

# Advanced Programming

Quick motivation and overview

# Bio

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# Introduction

# The importance of coding

“Programming jobs overall are growing **12% faster than the market average.**”[1]

“Half of all programming openings are in industries outside of technology.”[2]

“A data scientist is a better programmer than the average statistician and a better statistician than the average programmer.” [3]

# Everybody has to code (or will someday)

Not only technology related fields of study requires programming skills

- Designers
- Social scientists
- Statisticians
- Engineers
- Biologists
- Physicists
- Economists

# Complexity Analysis

# What is Complexity Analysis ?

Focuses on classifying computational problems according to their inherent difficulty, and relating those classes to each other.

Two categories:

- Time complexity
- Space complexity

# Understanding

```
For i=0; i<N; i++
```

```
    For j=0; j<N; j++
```

```
        If N[i]==N[j]
```

```
            \\do something
```

```
For i=0; i<N; i++
```

```
    For j=0; j<M; j++
```

```
        If N[i]==M[j]
```

```
            \\do something
```

What is the difference regarding time complexity?

If N and M have different sizes, what is the best approach to write this code?

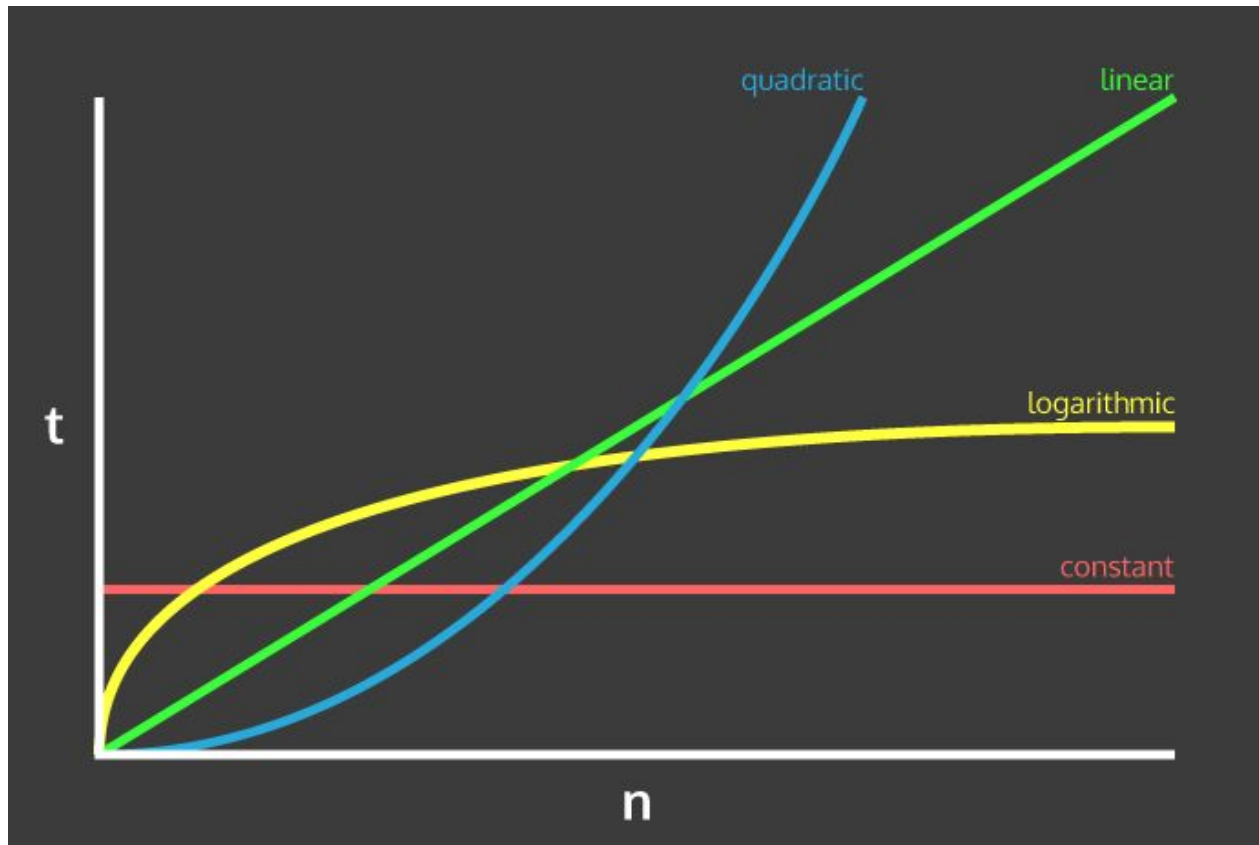
How we can apply a simple data structure to improve its time complexity?



# Why does it matter?

Big O notation:

- Constant:  $O(1)$
- Linear:  $O(n)$
- Logarithmic:  $O(\log n)$
- Quadratic:  $O(n^2)$
- Exponential:  $O(2^n)$
- Factorial:  $O(n!)$



# Complexity and Big Data Problems

When the N is really Big !

If Search inside an array with 1 Billion of registers:

- Using linear search:  $O(n) = 1$  Billion of comparisons
- Using Binary search tree:  $O(\log n) = 30$  comparisons

In Some problems, using better approaches makes you reduce  $O(n)$  to  $O(1)$

# Advanced Programming

Using python

# Why Python?

According to the [TIOBE index](#), Python is one of the most popular programming languages in the world, ranking higher than Perl, Ruby, and JavaScript by a wide margin.

5th Largest StackOverflow Community

On Angel List, Python is the 2nd most demanded skill and also the skill with the highest average salary offered.

# Python and Big Data

Easy to learn, easy to use, and has powerful libraries for data manipulation and analysis, machine learning and web development.

The other important side of python is its ability to integrate easily with web applications.

High level language, what is easy to write good solutions using data structures without know how to implement them

Map Reduce, Hadoop, Spark and other solutions that can be used with python

# Python may be slow

It is important to know how to code well to not fall into pitfalls

You cannot do everything with libraries. You need to dirty your hands !

Not tuning for performance is one of the top 10 mistakes in python [4]

# OO-Programming

Oriented Object Programming

# OOP and structured programming

Python is a OOP language and for that reason you can use Class, abstract classes, instances attributes, methods, inheritance and so on.

Even though the above features few people code it using OOP concepts

Programming complex software demands design patterns and OO code-like



# Why is it so important?

Maintaining

Reusability

Organization

Scalability

Helps you to model real problems

# Conclusion

# The Big Tech Companies hires good coders

Know how to programming matters much more than know a specific programming language

The programming language does not helps you to much if you do not know how to programming

Unlikely programming skills, most programming languages and (especially) technologies demands changes within the time

# Better coding skills = Higher chance to get a job

Knowing how to programming well helps you to learn how to use a programming language better

The market can pay you training classes for some technologies but is rare to pay you to learn how to programme well

“Jobs that require coding skills pay up to \$22,000 per year more, on average.”[2]

Even technical coordinators should know about good concepts about system design and coding

# References

- [1] <http://burning-glass.com/research/coding-skills/>
- [2] <https://www.fastcompany.com/3060883/why-coding-is-the-job-skill-of-the-future-for-everyone>
- [3] [https://www.reddit.com/r/AskStatistics/comments/5dcjma/is\\_programming\\_more\\_important\\_than\\_math\\_and\\_stats/](https://www.reddit.com/r/AskStatistics/comments/5dcjma/is_programming_more_important_than_math_and_stats/)
- [4] <https://www.airpair.com/python/posts/top-mistakes-python-big-data-analytics>
- [5] <https://www.quora.com/Is-Object-oriented-programming-really-that-important-to-learn-Isnt-there-any-way-around-it>

# Get in touch

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**See you in the next class :)**