Programming Languages: How does Python measure up?

PyCon Pakistan 2018

And the best programming language is?

It depends

and no it isn't necessarily Python

So what does
it depend on?

Popularity/Support/Community/Growth

So what does
it depend on?

Popularity/Support/Community/Growth

Performance (CPU/Memory/Energy)

So what does it depend on?

So what does it depend on?

Popularity/Support/Community/Growth

Performance (CPU/Memory/Energy)

Security

So what does it depend on?

Popularity/Support/Community/Growth

Performance (CPU/Memory/Energy)

Security

Tooling

So what does it depend on?

Popularity/Support/Community/Growth

Performance (CPU/Memory/Energy)

Security

Tooling

Verbosity/Expressiveness/Readability

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Speed of development

So what does it depend on?

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Target Platforms

So what does it depend on?

Popularity/Support/Community/Growth

Performance (CPU/Memory/Energy)

Security

Tooling

Verbosity/Expressiveness/Readability

Speed of development

Target Platforms

Elasticity/Adaptability

Popularity

TIOBE ……(https://tiobe.com/tiobe-index/)

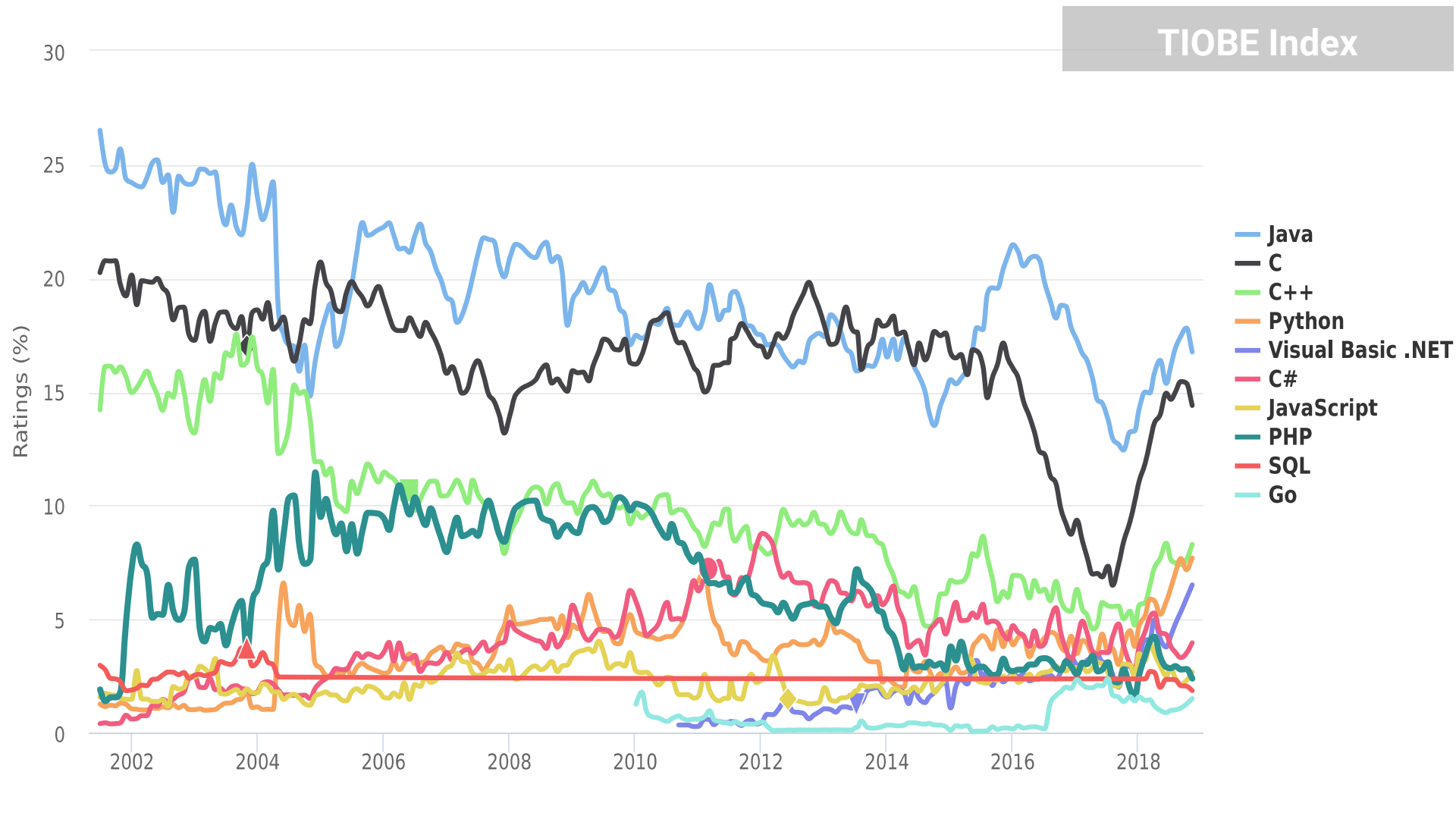
PYPL ……(https://pypl.github.io/PYPL.html)

SO……(https://insights.stackoverflow.com/survey/2018)

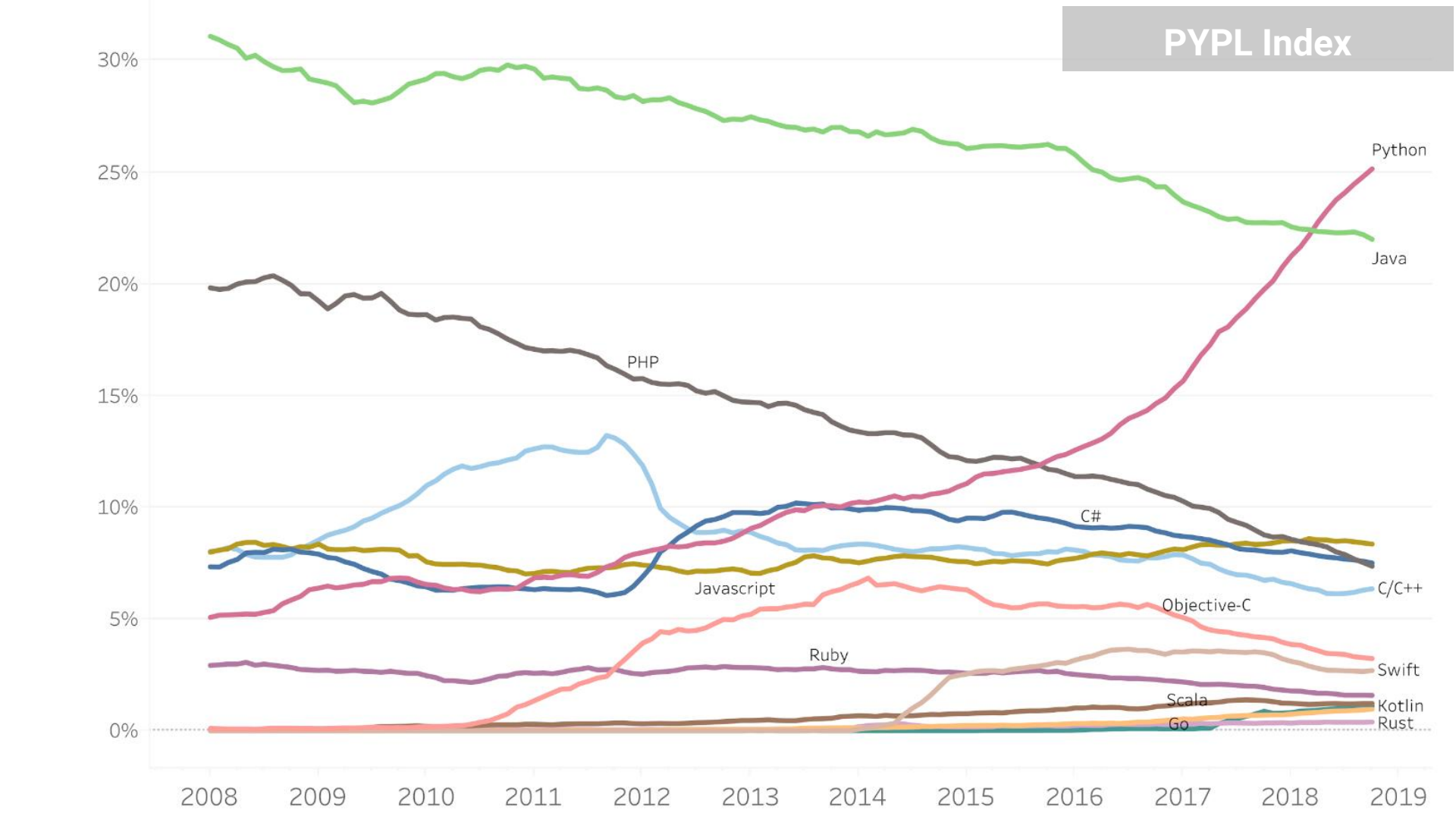
IEEE Spectrum……(https://spectrum.ieee.org)

Redmonk……..(https://redmonk.com)

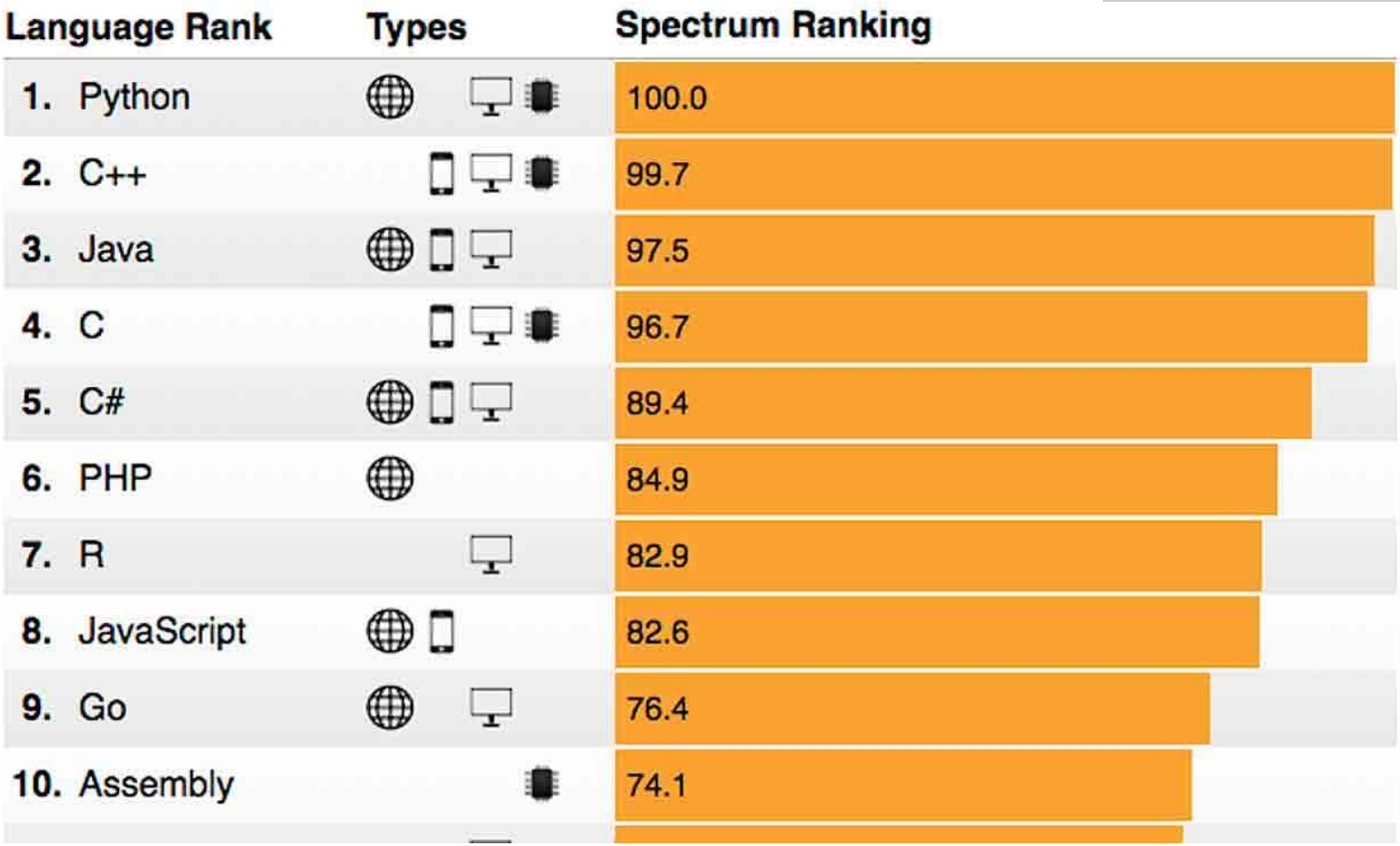
HN: Who's hiring…….(https://medium.com/@yasser.bashir)


TIOBE Index
30
25
20
15
10
5
0
Ratings (%)
2002
2004
2006
2008
2010
2012
2014
2016
2018
Java
C
C++
Python
Visual Basic .NET
C#
JavaScript
PHP
SQL
Go

PYPL Index

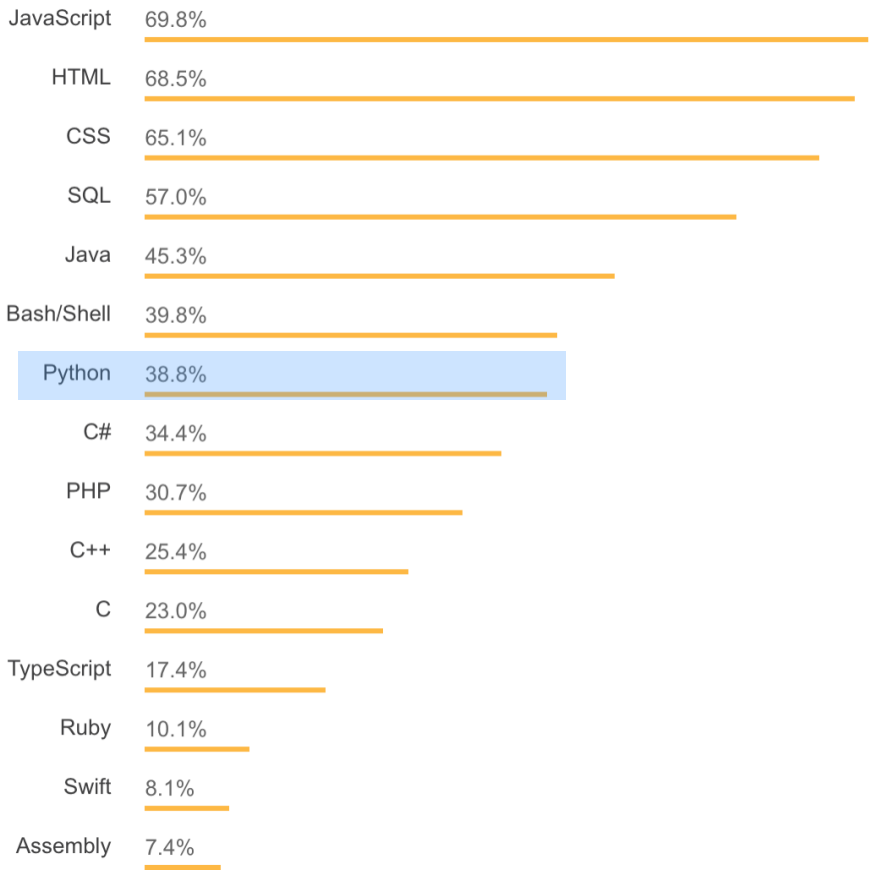

30%
25%
20%
15%
10%
5%
0%
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
Python
Java
PHP
C#
C/C++
Javascript
Objective-C
Ruby
Swift
Scala
Kotlin
Go
Rust

IEEE Spectrum Index

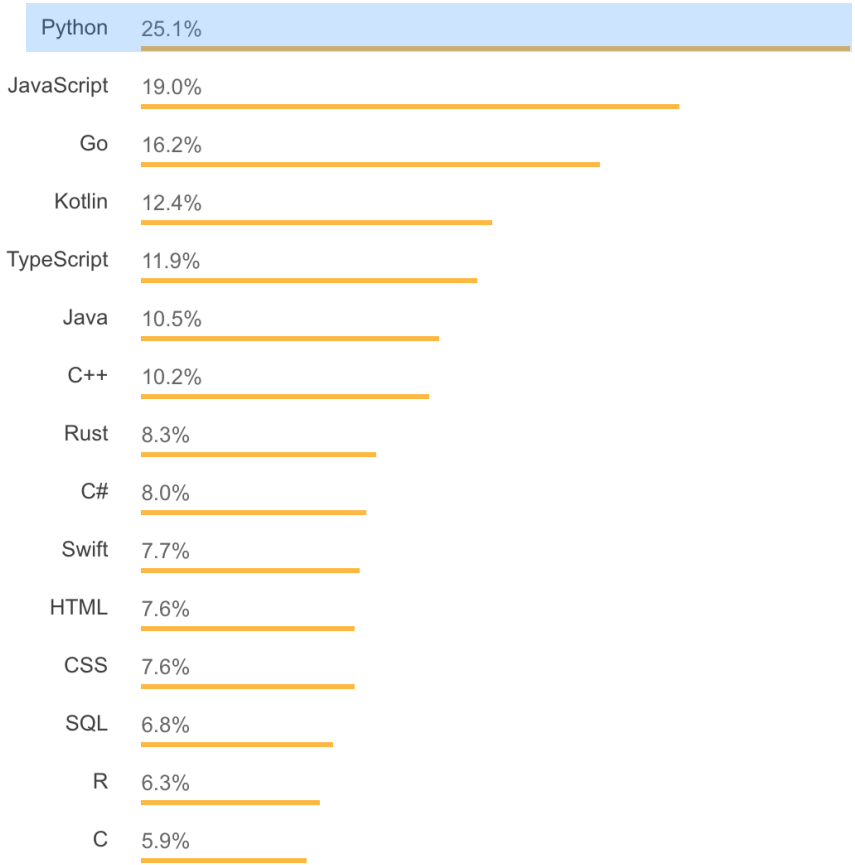


Most Popular Technologies

StackOverflow Index

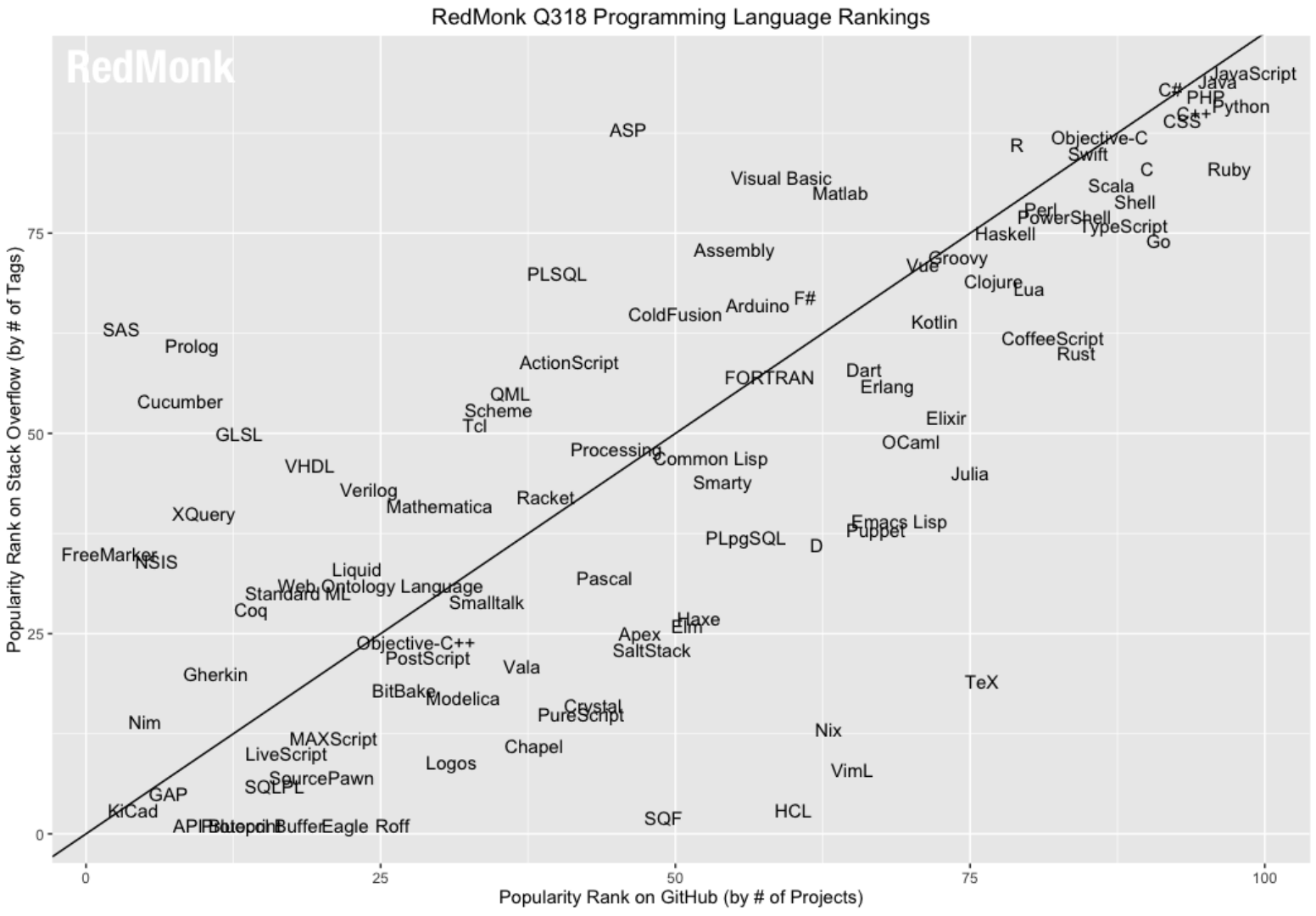


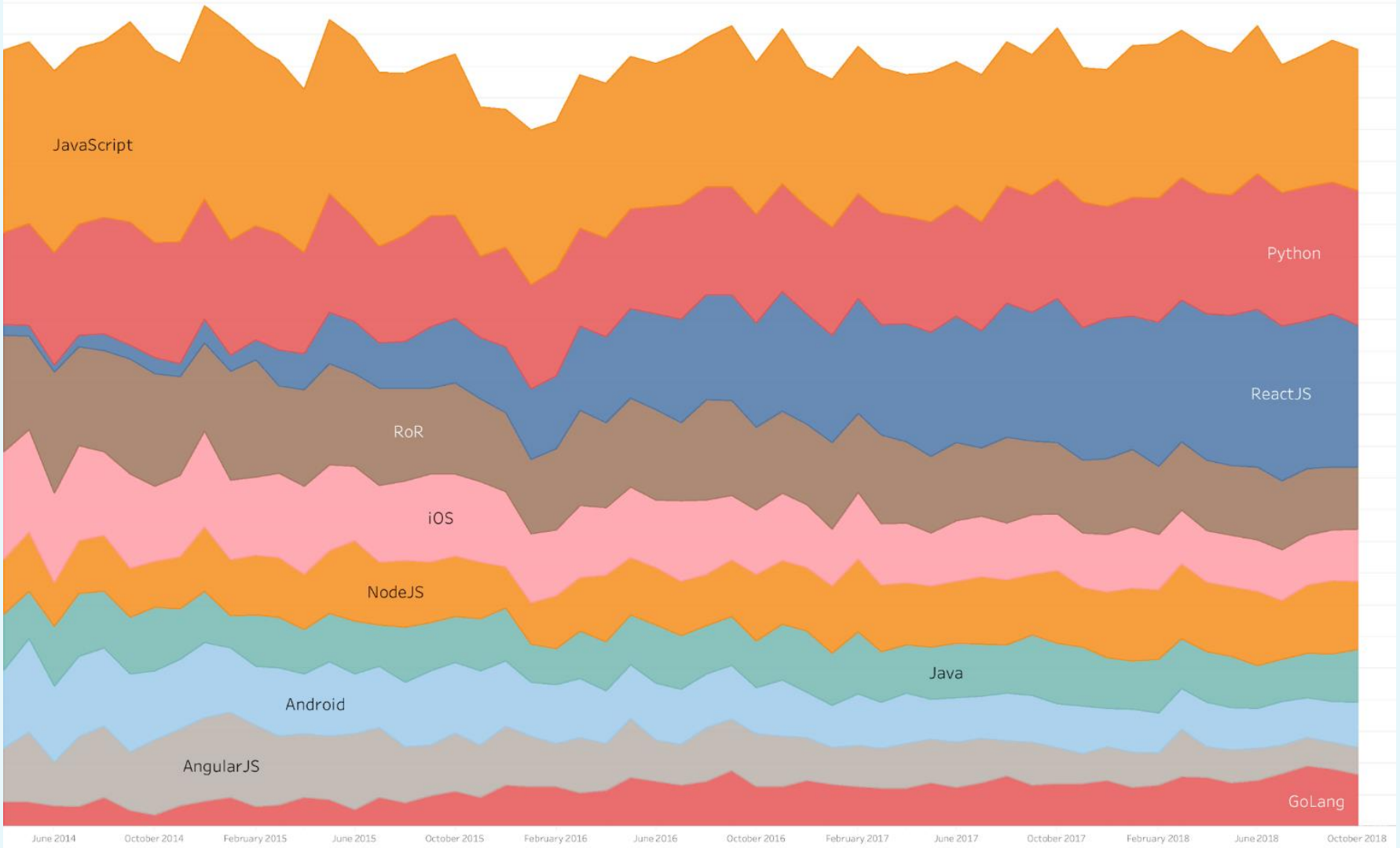
Most Loved, Dreaded, and Wanted



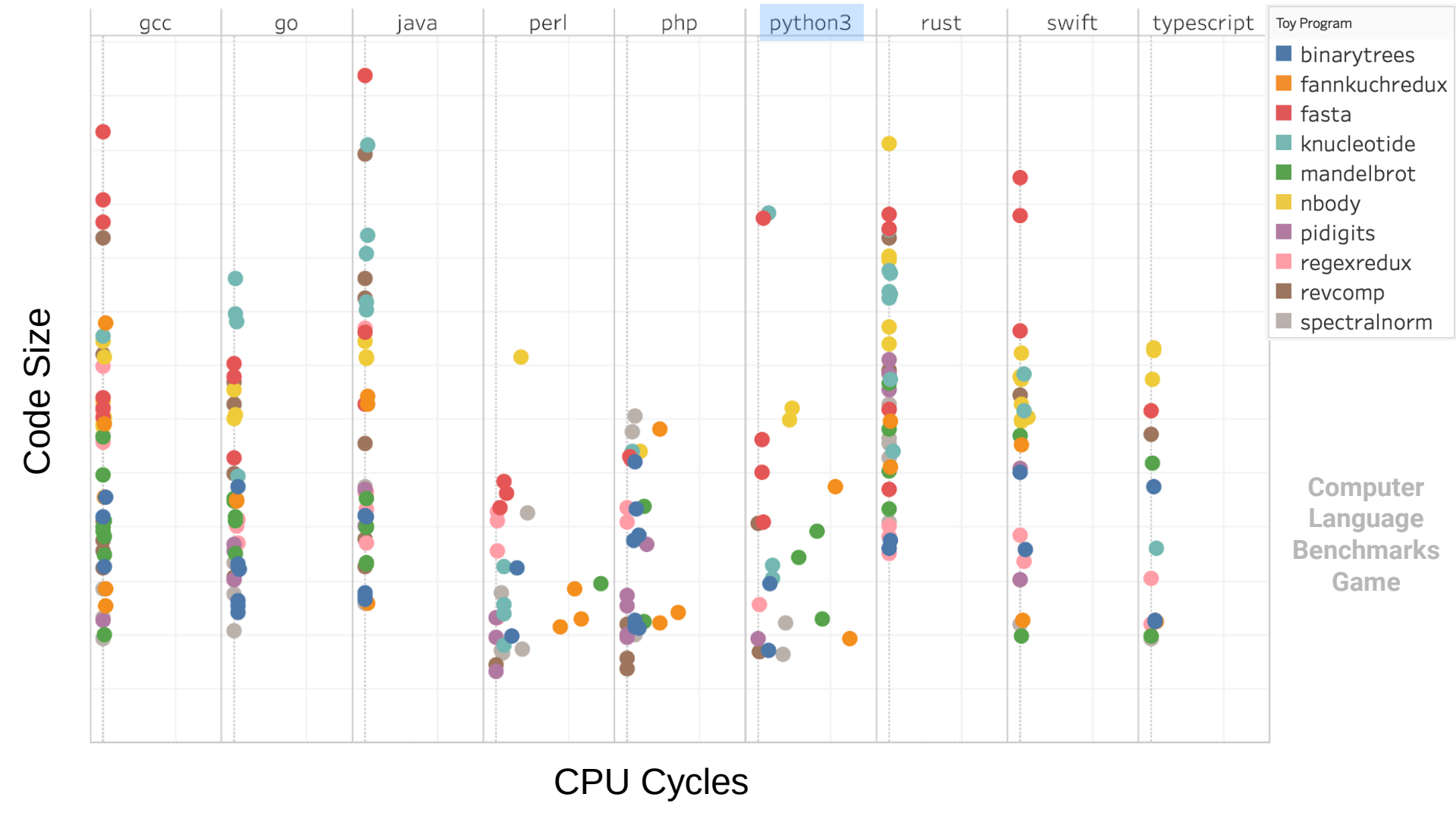
Top Paying Technologies

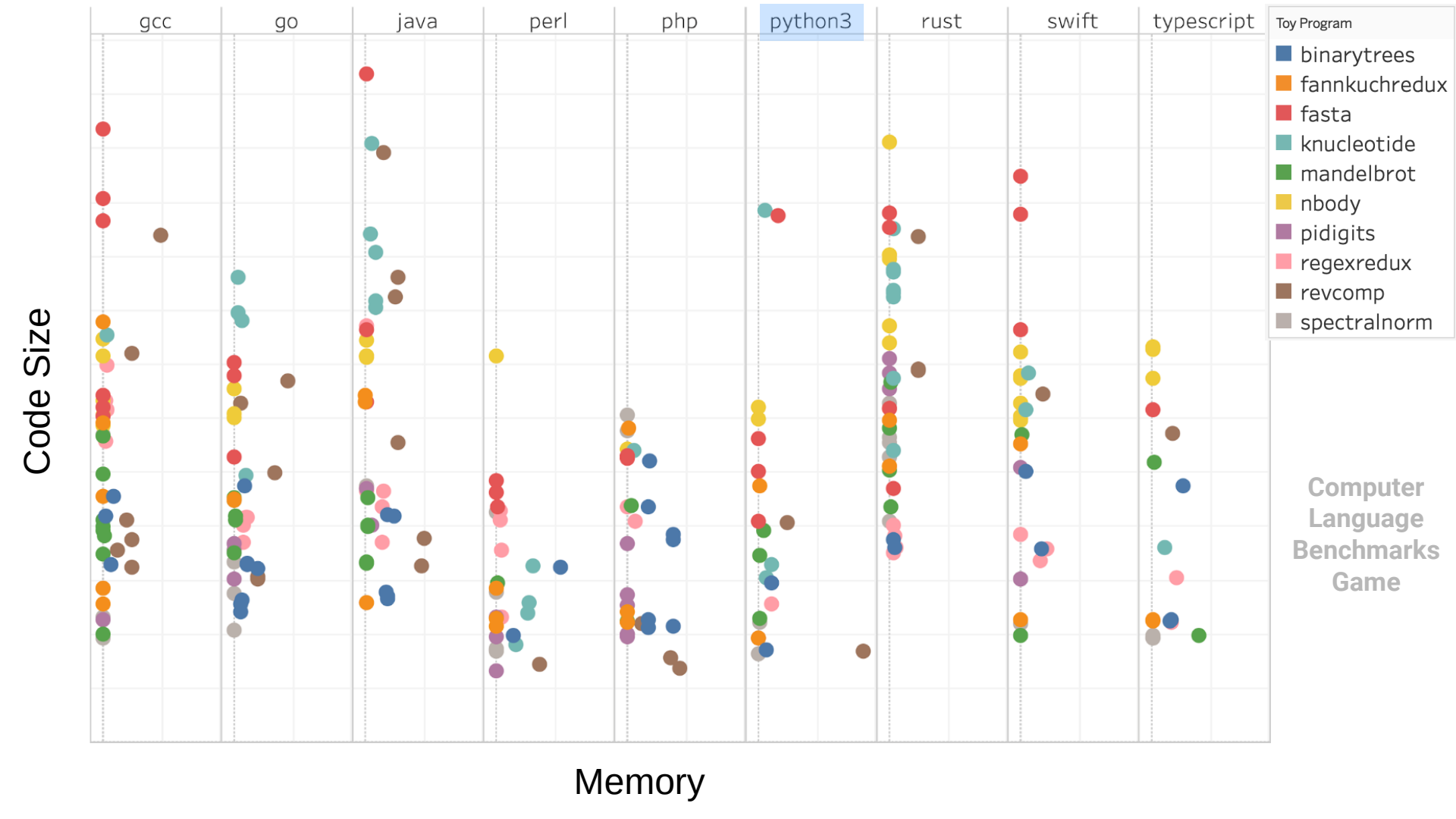
StackOverflow Index


RedMonk Q318 Programming Language Rankings
RedMonk
Popularity Rank on Stack Overflow (by # of Tags)
Popularity Rank on GitHub (by # of Projects)
0
25
50
75
100
JavaScript
Java
C#
PHP
Python
C++
CSS
R
Objective-C
Swift
C
Ruby
Scala
Shell
Perl
PowerShell
TypeScript
Haskell
Go
Groovy
Vue
Clojure
Lua
Kotlin
CoffeeScript
Rust
Dart
Erlang
Elixir
OCaml
Julia
Emacs Lisp
Puppet
D
PLpgSQL
Smarty
Common Lisp
Processing
Racket
Mathematica
Verilog
VHDL
Liquid
Web Ontology Language
Standard ML
Coq
Smalltalk
Pascal
Haxe
Elm
Apex
SaltStack
Objective-C++
PostScript
Vala
Gherkin
BitBake
Modelica
Crystal
PureScript
TeX
Nix
VimL
HCL
SQF
Chapel
Logos
MAXScript
LiveScript
SourcePawn
SQLPL
GAP
KiCad
Nim
Roff
Eagle
Buffer
Blueprint
API Blueprint
FreeMarker
NSIS
XQuery
GLSL
Cucumber
SAS
Prolog
ASP
Visual Basic
Matlab
Assembly
PLSQL
ColdFusion
Arduino
F#
ActionScript
FORTRAN
QML
Scheme
Tcl


JavaScript
Python
ReactJS
RoR
iOS
NodeJS
Java
Android
AngularJS
GoLang
June 2014
October 2014
February 2015
June 2015
October 2015
February 2016
June 2016
October 2016
February 2017
June 2017
October 2017
February 2018
June 2018
October 2018

Performance


gcc
go
java
perl
php
python3
rust
swift
typescript
Toy Program
binarytrees
fannkuchredux
fasta
knucleotide
mandelbrot
nbody
pidigits
regexredux
revcomp
spectralnorm
Code Size
CPU Cycles
Computer Language Benchmarks Game


gcc
go
java
perl
php
python3
rust
swift
typescript
Toy Program
binarytrees
fannkuchredux
fasta
knucleotide
mandelbrot
nbody
pidigits
regexredux
revcomp
spectralnorm
Code Size
Memory
Computer Language Benchmarks Game

Time & Memory	Energy & Time	Energy & Memory	Energy & Time & Memory
C • Pascal • Go	C	C • Pascal	C • Pascal • Go
Rust • C++ • Fortran	Rust	Rust • C++ • Fortran • Go	Rust • C++ • Fortran
Ada	C++	Ada	Ada
Java • Chapel • Lisp • Ocaml	Ada	Java • Chapel • Lisp	Java • Chapel • Lisp • Ocaml
Haskell • C#	Java	OCaml • Swift • Haskell	Swift • Haskell • C#
Swift • PHP	Pascal • Chapel	C# • PHP	Dart • F# • Racket • Hack • PHP
F# • Racket • Hack • Python	Lisp • Ocaml • Go	Dart • F# • Racket • Hack • Python	JavaScript • Ruby • Python
JavaScript • Ruby	Fortran • Haskell • C#	JavaScript • Ruby	TypeScript • Erlang
Dart • TypeScript • Erlang	Swift	TypeScript	Lua • JRuby • Perl
JRuby • Perl	Dart • F#	Erlang • Lua • Perl	
Lua	JavaScript	JRuby	
	Racket		
	TypeScript • Hack		
	PHP		
	Erlang		
	Lua • JRuby		
	Ruby		

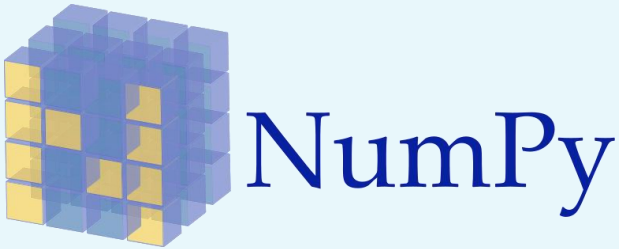
Energy (J) = Power (W) x Time(s)

Tooling


ANACONDA®


jupyter


SPYDER


NumPy


SciPy.org

Security/Safety

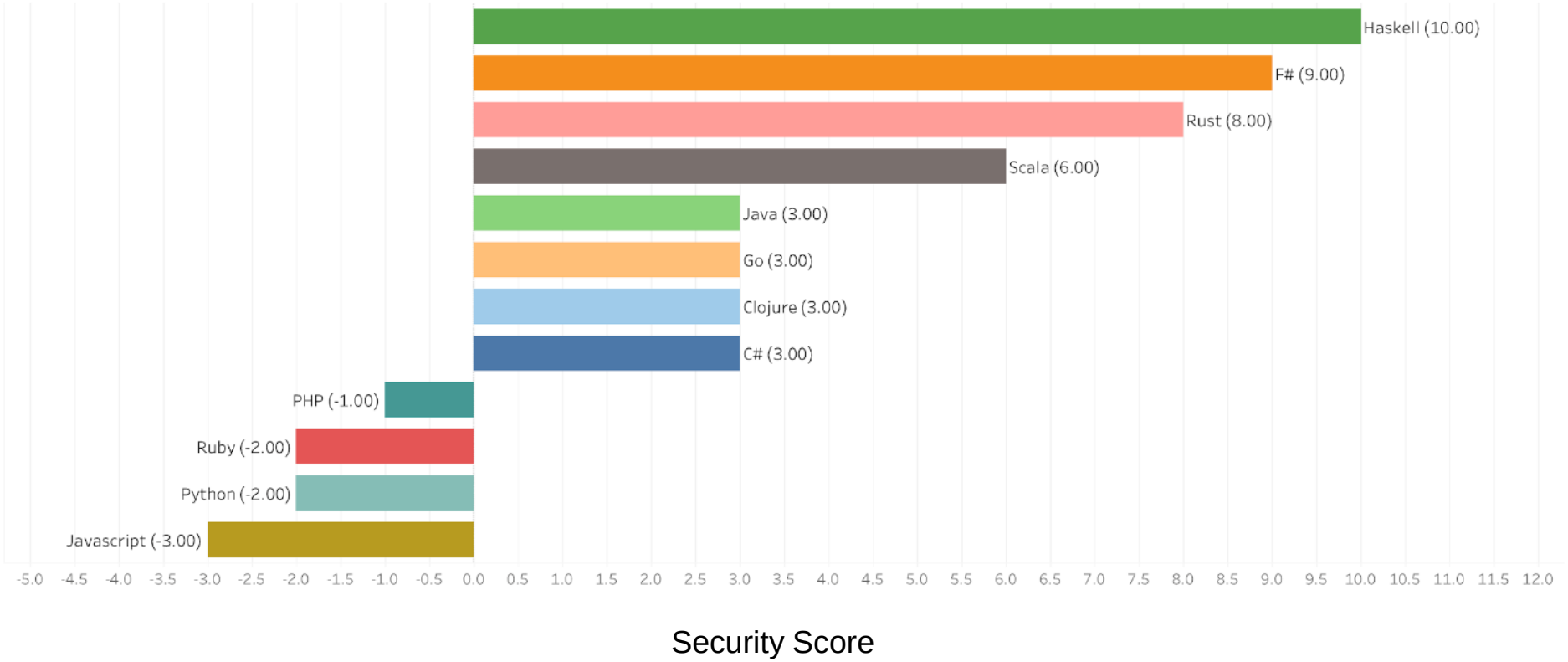
Steve Shogren's Benchmark

Safety Check	PHP	Ruby	Python	JavaScript
Prevent Null Variable Usage	0	0	0	0
Prevent Null List Iteration	0	0	0	0
Prevent Variable Reuse for Different Type	-1	-1	-1	-1
Ensure List Element Exists	0	0	0	0
Ensure Safe Type Casting	0	0	0	-1
Prevent Passing Wrong Type to Method	0	-1	-1	-1
Calling or Setting Misspelled Method, Field, Function, Variable	0	0	0	0
Missing Enum Value In Switch/Case or If/Else	-1	-1	-1	-1
Prevent Variable Mutation	0	0	0	0
Prevent Deadlocks	0	0	0	0
Guarantee Memory Deallocation	1	1	1	1
Tail Call Optimization	-1	-1	-1	-1
Guaranteed Code Evaluation When Passed To a Function	1	1	1	1
Functional Purity	0	0	0	0
Totals	-1	-2	-2	-3
Magnitude	100%	50%	50%	0%

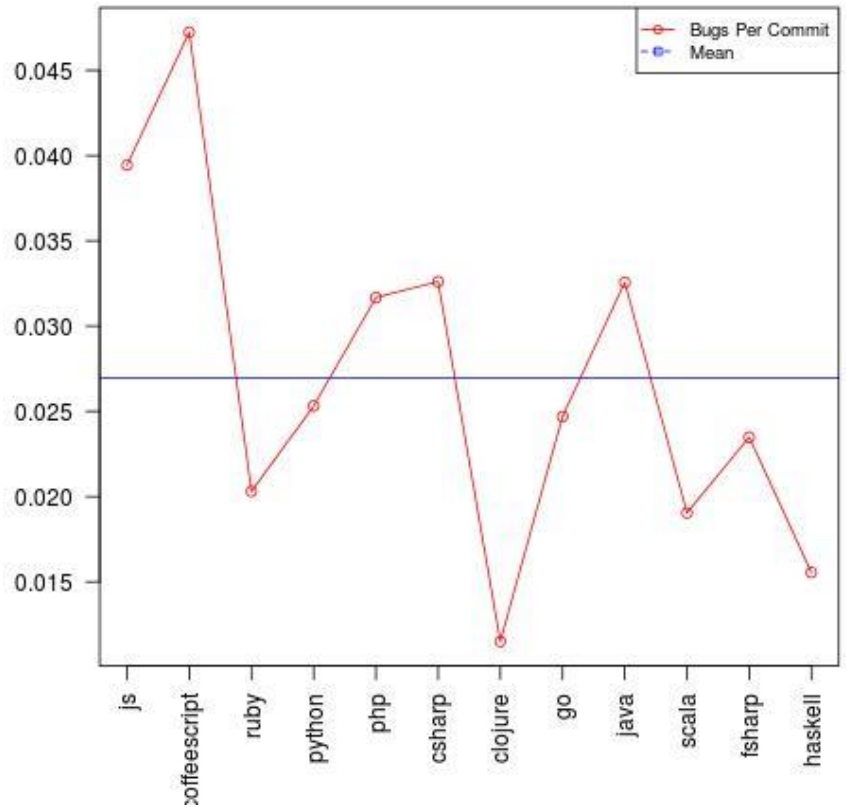
Steve Shogren's Benchmark

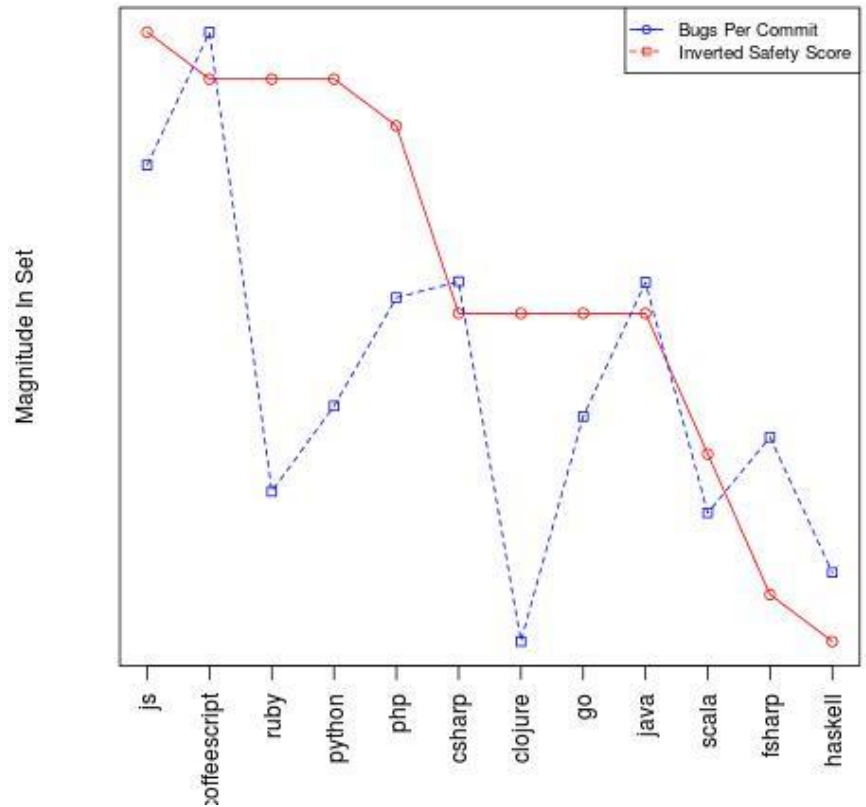
Safety Check	Clojure	Python	Go	Rust (No unsafe)
Prevent Null Variable Usage	0	0	0	1
Prevent Null List Iteration	1	0	0	1
Prevent Variable Reuse for Different Type	0	-1	1	1
Ensure List Element Exists	0	0	0	0
Ensure Safe Type Casting	0	0	0	1
Prevent Passing Wrong Type to Method	0	-1	1	1
Calling or Setting Misspelled Method, Field, Function, Variable	1	0	1	1
Missing Enum Value In Switch/Case or If/Else	-1	-1	-1	1
Prevent Variable Mutation	1	0	0	1
Prevent Deadlocks	1	0	0	0
Guarantee Memory Deallocation	1	1	1	0
Tail Call Optimization	0	-1	-1	-1
Guaranteed Code Evaluation When Passed To a Function	-1	1	1	1
Functional Purity	0	0	0	0
Totals	3	-2	3	8
Magnitude	50%	0%	50%	100%

Steve Shogren's Benchmark



Security Score


Bugs Per Commit Sorted By Safety Score
Bugs Per Commit
Mean
0.045
0.040
0.035
0.030
0.025
0.020
0.015
js
coffeescript
ruby
python
php
csharp
clojure
go
java
scala
fsharp
haskell


Safety Scores And Bugs/Commit
Bugs Per Commit
Inverted Safety Score
Magnitude In Set
js
coffeescript
ruby
python
php
csharp
clojure
go
java
scala
fsharp
haskell

And the winner is:

Popularity/Support/Community/Growth

Performance (CPU/Memory/Energy)

Security

Tooling

Verbosity/Expressiveness/Readability

Speed of development

Target Platforms

Elasticity/Adaptability

Final Thoughts

Context really matters

It is not languages that are fast or slow, it's their interpreters or compilers

At the end of the day the real benchmark is your own project

If you are not going to reuse existing code, GoLang is a great choice

Haskell and Rust when security/resilience matter

For every other case, use Python :)

Thank you

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