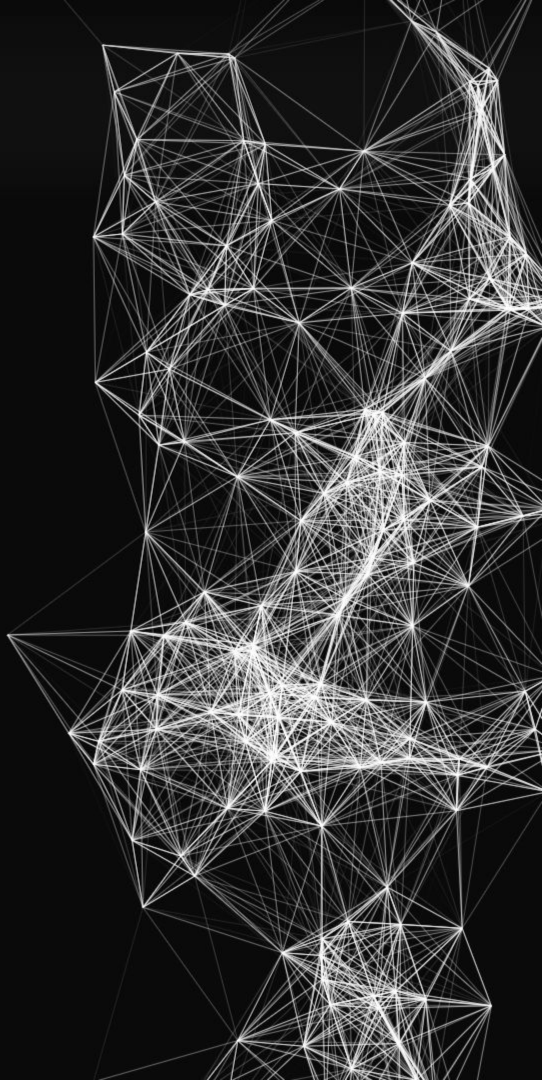
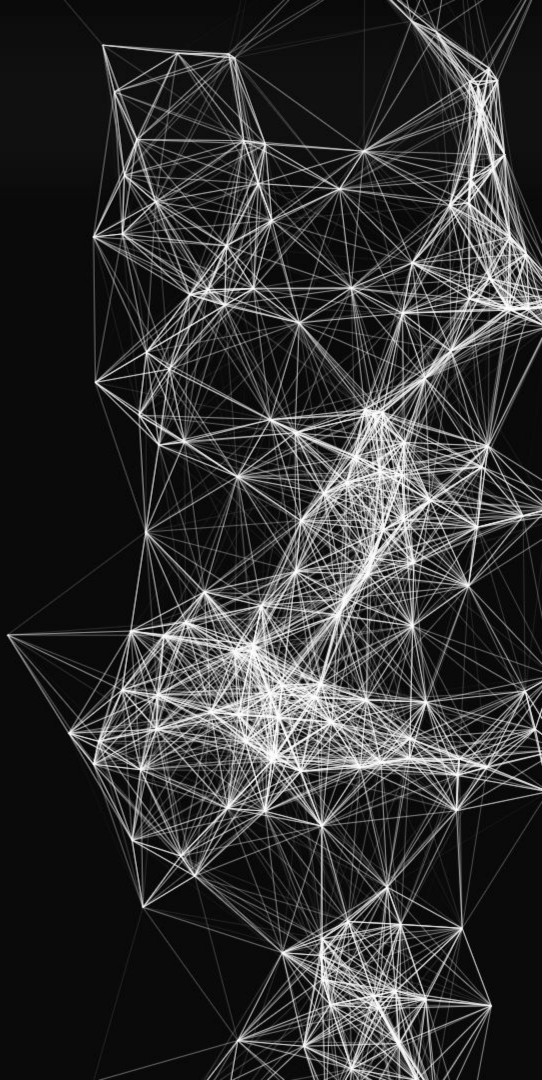
Project Euler

Ten problems, ten languages
(including python!)



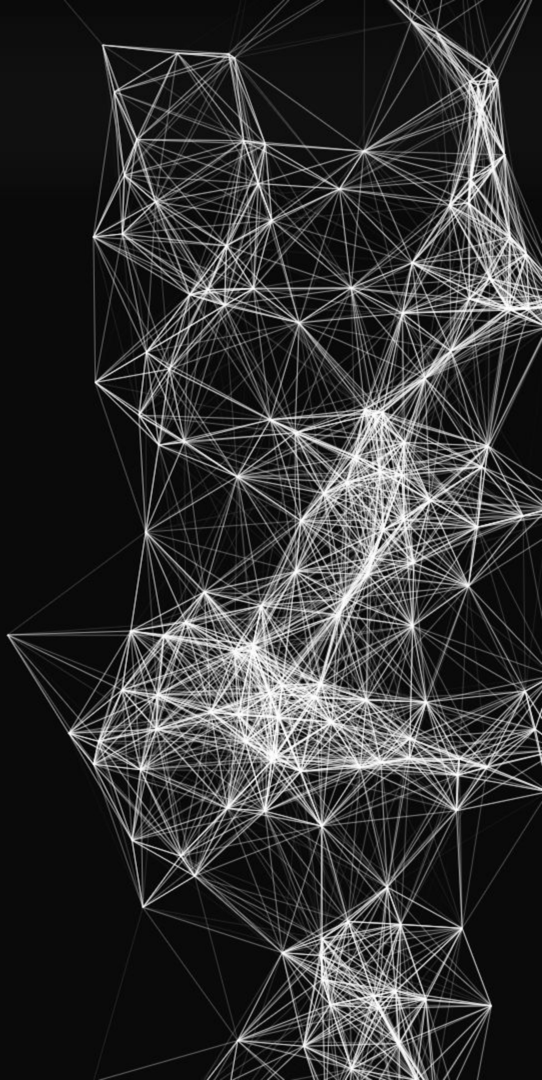
Plan

- Project Euler overview.
- Side project explanation.
- Python solutions.
- Using python to check all solutions and graph results.
- Improving python performance.



Project Euler

- Series of mathematical problems of increasing difficulty.
- Designed to be solved using programming.
- Concepts build on previous problems.
- Can often be solved with a naive, slow solution - but the goal is a solution in a reasonable time.

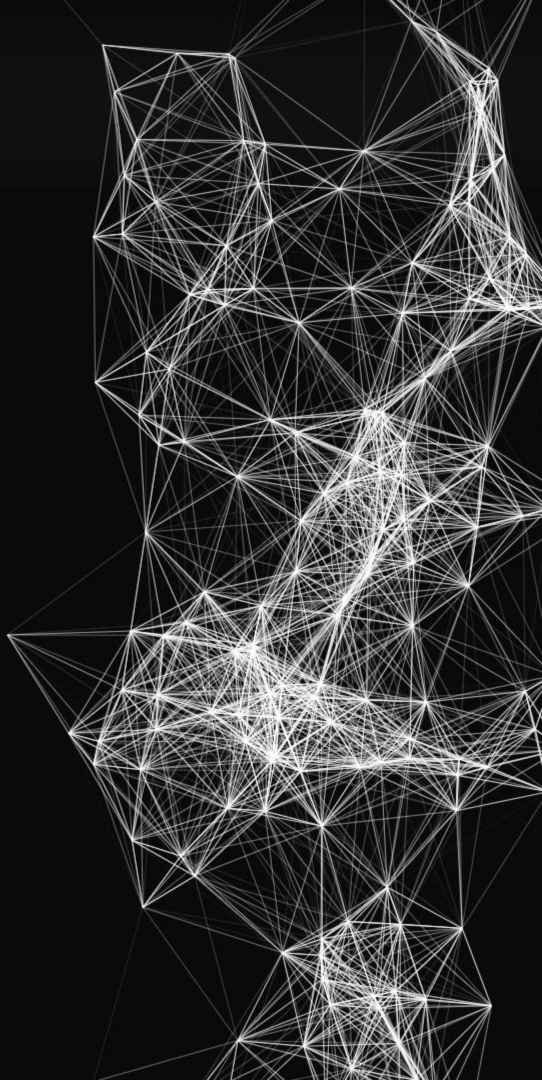


Ten languages

- C, C++, C#, Go, TypeScript, Kotlin, PHP, Python, Ruby and Rust.
- Reasons
  - Demonstrate capability in languages I’ve used (or want to use).
  - Have a good set of notes for common language tasks - file IO, OOP, loops, includes, performance timing etc.
  - Analyse language performance.
  - Explore using Docker & Docker Compose.
  - Fun?

The rules

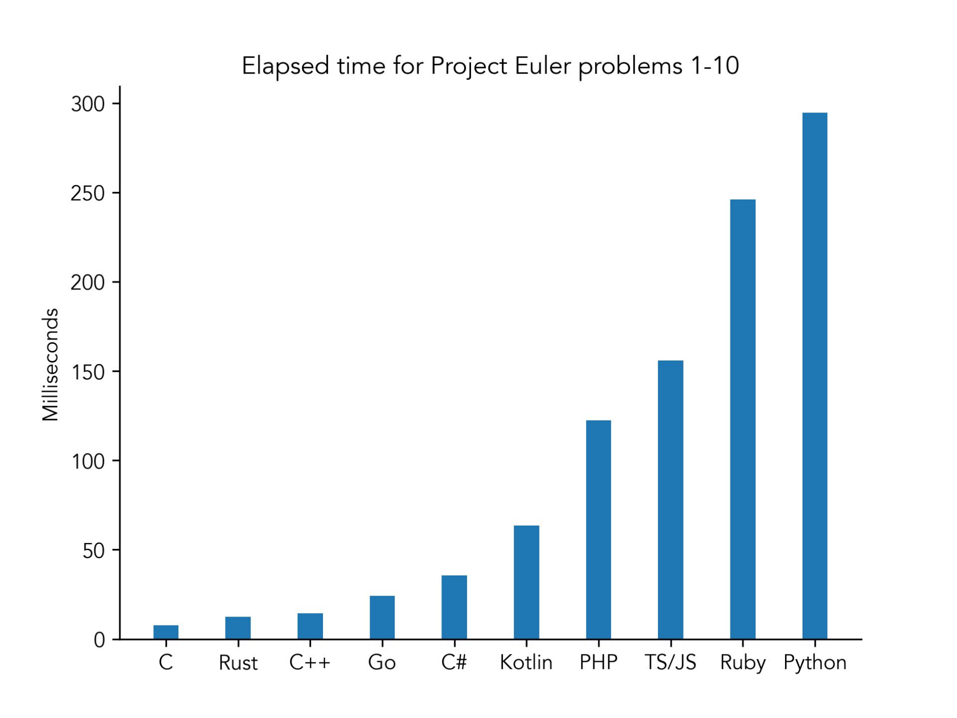
- Standard language only for solving, no external libraries.
  - STL considered standard for C++.
  - External libraries can be used for program structure e.g. ABC.
- Exact same algorithm in each language.
  - Apples to apples performance.
- Same program structure if possible.
  - C, Go and Rust don’t support OOP inheritance so composition style used.

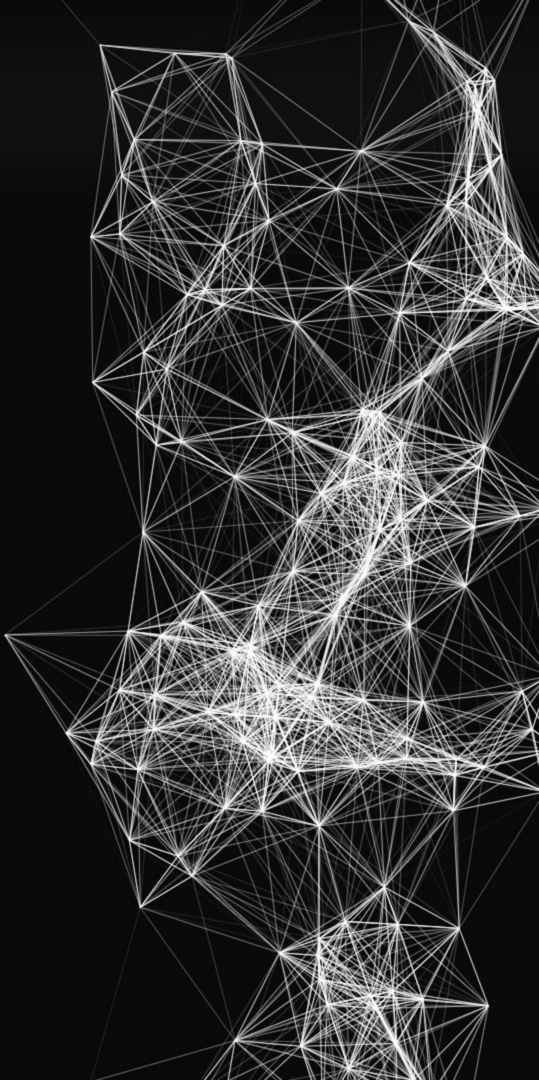


Orchestrating the environments

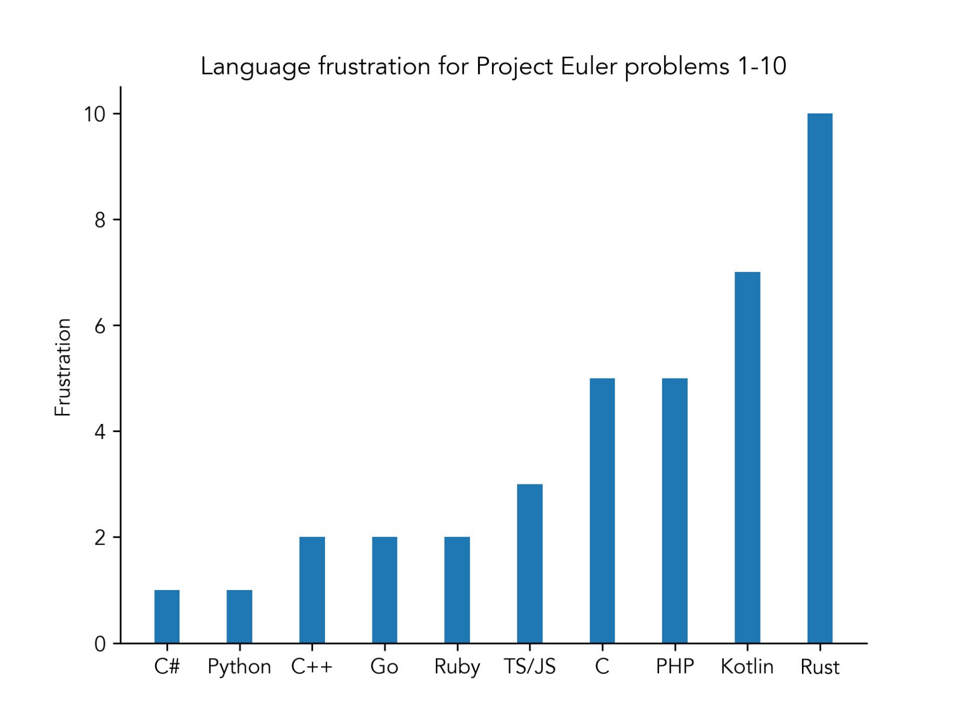
- Docker, docker compose, bash script & python.
- Official images used where possible.
- Python used to check the answers and graph the results.

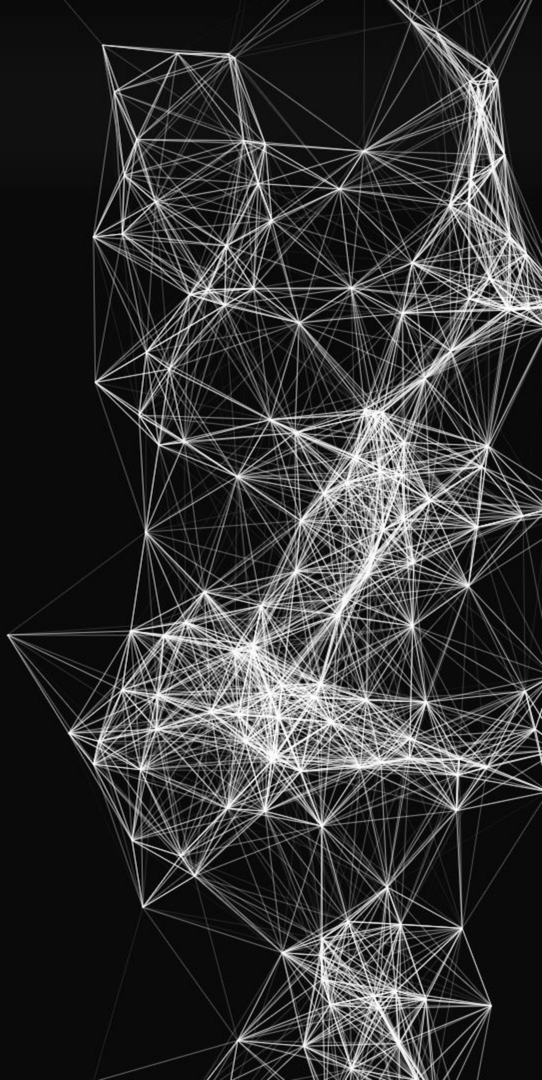
Results


Elapsed time for Project Euler problems 1-10
Milliseconds
300
250
200
150
100
50
0
C
Rust
C++
Go
C#
Kotlin
PHP
TS/JS
Ruby
Python



Language “frustration”

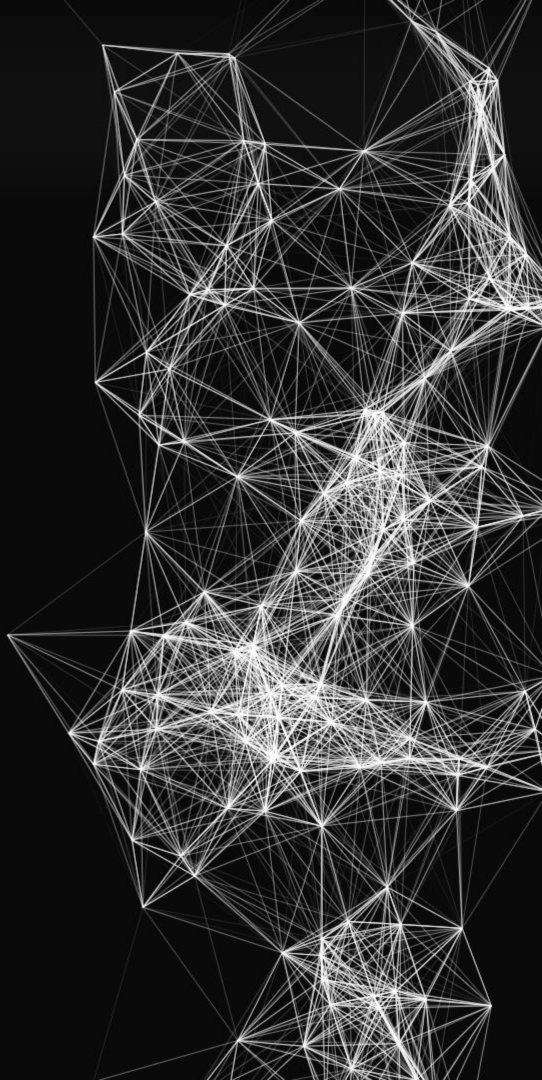




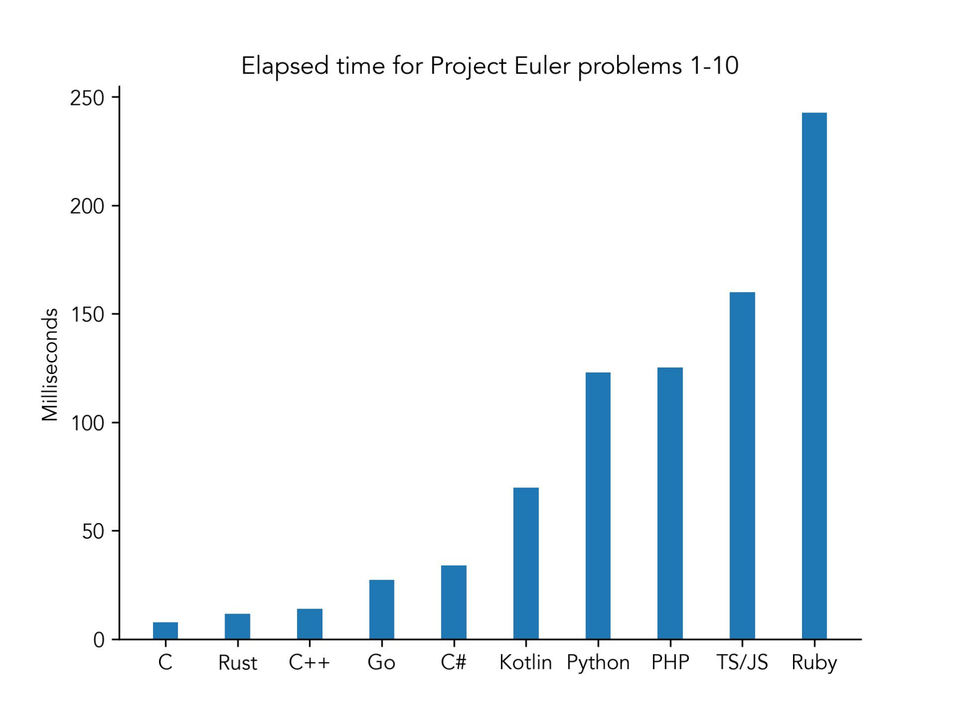
Note: Totally subjective, and frustration would decrease with familiarity.

Can we get faster?

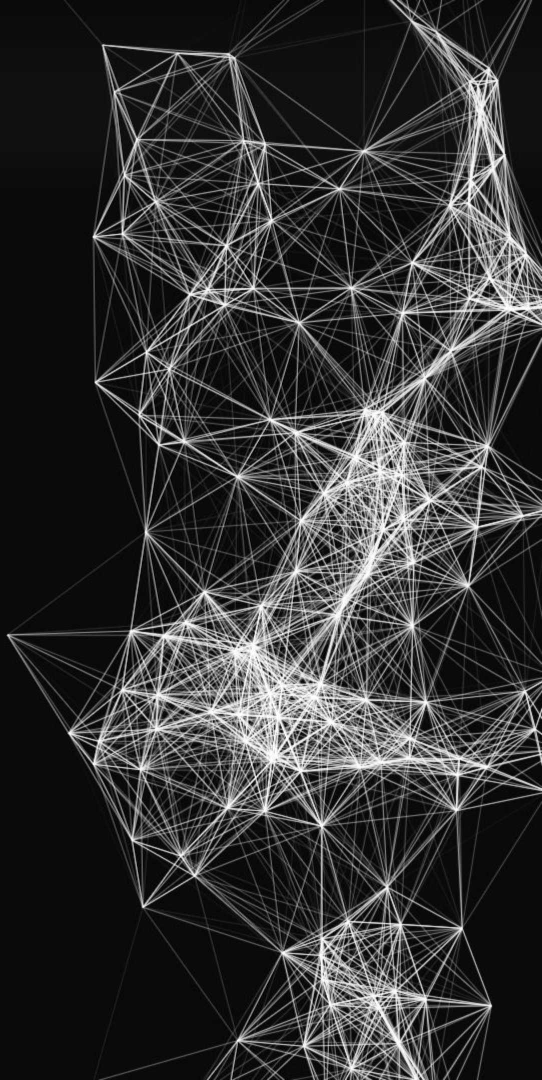
- Performance analysis?
- Numpy?
- External libraries?



After improving sieve time

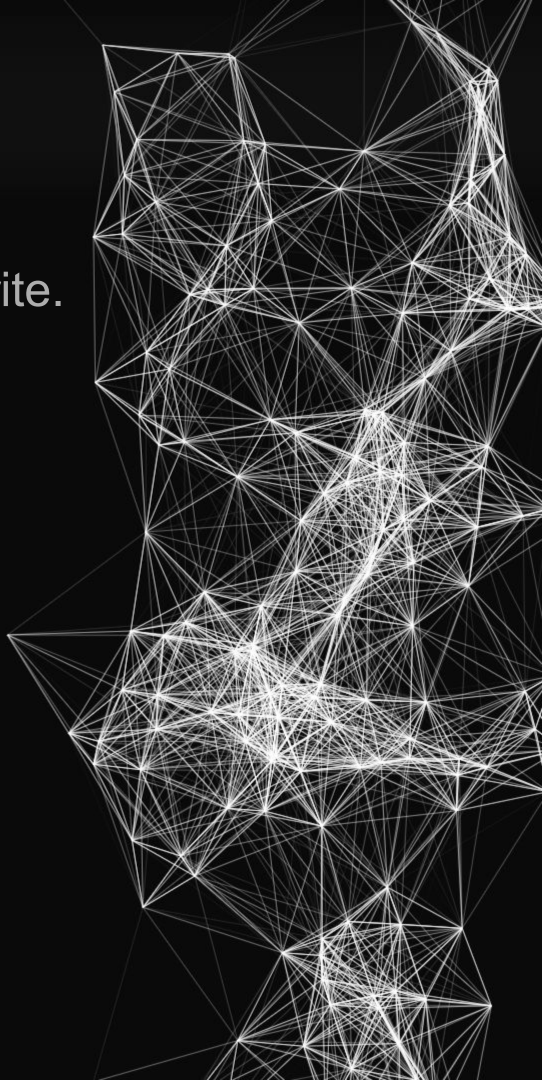


Elapsed time for Project Euler problems 1-10



Reflections

- Python very easy to code in, was one of the fastest to write.
- Some hidden gotchas due to no explicit types
  - //= vs /=
- Speed achievable in python by selecting libraries.
- Excellent at dealing with data and graphing.
- Lots of typos switching languages.
  - int varName = 5;
  - for(int i = …



Code

- https://gitlab.com/dihamilton/ten_problems