

Advanced Programming Topics

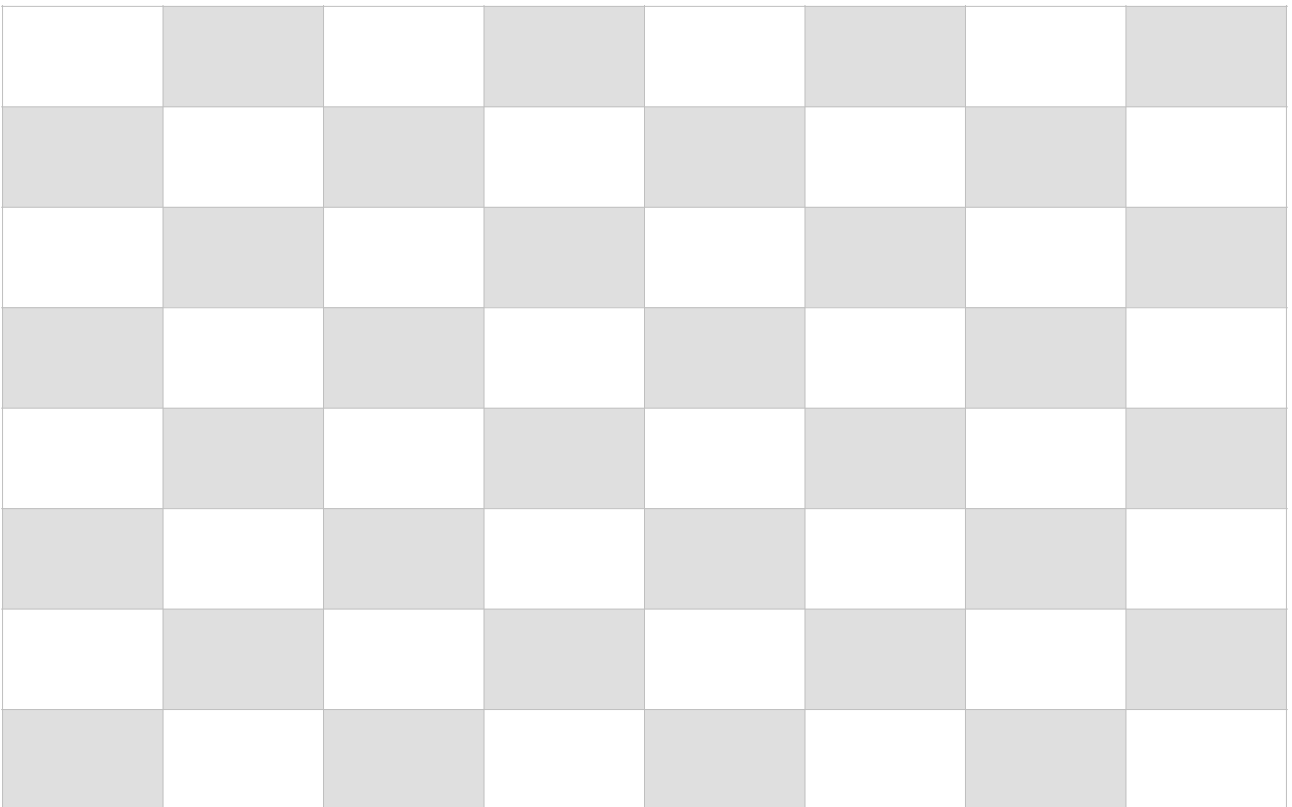
Why functional programming? Why algorithms? Why complexity? Why proof?

Lecture 1

James Marshall

Why functional programming?

The inventor and the king



A famous number sequence

A Haskell implementation

```
f 1 = 1  
f 2 = 1  
f n = f (n-1) + f (n-2)
```

Q: How long would it take to compute $f\ 300$?

Q: How old is the universe estimated to be?

A better Haskell implementation

```
g 1 a b = a  
g n a b = g (n-1) b (a+b)  
  
h n = g n 1 1
```

Q: How long would it take to compute $h\ 1000$?

Q: How do we work out the answers to these kind of questions?

Q: What makes h faster than f ?

Q: How do we know our algorithms are working correctly?