Computational and Statistical Thinking for Middle (Junior High) School Level

Roberto Araya
CIAE - IE University of Chile

COMPUTATIONAL THINKING

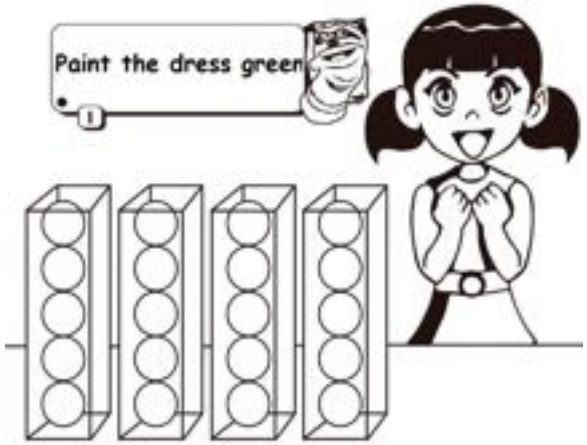
- Algorithmic thinking
- Modeling
- Machine learning

ALGORITHMIC THINKING

PAINT

Paint the dress green

1



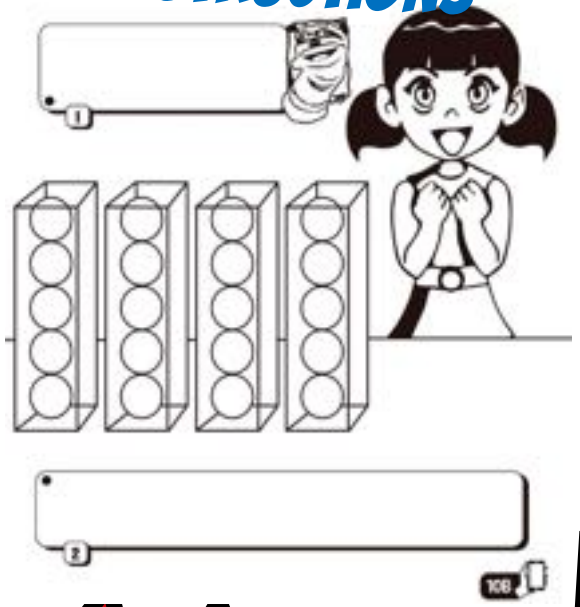
In each box paint at least two blue balls

2

10A

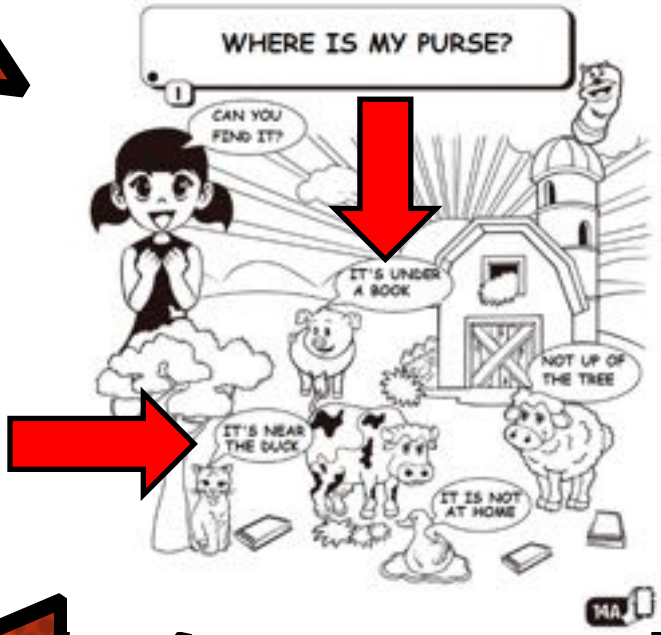
PAINT IN EACH BOX ONE BALL MOR THAN IN THE NEIGHBORING BOX ON ITS RIGHT

WRITE YOUR INSTRUCTIONS



PAINT IN EACH BOX A BLUE BALL MORE THAN A RED BALL

PAINT THE OBJECT WHERE THE PURSE IS



Write your own instructions

Conectaldeas

Colorea Ideas

MODELING

FOREST FIRES

IF

CELL WAS RED OR BLACK

THEN

CELL IS BLACK

OTHERWISE

IF

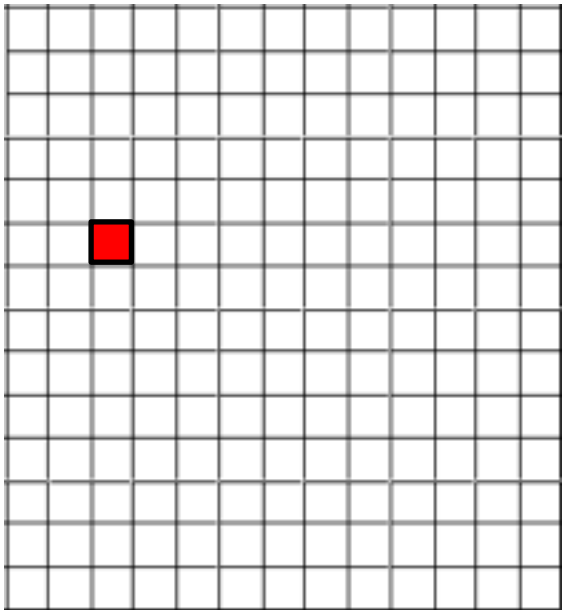
NEIGHBORING CELL WAS RED

THEN

CELL IS RED

ELSE

CELL IS WHITE



IF

CELL WAS RED OR BLACK

THEN

CELL IS BLACK

OTHERWISE

IF

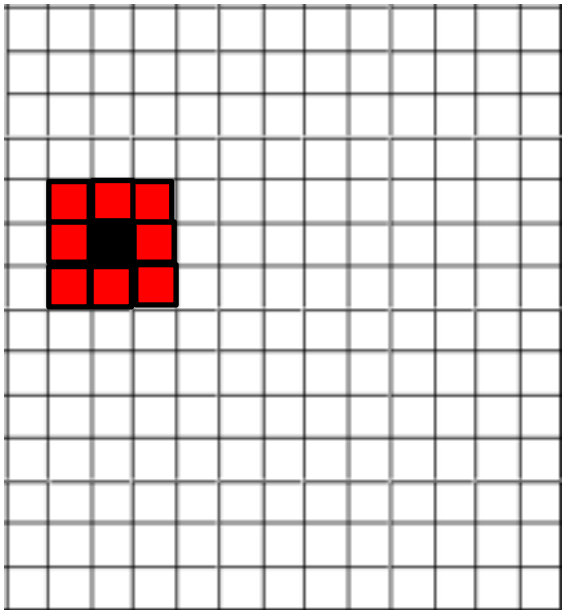
NEIGHBORING CELL WAS RED

THEN

CELL IS RED

ELSE

CELL IS WHITE



?

IF

CELL WAS RED OR BLACK

THEN

CELL IS BLACK

OTHERWISE

IF

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THEN

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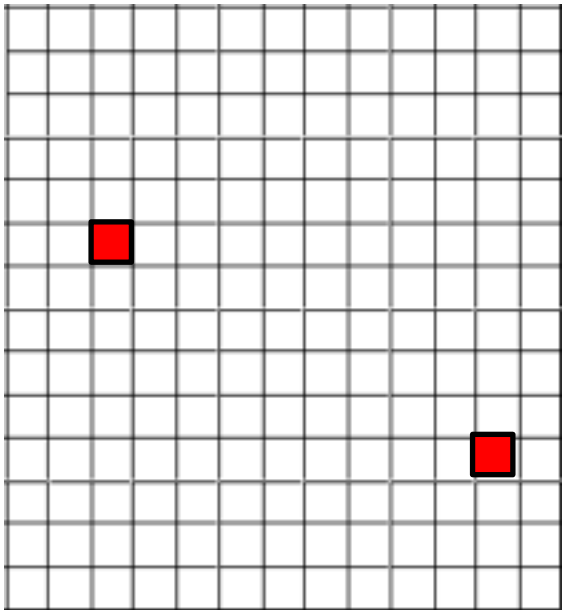
ELSE

CELL IS WHITE



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IF

CELL WAS RED OR BLACK

THEN

CELL IS BLACK

OTHERWISE

IF

NEIGHBORING CELL WAS RED

THEN

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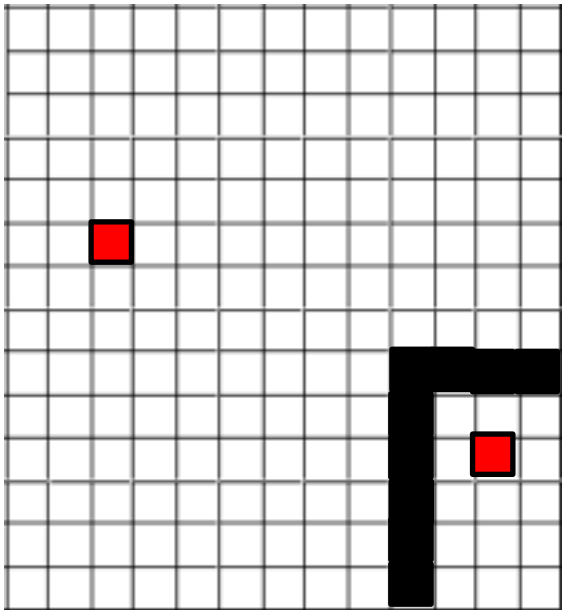
ELSE

CELL IS WHITE



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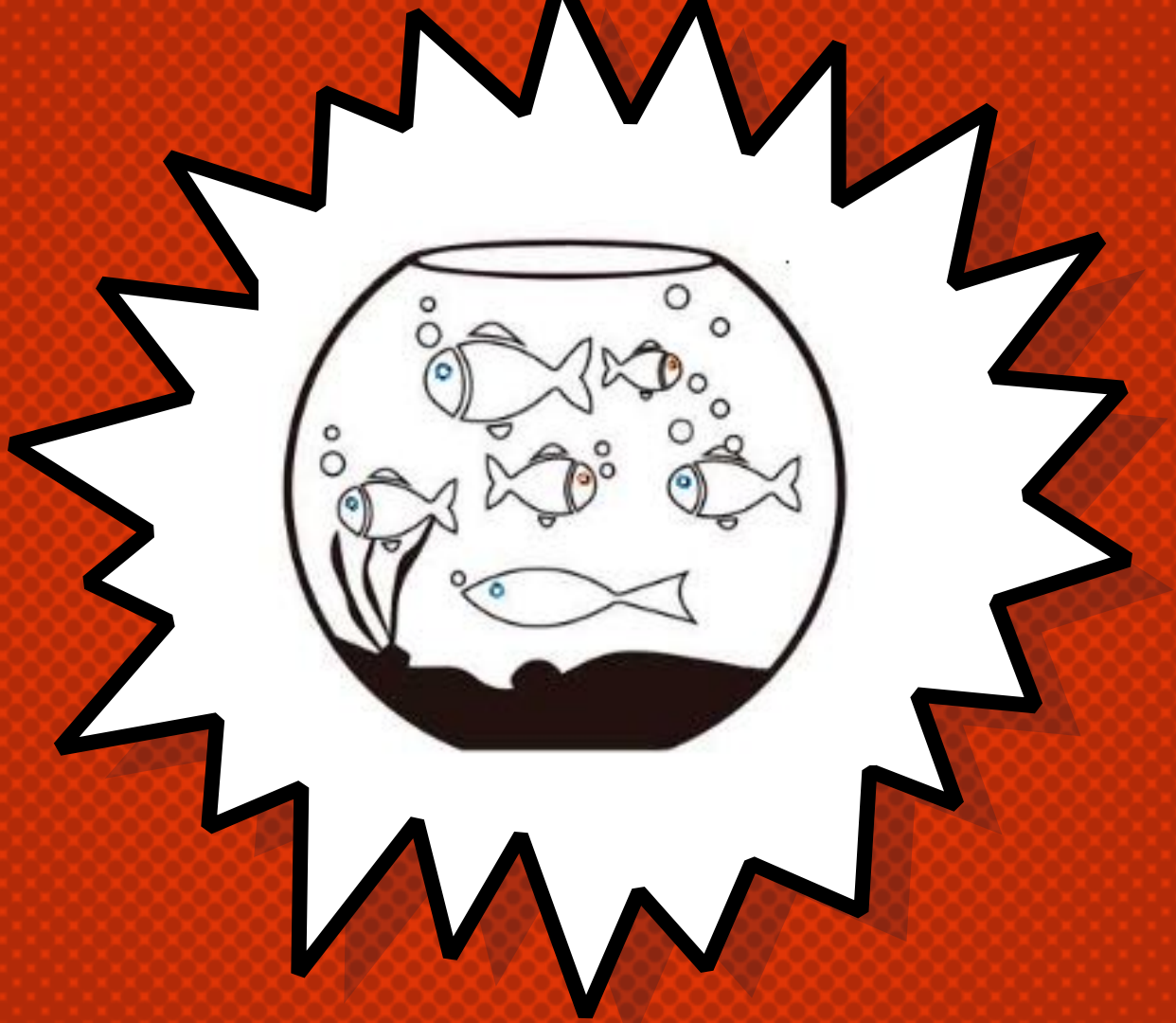
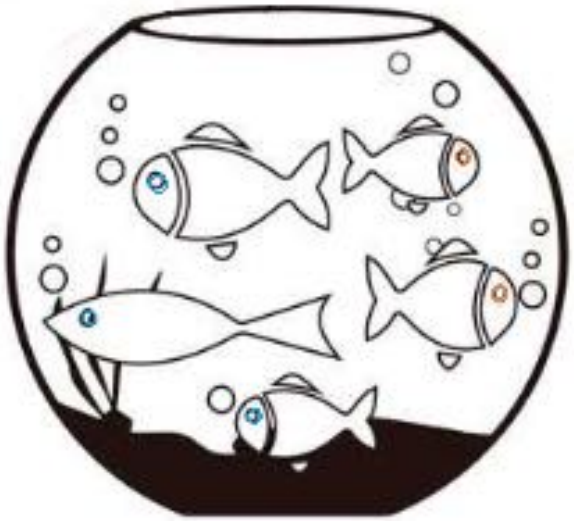
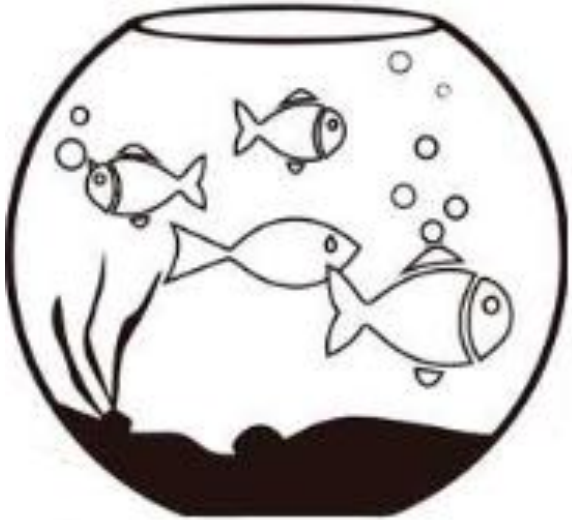
MACHINE LEARNING







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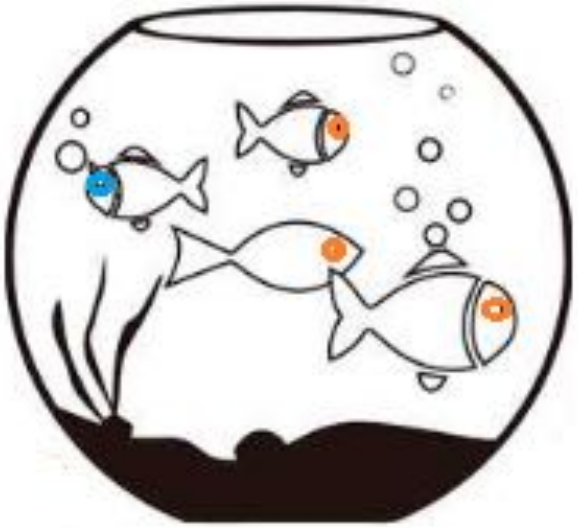

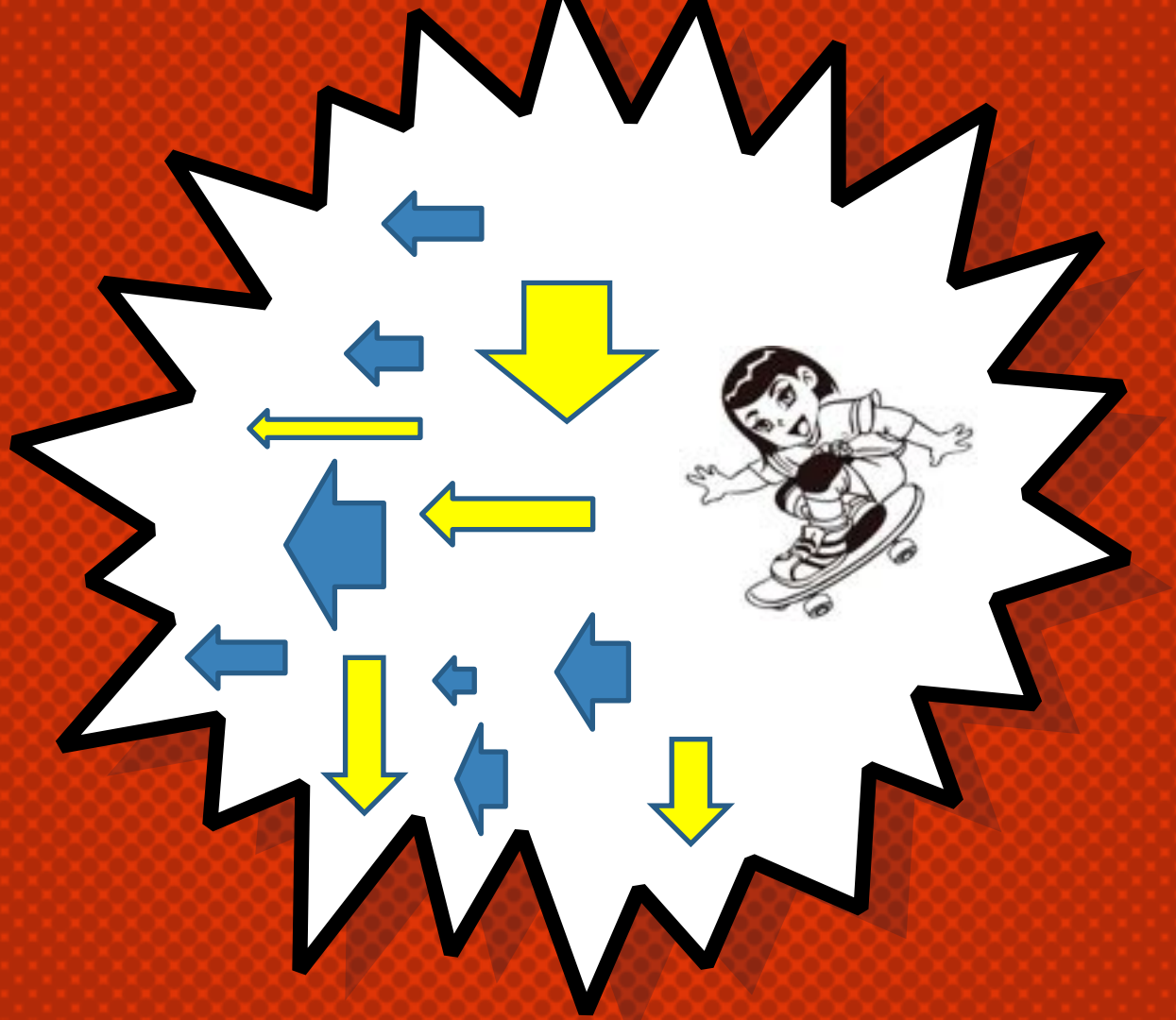

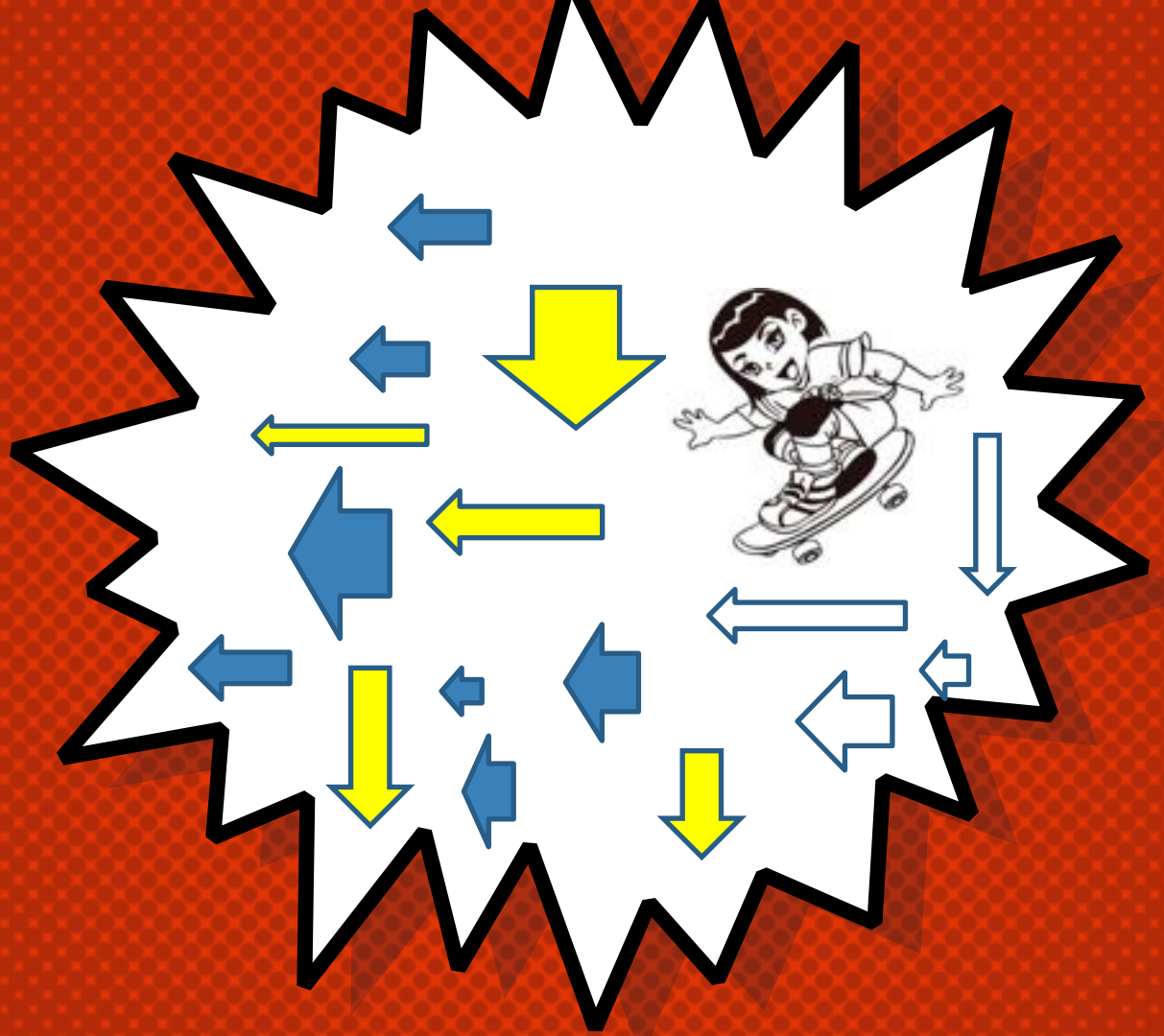

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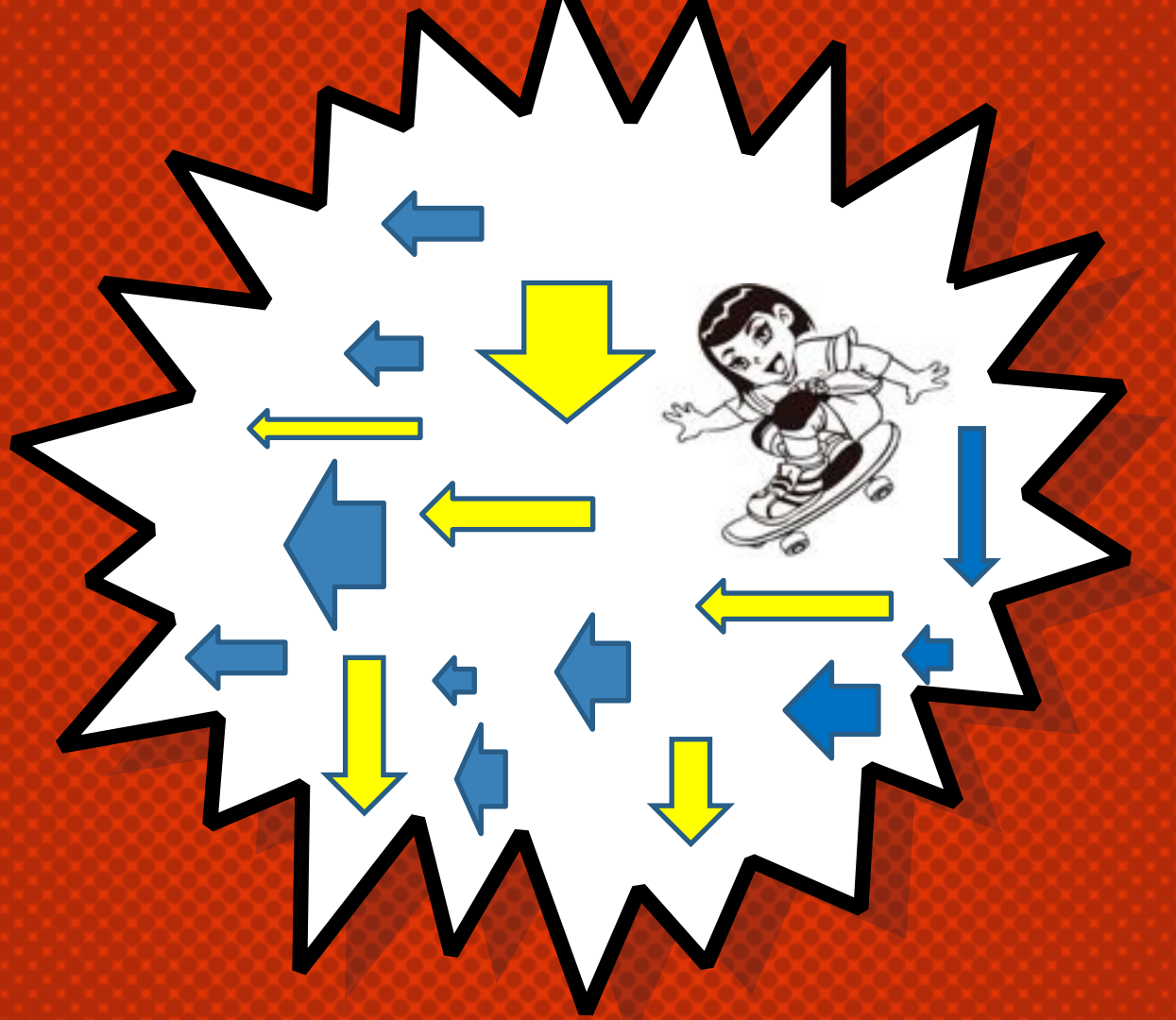
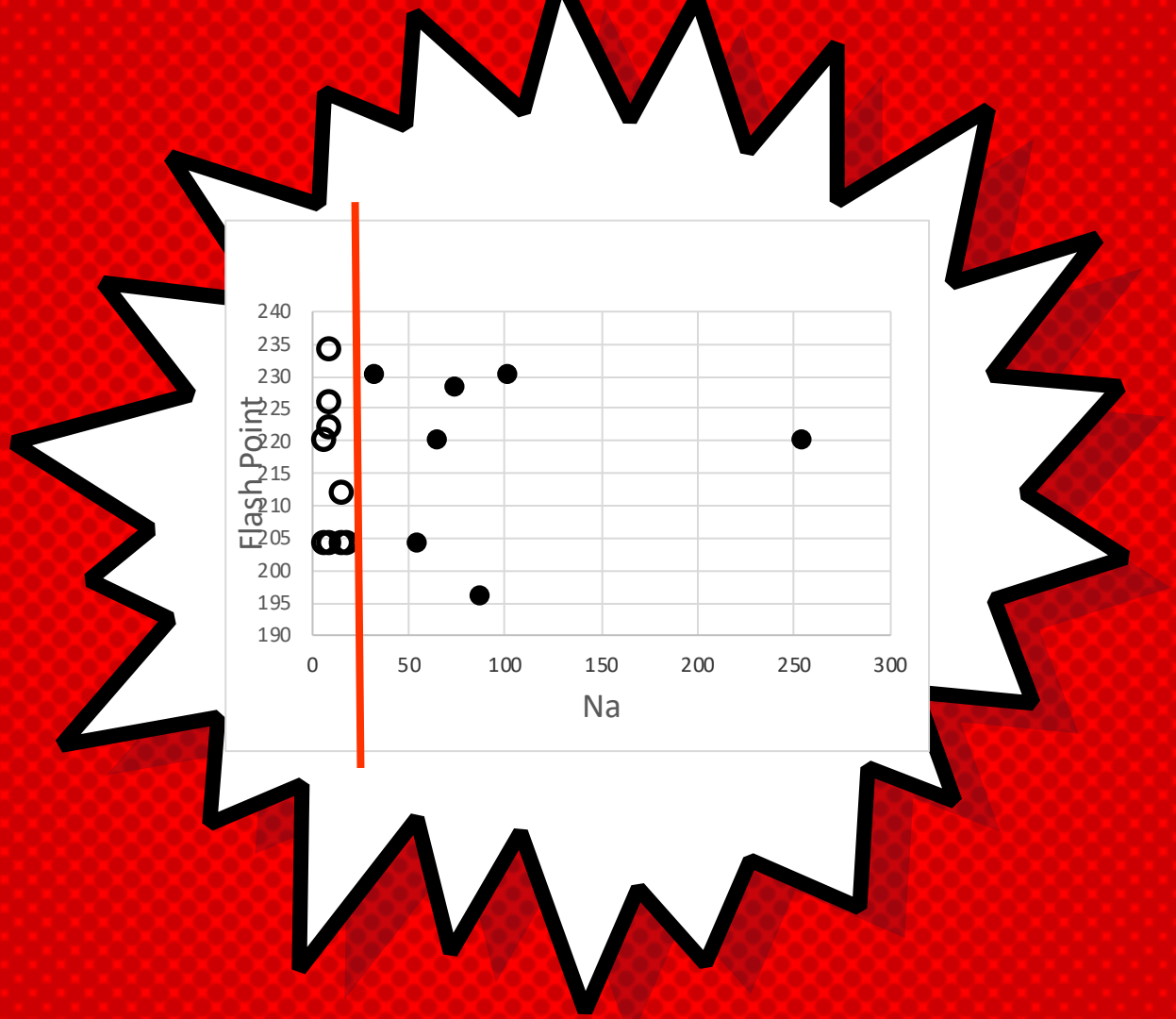
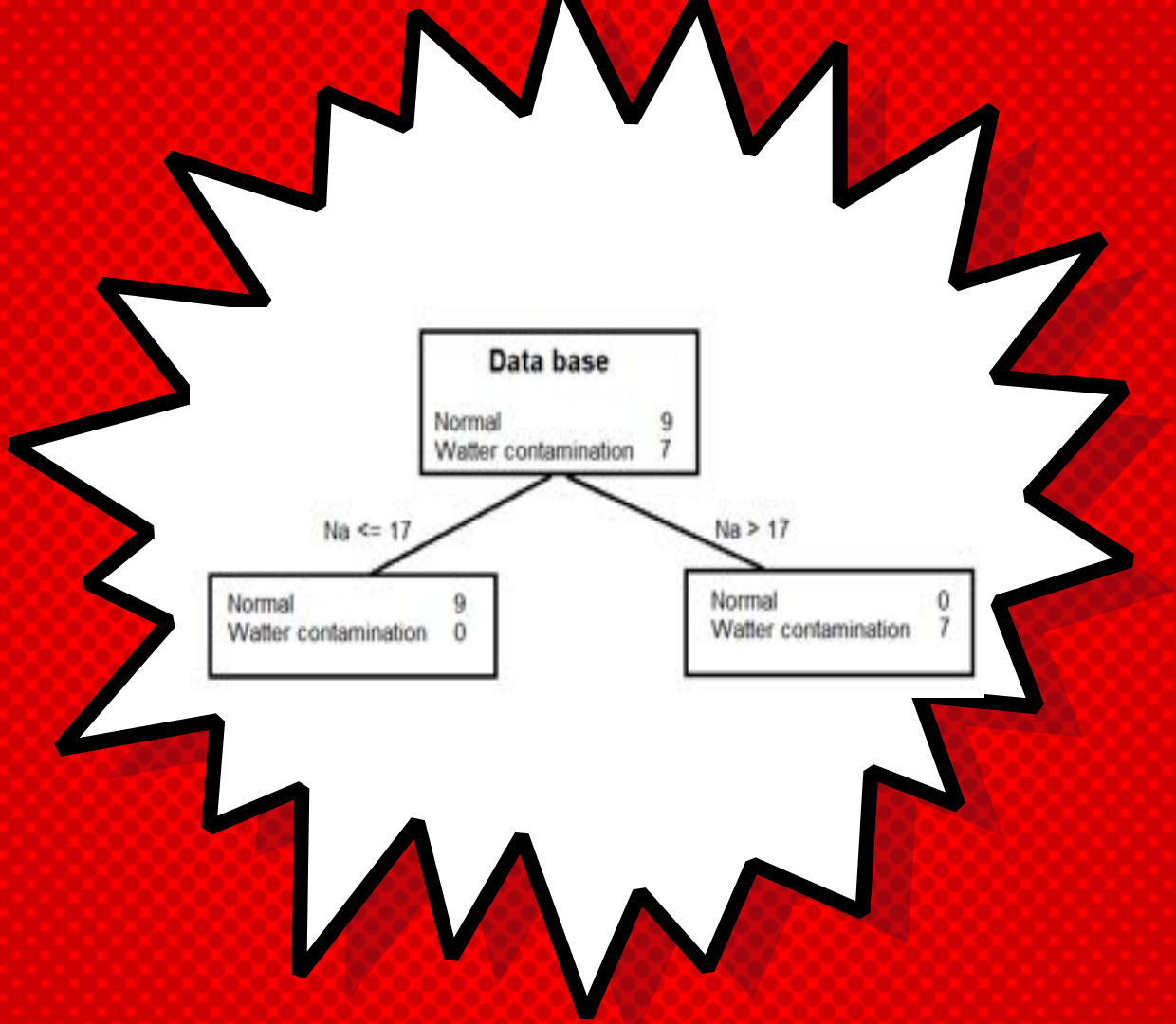


- Algorithmic thinking
- Modeling
- Machine learning

Case	Fe	Cu	Na	Flash point	Diagnosis
1	19	3	6	204	normal
2	45	11	8	204	normal
3	28	15	8	222	normal
4	10	4	6	220	normal
5	39	15	17	204	normal
6	37	13	15	204	normal
7	17	4	8	226	normal
8	10	3	8	234	normal
9	24	39	15	212	normal
10	64	10	254	220	Water contamination
11	57	13	87	196	Water contamination
12	34	87	101	230	Water contamination
13	54	8	65	220	Water contamination
14	43	15	54	204	Water contamination
15	69	15	74	228	Water contamination
16	77	17	32	230	Water contamination


240
235
230
225
220
215
210
205
200
195
190
Flash Point
0
50
100
150
200
250
300
Na


Data base
Normal 9
Watter contamination 7
Na <= 17
Na > 17
Normal 9
Watter contamination 0
Normal 0
Watter contamination 7

STATISTICAL THINKING

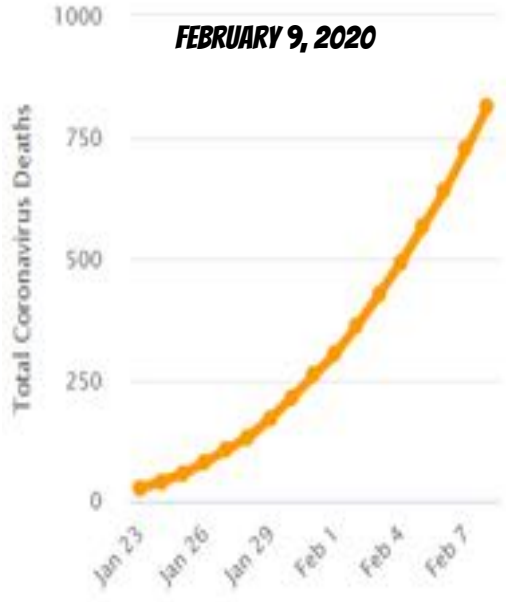

PATTERNS
QUESTIONS
OBJECTIVES
DATA MINING
UNDERSTANDING

CORONA VIRUS CASES

FEBRUARY 9, 2020

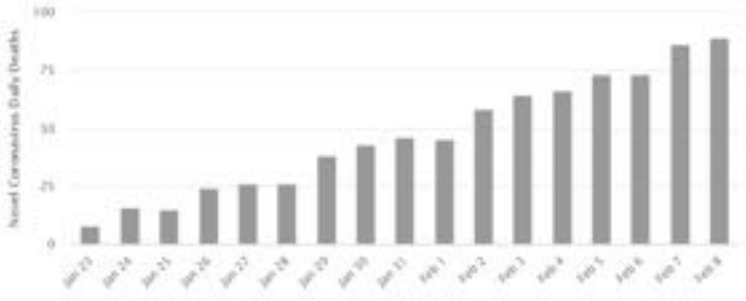
814 DEATHS

FEBRUARY 9, 2020



DAILY DEATHS

FEBRUARY 9, 2020

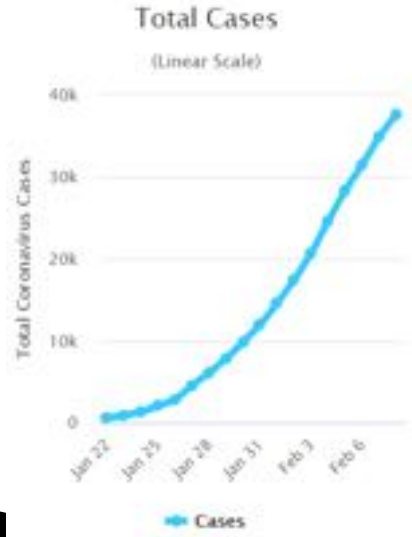


DAILY DEATHS GROWTH FACTOR


PATTERNS
QUESTIONS
OBJECTIVES
DATA MINING
UNDERSTANDING

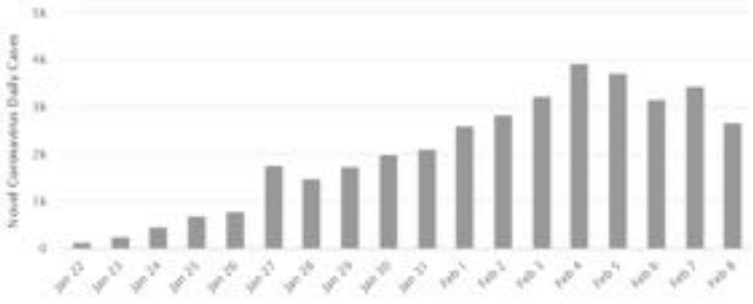
37,594 CASES

FEBRUARY 9, 2020

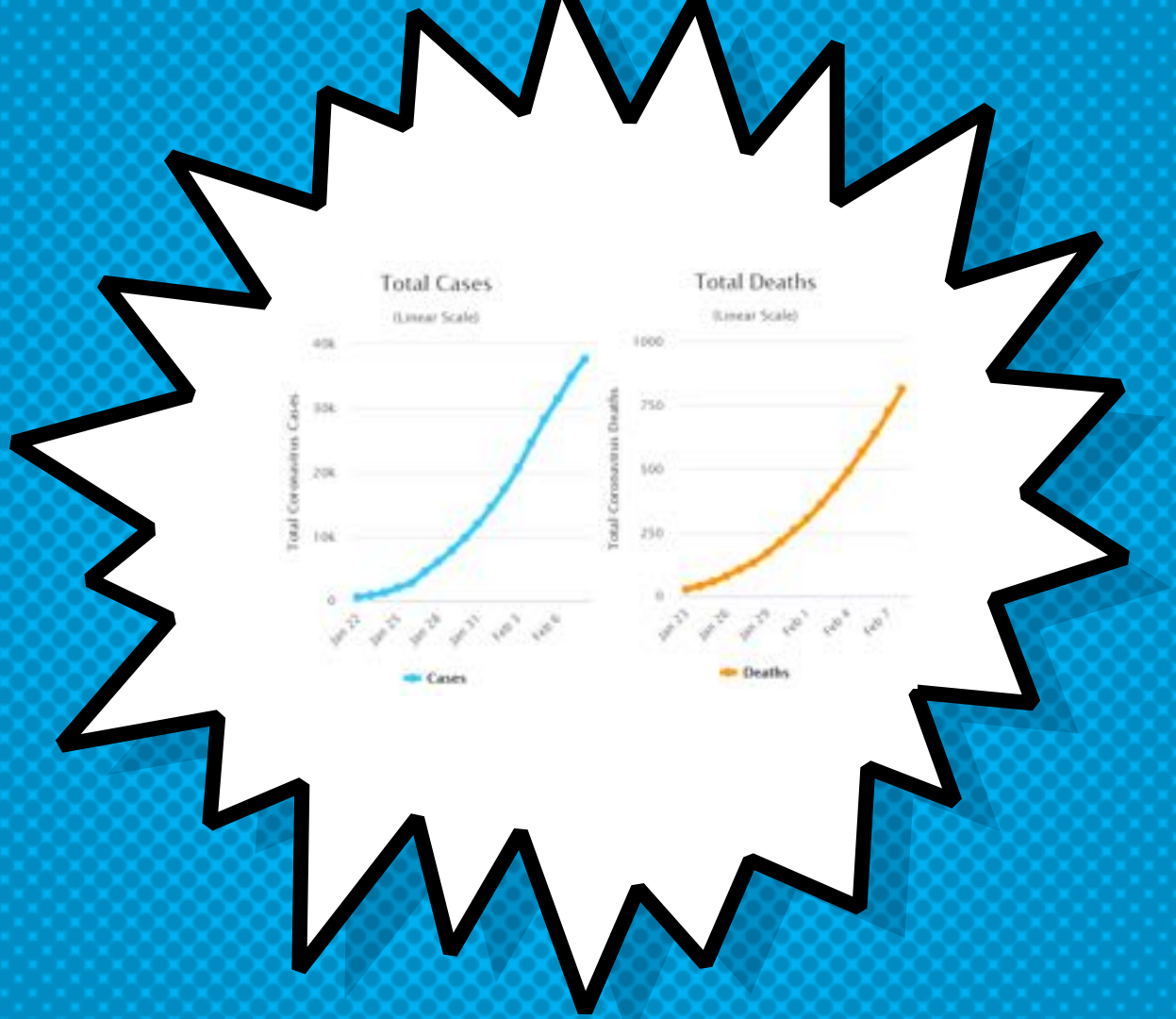


DAILY CASES

FEBRUARY 9, 2020



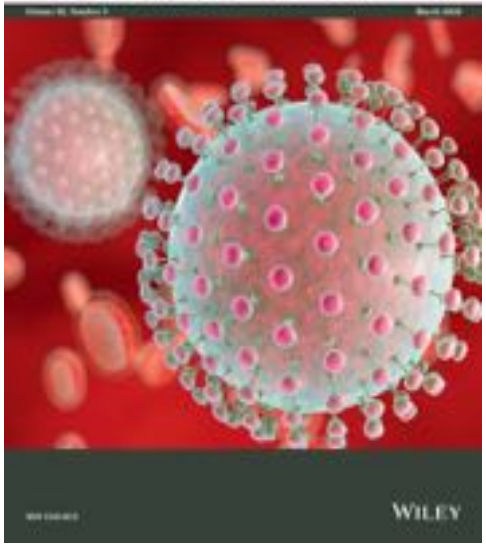
DAILY CASES GROWTH FACTOR


Total Cases
(Linear Scale)
Total Coronavirus Cases
40k
30k
20k
10k
0
Jan 22
Jan 25
Jan 28
Jan 31
Feb 3
Feb 6
Cases
Total Deaths
(Linear Scale)
Total Coronavirus Deaths
1000
750
500
250
0
Jan 23
Jan 26
Jan 29
Feb 1
Feb 4
Feb 7
Deaths


PATTERNS
QUESTIONS
OBJECTIVES
DATA MINING
UNDERSTANDING

MACHINE LEARNING AND STATITICAL THINKING

World Health Organization



CORONAVIRUS - 814 DEATHS 02-08

SARS - 774 DEATHS IN 2003

MERS - 858 DEATHS IN 2012

FIRST 17 DEATHS

Case	Gender	Age	1st sympt	Comorbidity	Surgery	1st sympt to death, days
1	M	61	Fever	yes	NA	20
2	M	69	Fever	yes	NA	16
3	M	89	No Fever	yes	NA	10
4	M	89	No Fever	yes	Yes	6
5	M	66	Fever	yes	Yes	10
6	M	75	Fever	yes	Yes	14
7	F	48	Fever	yes	NA	41
8	M	82	No Fever	NA	NA	12
9	M	66	No Fever	NA	NA	30
10	M	81	Fever	NA	NA	11
11	F	82	Fever	yes	NA	19
12	M	65	No Fever	NA	NA	13
13	F	80	Fever	yes	NA	11
14	M	53	Fever	NA	NA	20
15	M	86	No Fever	yes	Yes	19
16	F	70	Fever	NA	NA	8
17	M	84	Fever	yes	Yes	16

814 DEATHS

37,595 CASES

6,196 SEVERE CONDITION

TWO MACHINE LEARNING

- x **DEATH** - NO DEATH
- x **SEVERE** - NO SEVERE

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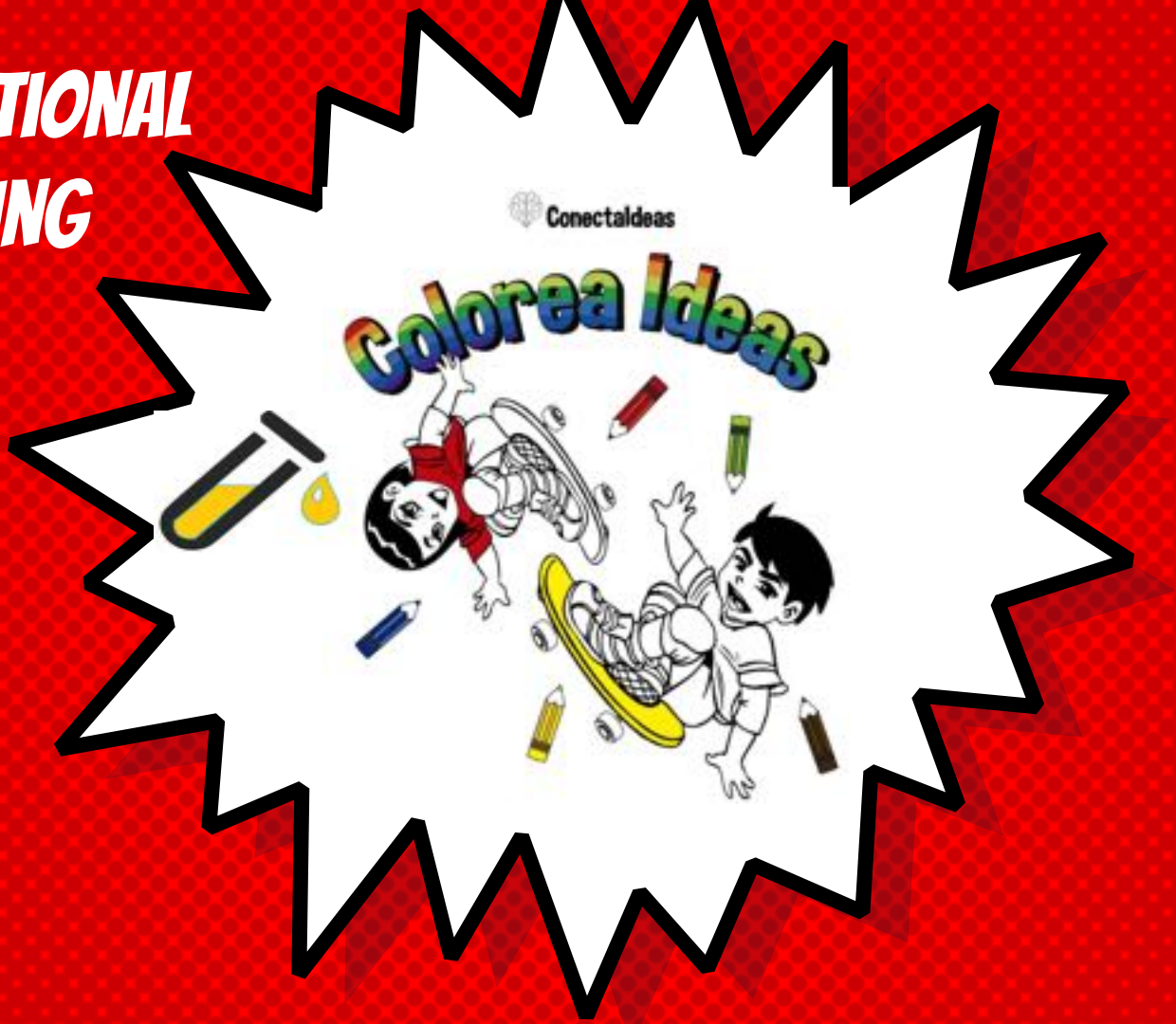
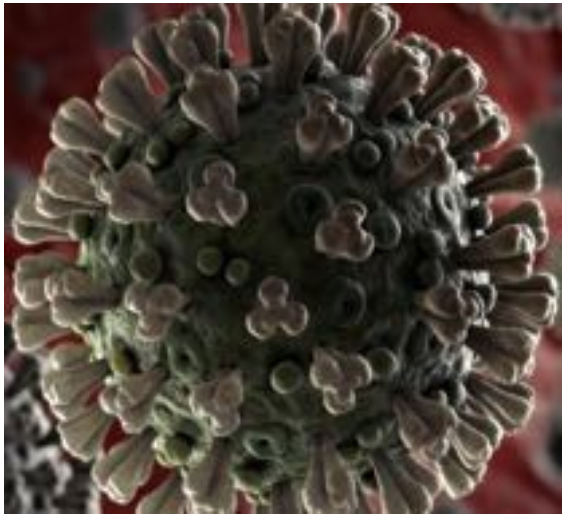
COMPUTATIONAL THINKING



STATISTICAL THINKING

World Health Organization



THANK YOU

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