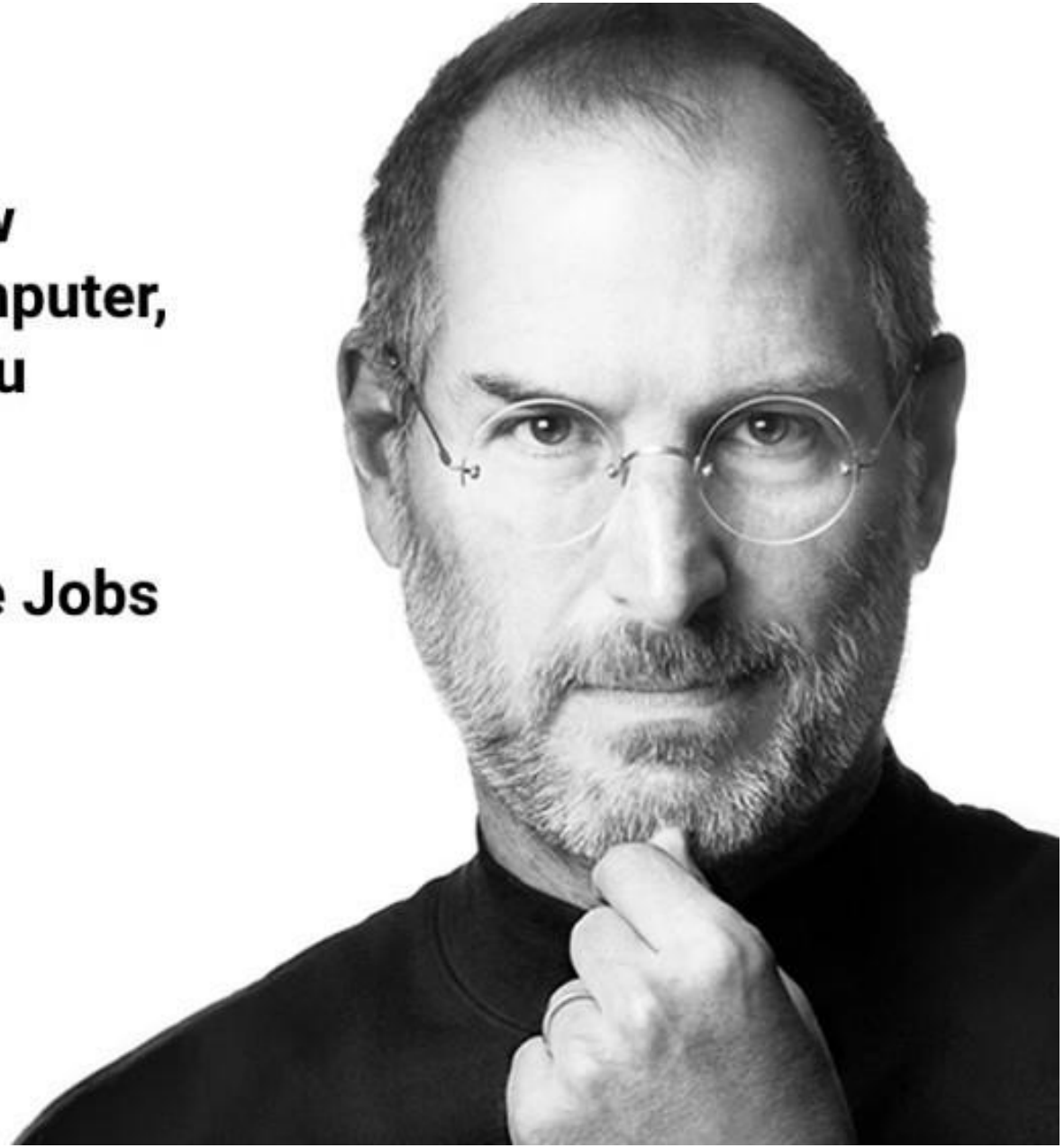
Manoel Gadi

- more than 16 years in Banking and Financial Institutions like Citibank and Santander
- most in Analytics functions for Risk Management in Brazil (Sao Paulo), the UK (Milton Keynes) and Spain (Madrid)
- Teaching in IE University since 2013 and since 2019 he is fully dedicated to teaching in IE University in courses ranging from Programming, Statistics, Machine Learning, Banking, and Fintech.

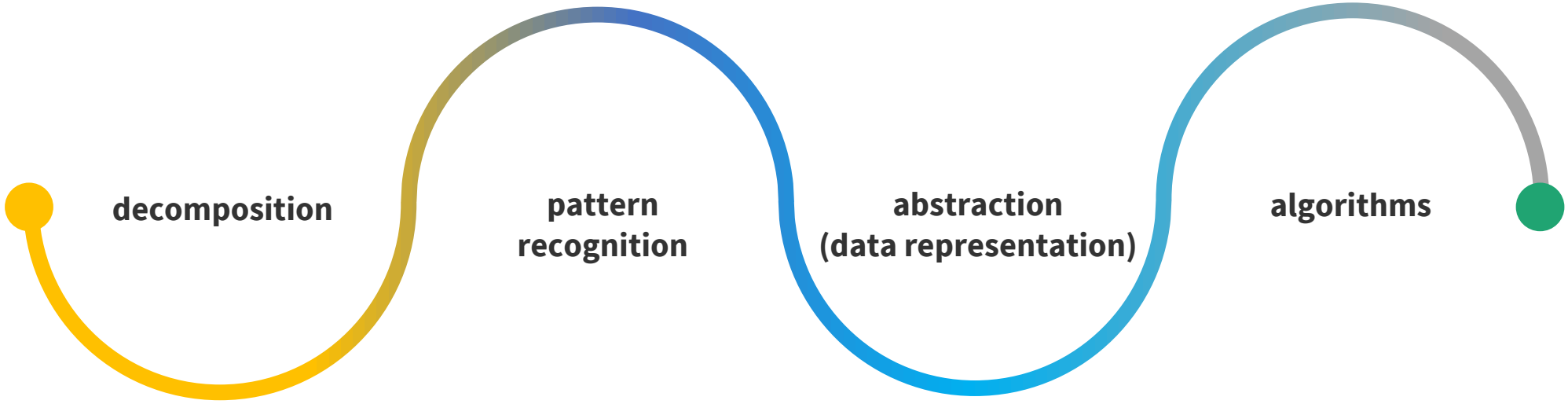
"Everyone should know
how to program a computer,
because it teaches you
how to think."

Steve Jobs



What we will see today? Computational thinking

An approach to solving problems using concepts and ideas from computer science, and expressing solutions to those problems so that they can be run on a computer.



breaking down a problem into smaller parts.

looking for patterns in those subproblems.

figuring out what information is needed (as input, intermediate and output).

developing a step-by-step solution.

Computational thinking

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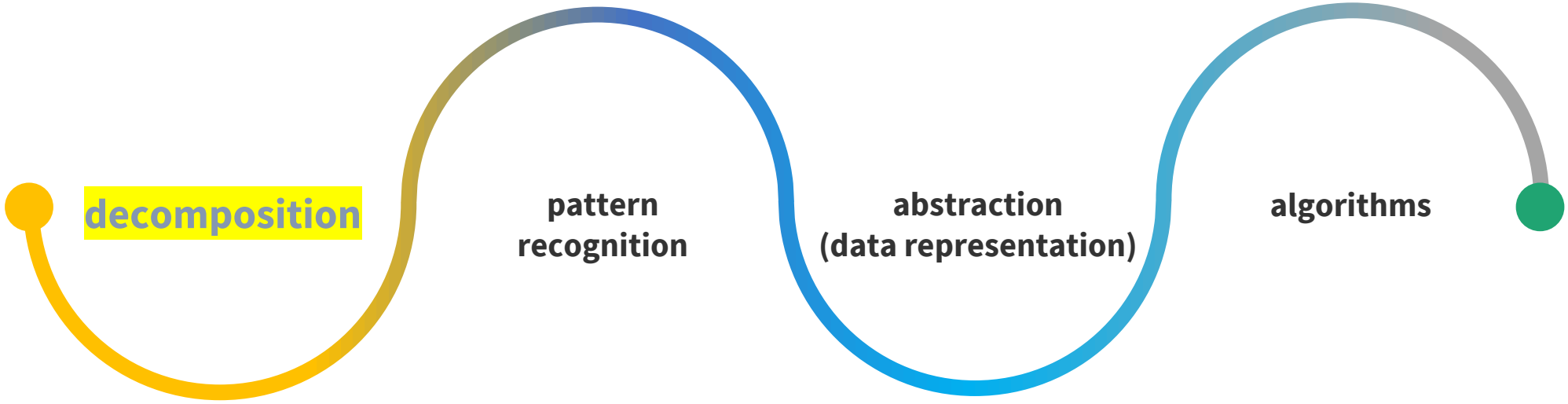

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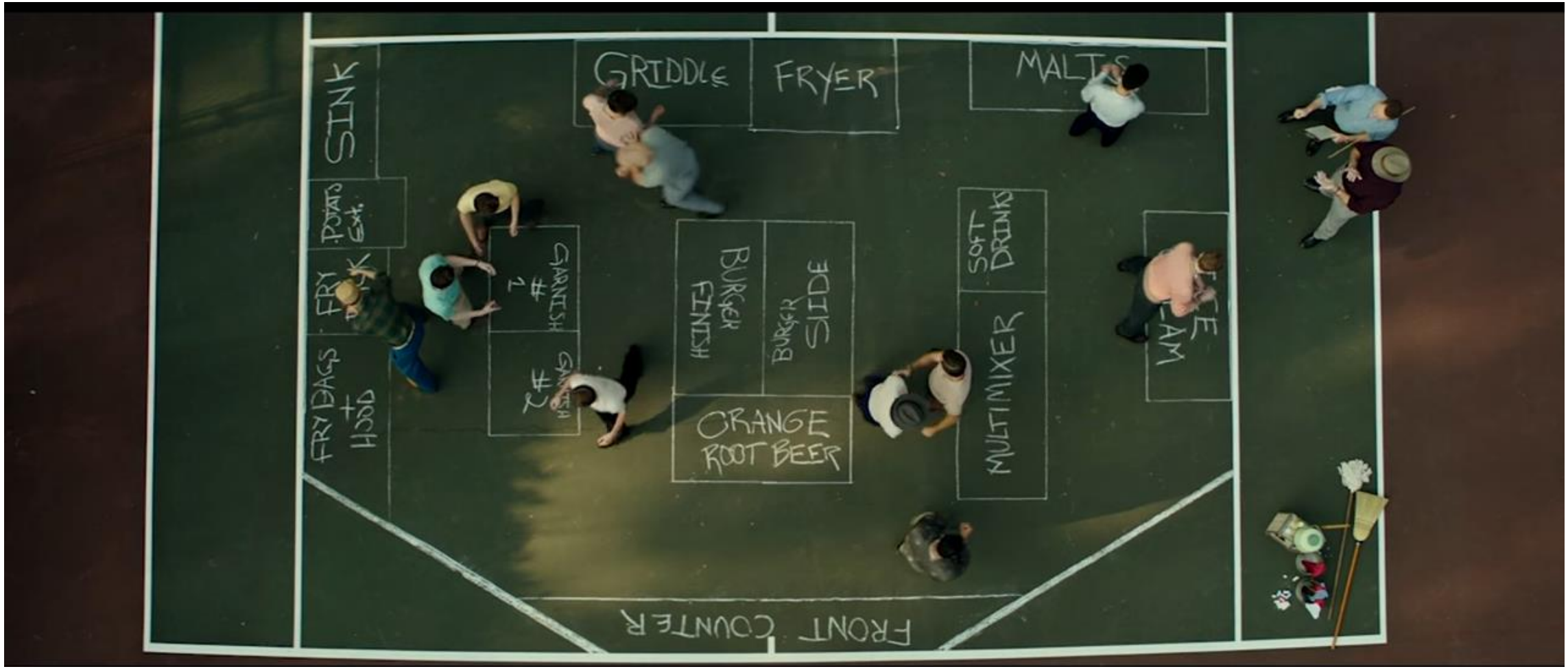
McDonald's decomposition – Burger



https://youtu.be/u00S-hCnmFY

Computational Thinking Recap

Player vs Player
1:1 Devices

Classic

Team vs Team
Shared Devices

Team mode

DECOMPOSITION

- **Breaking a complex problem into more manageable sub-problems**

- **Putting together solutions to sub-problems gives a solution the original, complex problem.**

Example: Publishing Bank's Strategic KPI Report

PATTERN RECOGNITION

- **Finding similarities or shared characteristics within or between problems.**

- **Makes the problem easier to solve since the same solution can be used for each occurrence of the pattern.**

- **Opportunity to generalize an algorithm to solve many different problems**

Example: Publishing Bank's Strategic KPI Report

Process for every KPI (repeated for all occurrences/ KPIs):
identify data provider, obtain data, prepare analysis, obtain remarks from accountable personnel/ department, publish the report

ABSTRACTION

(DATA REPRESENTATION)

- Determining what characteristics of the problem are important and filtering out those that are not.

- Use these to create a representation of what we're trying to solve

Example: Publishing Bank's Strategic KPI Report

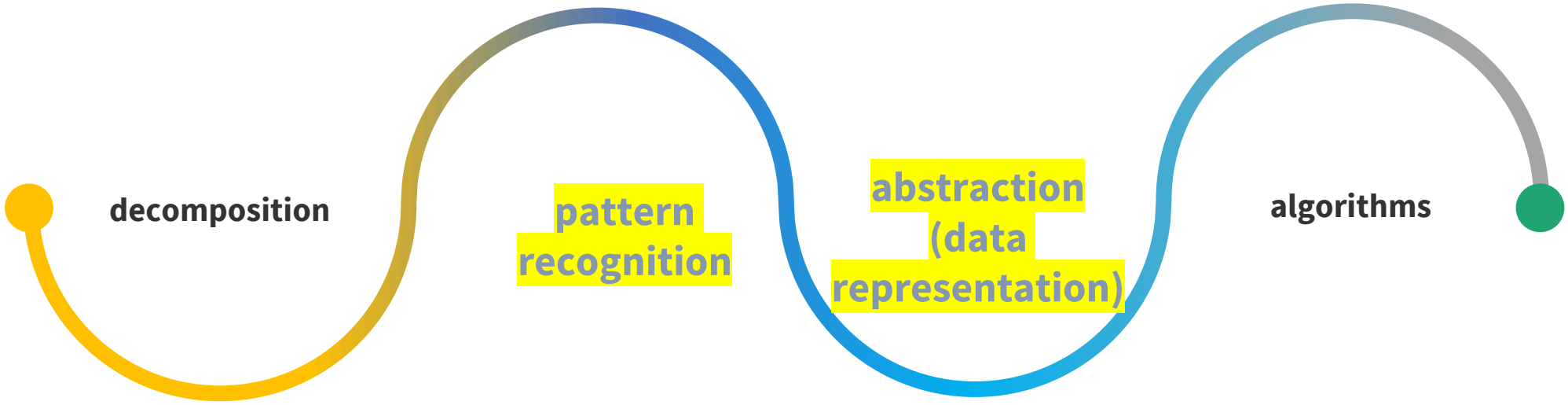
- Only final performance data for the concerned period and the result for the same period last year

ALGORITHMS

- Step-by-step instructions of how to solve a problem.
- Identifies what is to be done (the instructions), and the order in which they should be done.
- Instructions: expressed as something humans understand, eventually translated in to sequences of computer instructions, Can be described in English, as a flowchart, or by using a pseudocode.

Frog Game –

Exercise on step (2) Pattern Recognition and step (3) Abstraction



breaking down a problem in to smaller parts.

looking for patterns in those subproblems.

figuring out what information is needed.

developing a step-by-step solution.

EXERCISE: In small groups, by clicking in each FROG, make all frogs cross to the other side:
http://mfalonso.pythonanywhere.com/frogs

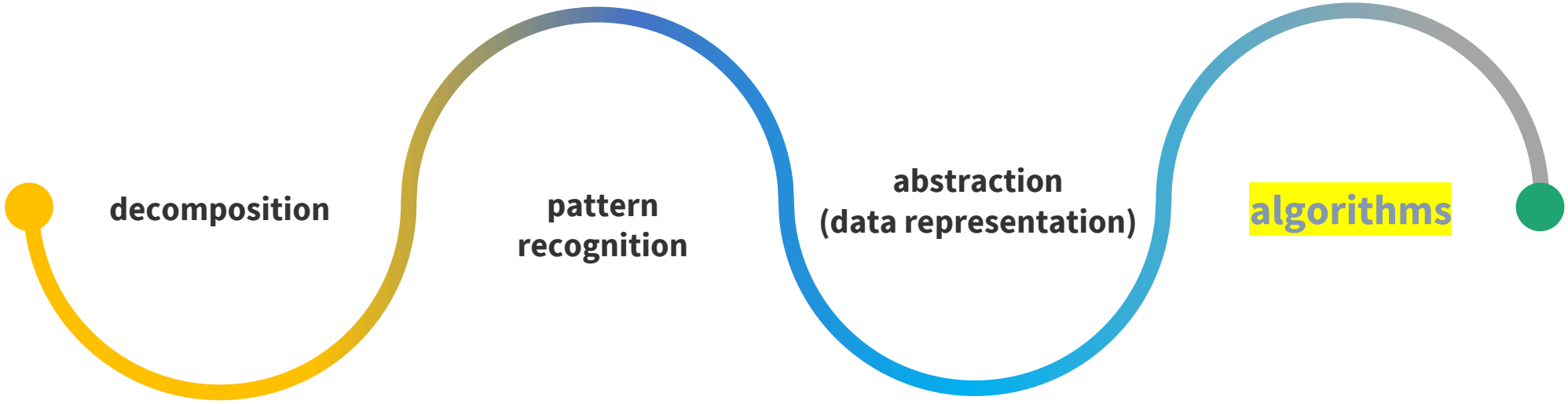
Start:

Final Objective:

And write down the steps to solve the problem – to later guide the teacher with the steps to complete the game

Writing Algorithms for computers and humans

Exercise Pattern Recognition and Abstraction



breaking down a problem in to smaller parts.

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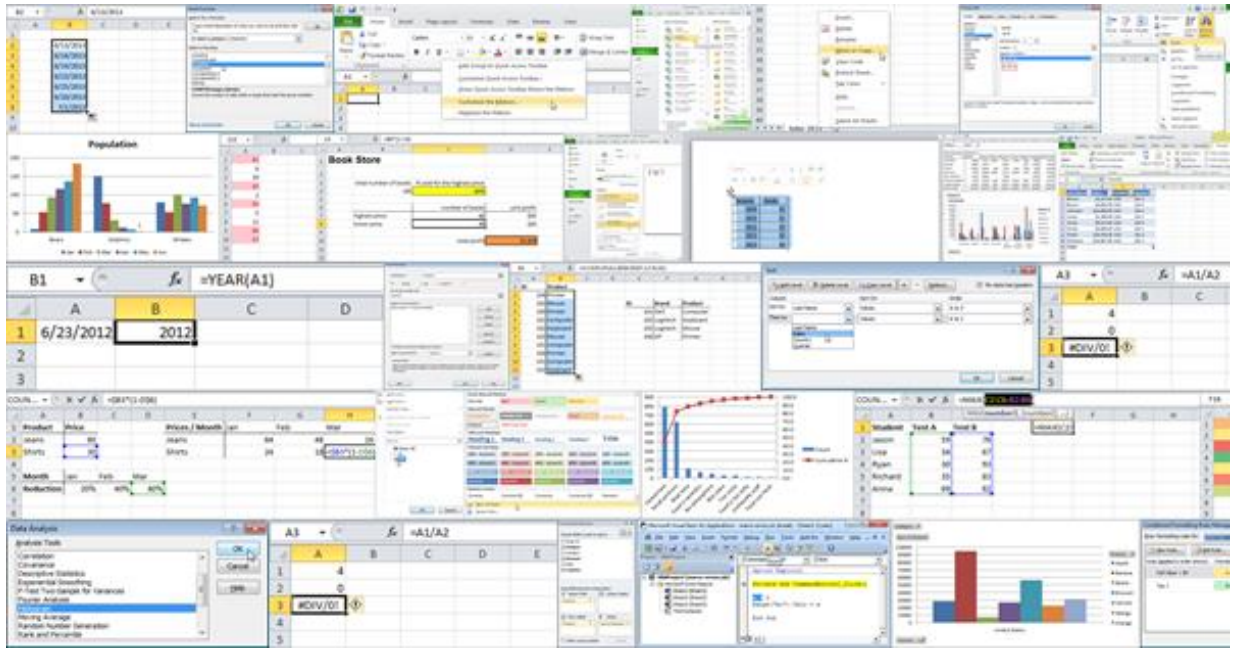
Why algorithms are called algorithms

BBC Ideas = https://www.youtube.com/watch?v=oRkNaF0QvnI

Conclusion:

An algorithm is a set of defined and unambiguous, orderly and finite instructions or rules that typically allows to solve a problem, perform a computation, process data and carry out other tasks or activities. An algorithm has an initial state and an input, follows successive steps and reaches a final state obtaining a solution.

A complex Excel is not an algorithm



But an opportunity for good consultants to charge expensive to turn it into an algorithm!

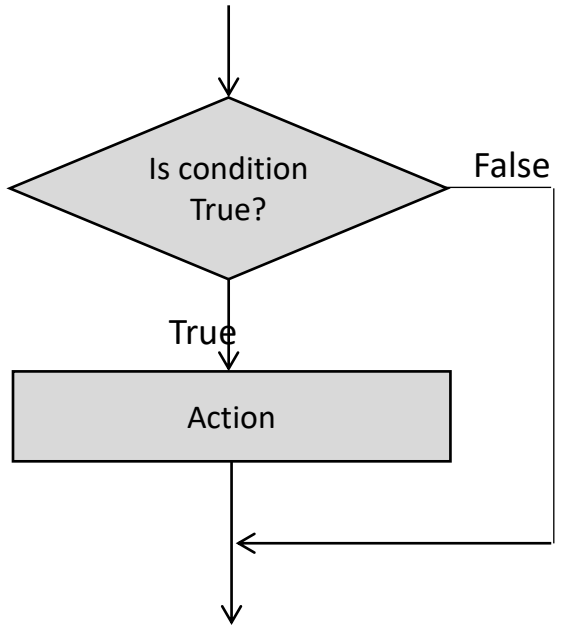
So that it is then easy to hire the

Optional Podcast about “Excel Hell”: https://talkpython.fm/episodes/show/200/escaping-excel-hell-with-python-and-pandas

WRITTING ALGORITHMS
CONTROL STRUCTURES / FLOWCHARTS for HUMANS & PROGRAMMING CODES for COMPUTERSS

IF - Selective Control Structures.

IF-WITHOUT ELSE: If the Condition is True, the Action is executed, otherwise the algorithm continues with its execution.



Flow charts for humans to read:

Programming language code for computers to read:

```
GENERIC SINTAX IN PYTHON
if (condition):
  action
```

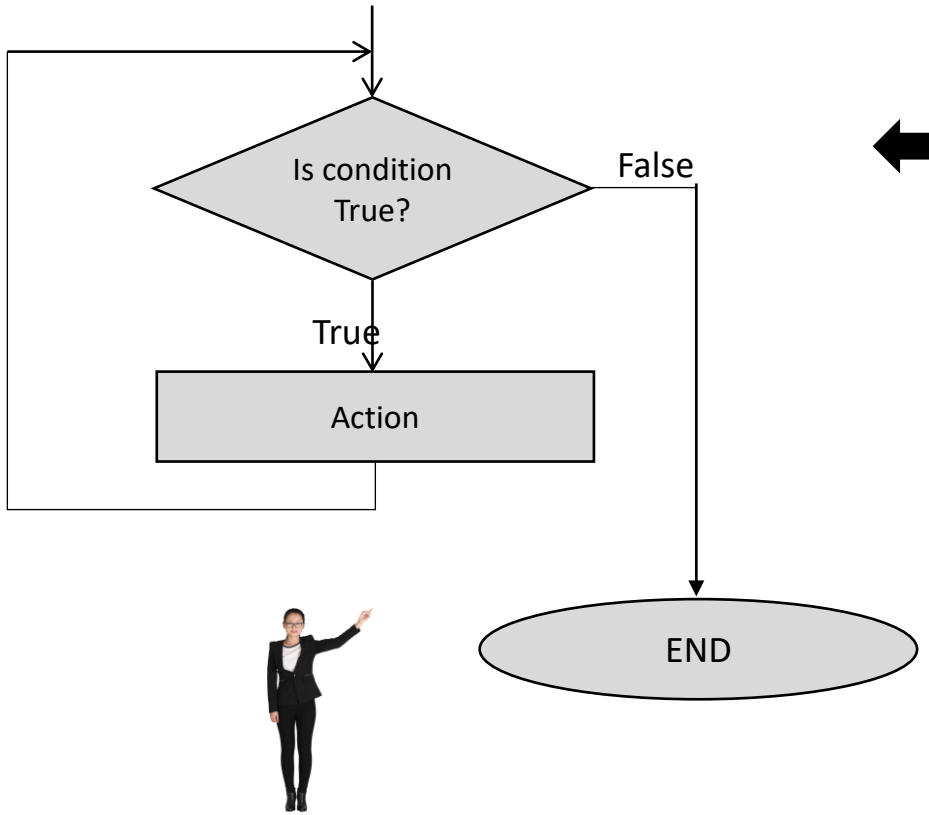
PYTHON CODE EXAMPLE:

```
x = 5
if(x > 0):
    print("Positive number")
```

```
R CODE EQUIVALENT:
x <- 5
if(x > 0){
    print("Positive number")
}
```

WHILE LOOP - Repetitive Control Structures.

While: The Condition is evaluated. If True, the Action is executed and the condition is evaluated again. As soon as the Condition is False, the loop is exited and the algorithm continues to run. When the Condition is evaluated, at the beginning, before entering the loop, if the condition is False, it will never enter the loop. Therefore this type of loop is obligatorily used, in the event that, there is a possibility that the loop can be executed 0 times.



GENERIC SINTAX IN PYTHON

```
while (condition):
  action
else:
  final_action
```

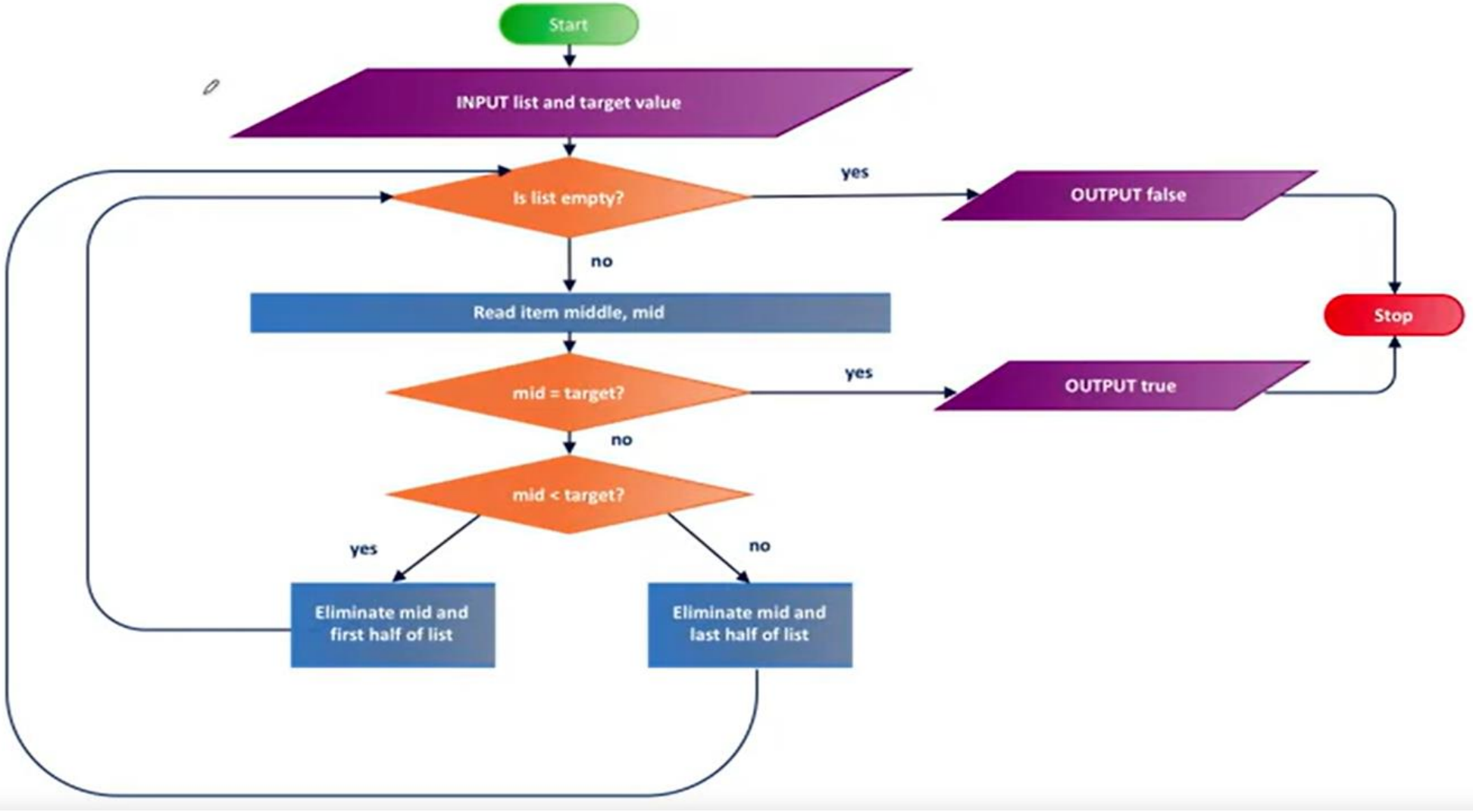
PYTHON CODE EXAMPLE:

```
i = 5
while(i > 0):
    print(".")
    i = i - 1
```

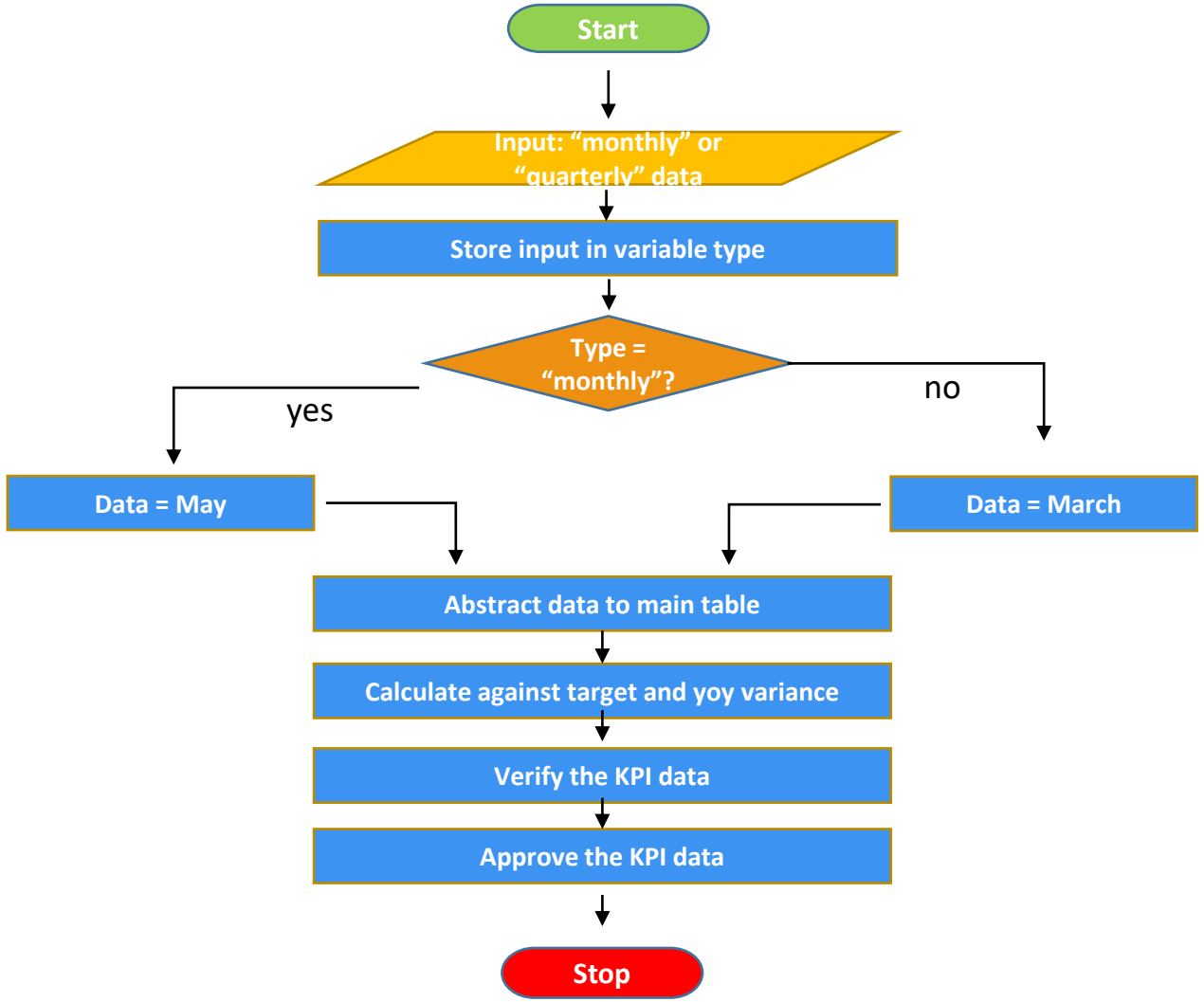
R CODE EXAMPLE EQUIVALENT:

```
i <- 5
while(i > 0){
    print(".")
    i <- i - 1
}
```

FLOWCHART : BINARY SEARCH



BUSINESS EXAMPLE PUBLISHING KPIS USING FLOWCHAT:



Name	Symbol
Start or Stop	Start / Stop
Process	Process
Decision	Decision
Input or Output	Input/Output
Next Instruction	↓

The Big Bang Theory - The Friendship Algorithm
USING FLOW DIAGRAMS

https://www.youtube.com/watch?v=k0xgjUhEG3U

WHERE TO GO FROM HERE? PLAY MORE…

PROGRAMMING - COMMUNICATING TO COMPUTERS:

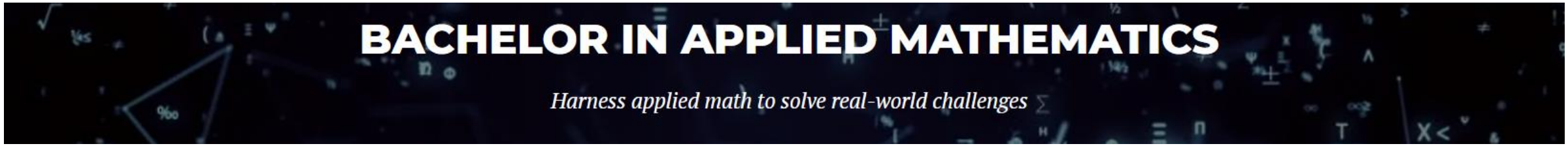
https://codecombat.com/students?_cc=EnemyDrawGame

PLAY AGAIN THE KAHOOTS:

IE Business School - Computational Thinking Recap & Algorithms and Flowcharts

https://kahoot.it/challenge/06889592?challenge-id=a3613dad-8cfd-48a4-b5f2-2043399b46ec_1679325352013

WHERE TO GO FROM HERE? COME AND STUDY WITH US...



- DUAL DEGREE IN **PHILOSOPHY, POLITICS, LAW AND ECONOMICS** & DATA AND BUSINESS ANALYTICS
- DUAL DEGREE IN **BUSINESS ADMINISTRATION** + DATA & BUSINESS ANALYTICS

DURATION	LANGUAGE	LOCATION	INTAKE	MODE OF STUDY	FORMAT
4 years	English	Segovia or Madrid	September	Full-time	In-person

Our Students

Our Students

50+

Different education systems

75%

Non-Spanish students

45+

Languages spoken on campus

Our Campus

Two Locations, One Experience

Two Locations, One Experience

Segovia

Madrid

Segovia

Madrid

Our Studies

Sabrina Baldi
Junior Manager Global Markets
IE University

sabrina.baldi@ie.edu
+34 682 08 44 33

Manoel Gadi
Professor of the School of Science and Technologies

mfalonso@faculty.ie.edu

Madrid
Paseo de la Castellana, 259.
28046 Madrid, Spain

+34 915 689 600

Segovia
Cardenal Zúñiga, 12
40003 Segovia, Spain

+34 921 412 410

university@ie.edu
www.ie.edu/university

Contact us

@ieuniversity

Kahoot!

Algorithms and Flowcharts

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1:1 Devices

Classic

Team vs Team
Shared Devices

Team mode