COMP 333 Introduction

Kyle Dewey

About Me

- My research:
  - Automated program testing + CS education
    - Programming language design
- Lots of experience with functional and logic programming
- Taught this class a bunch

About this Class

- See something wrong? Want something improved? Email me about it! (kyle.dewey@csun.edu)
- I generally operate based on feedback

Bad Feedback

- This guy sucks.
- This class is boring.
- This material is useless.

Good Feedback

- This guy sucks, *I can't read his writing.*
- This class is boring, *it's way too slow.*
- This material is useless, *I don't see how it relates to anything in reality.*

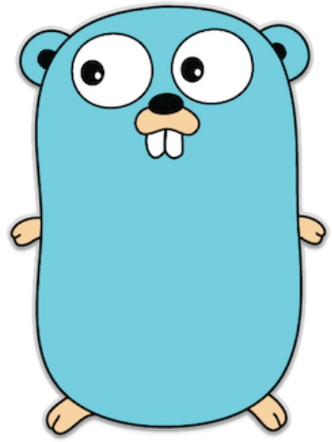
- I can't fix anything if I don't know what's wrong

Why this Course?

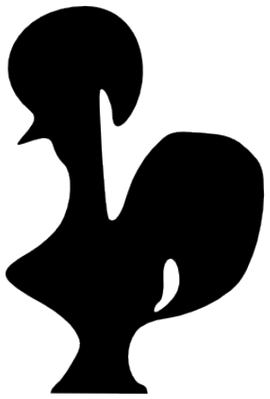
- Navigating programming languages
- Understanding how programming languages work
- Shaping how you think about programming

Navigating Languages

Animals

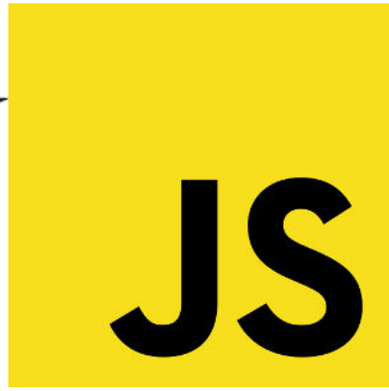


Birds



Camels

Pointy



Coffee

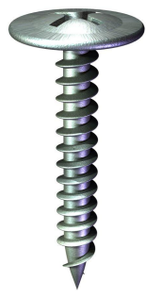
Lambda

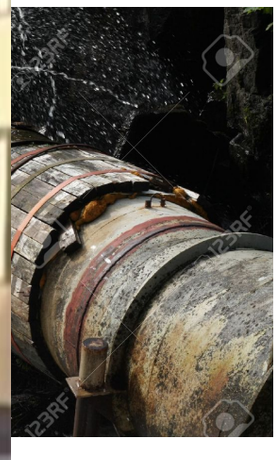
Whatever this is

How Languages Work

- Proper debugging demands knowledge of underlying language
- Knowledge prevents gotchas (and gotchas usually end with greater knowledge)
- While languages abound, language features are sparse

Thinking About Programming





The Point

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- The same problem can be MUCH simpler to solve in a different language

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Scala

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for {
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} yield (a, b)
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Java

- Bulk of Summer
- Bulk of semester

Common Misconceptions: Performance

"Always Write the Fastest Code"

- "Premature optimization is the root of all evil" - Donald Knuth
- Programmer median salary: $98,670/year
- AWS c7g.2xlarge (reserved 3 yr): $970/year
  - 8 cores, 16 GB RAM
- AWS c7g.16xlarge (reserved 3 yr): $7,762/year
  - 64 cores, 128 GB RAM

"High-Level Languages are Slow"

- Java can outperform C
- Choice of algorithm usually WAY more important
    - I have written Prolog that dramatically outperformed Java (thousands - millions of times faster)

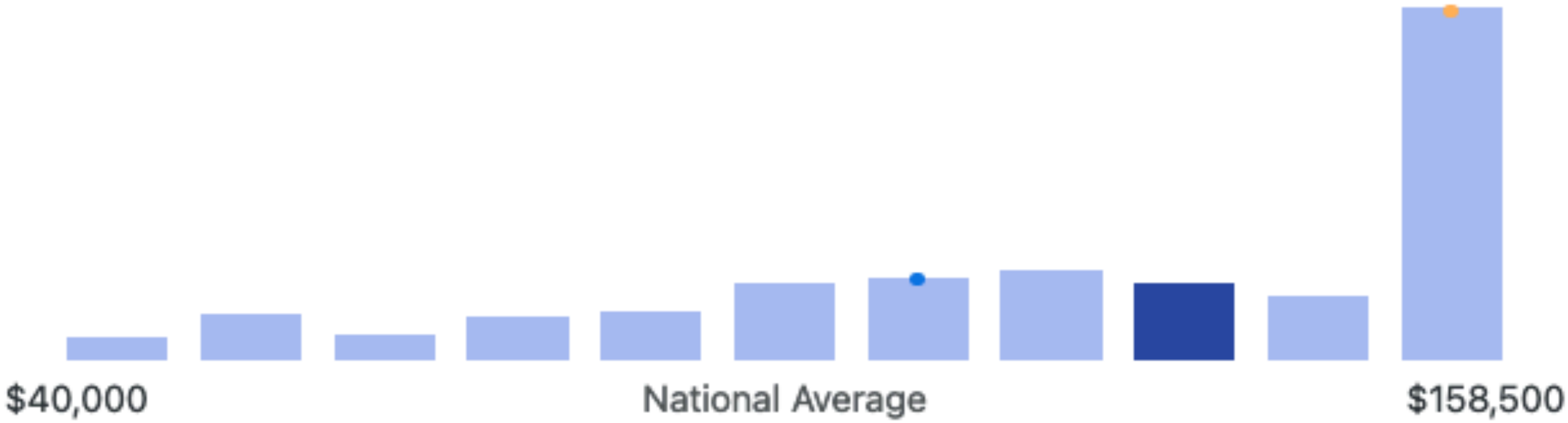
Common Misconceptions: Utility

"FP is Purely Academic"

- Functional programming makes concurrency much simpler
- Good software engineering practices tend to enforce functional styles
- Most modern languages now support functional programming features

Scala Developer Salary in Los Angeles

Yearly Monthly Weekly Hourly Table View



$129,348 /year

$62 /hour

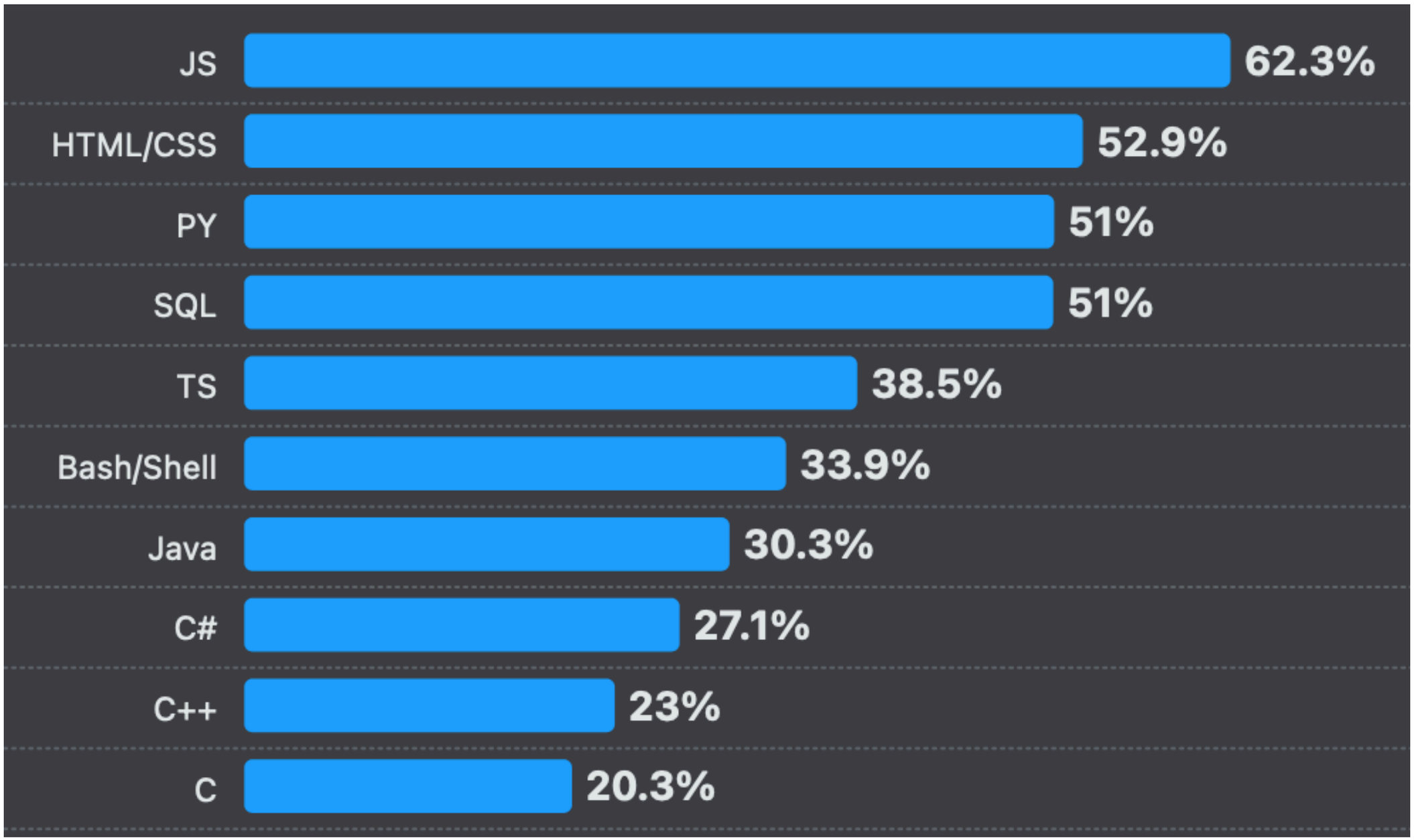
(Via Ziprecruiter)

Common Misconceptions: Stagnation

"Industry Moves Slowly"

- COBOL was once a vital language
- Perl was once the champion of the Internet
- Java was once most popular
- Companies that cannot adapt, die

"Industry Moves Slowly"



StackOverflow 2024 Developer Popularity Survey

Staying in a Comfort Zone

- "I know Python *and* Ruby, so I already am pretty flexible"

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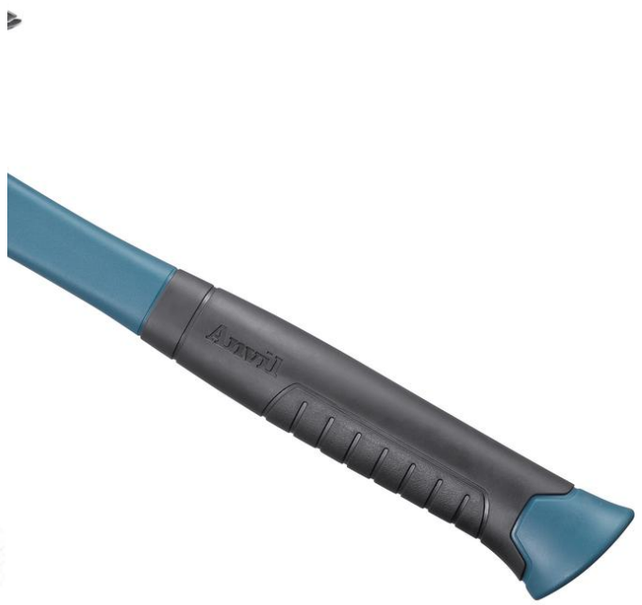

What this Course Is

- Heavy on programming
- Exposure to object-oriented, functional, logical, and a little parallel programming
- Exposure to various language features in the context of the languages you'll use

What this Course **Isn't**

- Advanced topics in any one style
- In-depth look at language implementations
- Heavy on theory

Languages We Will Use

- Java (class-based object-oriented programming)
- JavaScript (prototype-based object-oriented programming, functional programming)
- Rust (imperative programming, functional programming)

Why Java?

- 7th most popular language on StackOverflow
- OOP with class-based inheritance
- Even if you have used it, you may be rusty, and you might not have used all the relevant functionality
- Statically typed, garbage collected, just-in-time compilation

Why JavaScript?

- Most popular language on StackOverflow
- OOP with prototype-based inheritance
- Dynamically typed, garbage collected, (typically bytecode) interpreted, just-in-time compilers available

Why Rust?

- 14th most popular on StackOverflow, and most admired language
- Imperative and functional feature set
- Low-level language (fine-grained memory control, pointers, no runtime environment, compiles to machine code)
- ...with traditionally high-level features (algebraic data types, pattern matching, higher-order functions, typeclasses, type inference)

Syllabus