: rest => v :: my_flatten(rest)  
  }
```

Questions?



My Office Hours: Thursdays 12 – 14
And specifically for Scala: Tuesdays
10:45 – 11:45

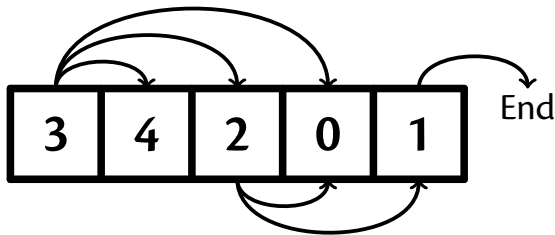


**Mind-Blowing Programming Languages:
Overloading in any language is great but it
makes a difference $10/3$ or $10.0/3$**



Mind-Blowing Programming Languages: PHP (7.0)

Jumping Towers



shortest: 3 → 4 → End

“Children” / moves

