Q: What is entropy in the context of decision trees?

iClicker

A. The uncertainty or mixed information in a dataset

B. The number of nodes in a tree

C. The difference between training and test data

D. The length of the decision path in a tree

CPSC 100

Computational Thinking

Sequential Algorithm + Programming

Instructor: Parsa Rajabi
Department of Computer Science
University of British Columbia

Agenda

- Learning Goals
- Course Admin
- Sequential Algorithm
- Intro to Programming

Learning Goals

Learning Goals

After this week's lecture, you should be able to:

- Identify the differences between sequential and "breaking bad" algorithms
- Discuss the **difference** between high level, assembly & machine code.
- **Identify and describe** the components of an algorithm
  - (i.e., sequencing, selection, and iteration)
- **Use snap blocks** to represent algorithms
- Be able to **trace** through code using sequences of instructions, variables, loops, and conditional statements in short programs
  - Read carefully: it says be able to **trace** code, **not write code**. In order to help you do this, you will write a small amount of code in lab. You will not, however, be asked to write code on exam.
- Describe in English what a block of *Snap!* code does.

Course Admin

Course Admin

- **Group Contracts**
  - Due on Monday, Jan 27 at 11:59pm (tonight)!
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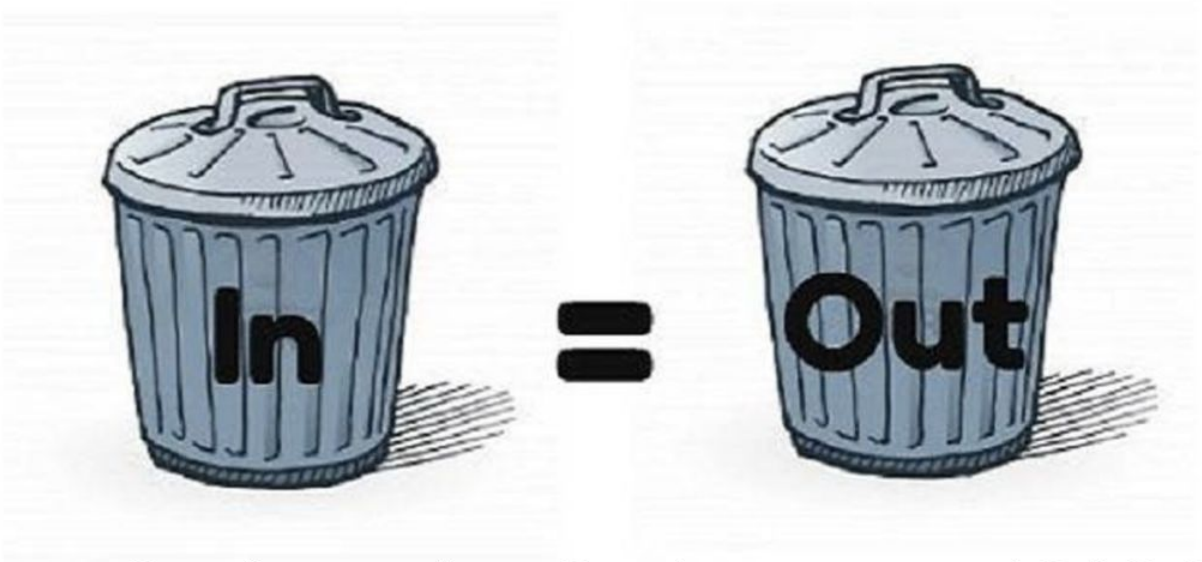
  - Friday, February 14 at 3pm

Data's influence on algorithms

Training data influences the classifier



Garbage in, Garbage out (GIGO)

Real World Examples?

Reuters

World Business Markets Sustainability More

Insight - Amazon scraps secret AI recruiting tool that showed bias against women

By **Jeffrey Dastin**

October 10, 2018 5:50 PM PDT · Updated 6 years ago

Aa

SAN FRANCISCO (Reuters) - Amazon.com Inc's machine-learning specialists uncovered a big problem: their new recruiting engine did not like women.

The team had been building computer programs since 2014 to review job applicants' resumes with the aim of mechanizing the search for top talent, five people familiar with the effort told Reuters.

Source

How We Analyzed the COMPAS Recidivism Algorithm

by Jeff Larson, Surya Mattu, Lauren Kirchner and Julia Angwin
May 23, 2016

← Read the story

Across the nation, judges, probation and parole officers are increasingly using algorithms to assess a criminal defendant's likelihood of becoming a recidivist – a term used to describe criminals who re-offend. There are dozens of these risk assessment algorithms in use. Many states have built their own assessments, and several academics have written tools. There are also two leading nationwide tools offered by commercial vendors.

We set out to assess one of the commercial tools made by Northpointe, Inc. to discover the underlying accuracy of their recidivism algorithm and to test whether the algorithm was biased against certain groups.

Our analysis of Northpointe's tool, called COMPAS (which stands for Correctional Offender Management Profiling for Alternative Sanctions), found that black defendants were far more likely than white defendants to be incorrectly judged to be at a higher risk of recidivism, while white defendants were more likely than black defendants to be incorrectly flagged as low risk.

Source

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IEEE Spectrum FOR THE TECHNOLOGY INSIDER

Type to search

ARTICLE | AI

In 2016, Microsoft's Racist Chatbot Revealed the Dangers of Online Conversation

The bot learned language from people on Twitter—but it also learned values

BY OSCAR SCHWARTZ | PUBLISHED 25 NOV 2019 | UPDATED 04 JAN 2024 | 5 MIN READ

Source

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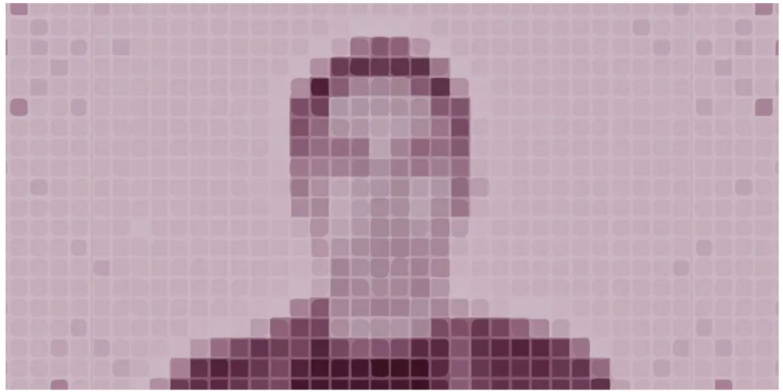
Racial Discrimination in Face Recognition Technology

October 24, 2020



By Alex Najibi

BLOG POSTS BY MONTH

March 2023 (1)
September 2022 (3)
December 2021 (1)
October 2020 (4)
May 2020 (2)

1 of 4 »

Source

BBC Sign in Home News Sport Business Innovation Culture

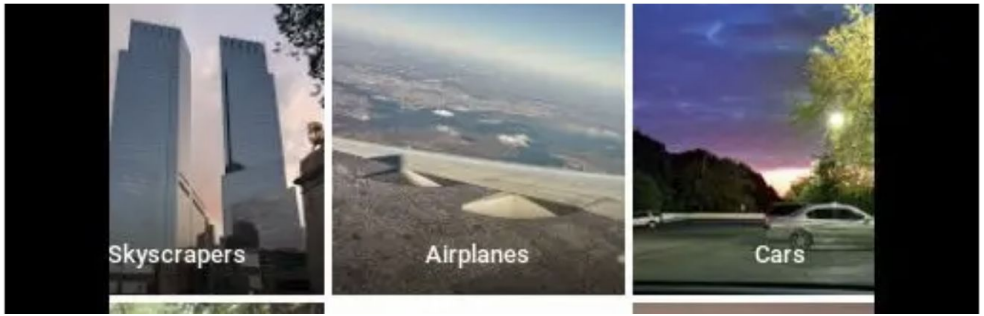
NEWS

Home | Israel-Gaza war | War in Ukraine | Climate | Video | World | US & Canada | UK | Business | Tech

Tech

Google apologises for Photos app's racist blunder

1 July 2015



Source

Sequential Algorithm

Sequential Algorithm for Signaling Words

Jean-Dominique Bauby was a journalist who had *locked-in syndrome*.

He used the *partner-assisted scanning system* to dictate a 130 page book by blinking.

Sequential Algorithm for Signaling Words

“It is a simple enough system," Bauby explains.

"You read off the alphabet… until, with a blink of my eye, I stop you at the letter to be noted. The maneuver is repeated for the letters that follow, so that fairly soon you have a whole word.”

In other words, you go through each letter, row by row, and read off all the letters.

Sequential Algorithm for Signaling Words

A	B	C	D	1	2
E	F	G	H	3	4
I	J	K	L	M	N
O	P	Q	R	S	T
U	V	W	X	Y	Z
5	6	7	8	9	0

Sequential Algorithm for Signaling Words

Let's set our goal to **minimize the number of letters that have to be looked** at to spell a word.

So each letter you look at has a cost of "1"

We also have to decide if there's any extra "cost" to having the "signals".

Let's say each signal also costs "1"

Sequential Algorithm for Signaling Words

Sequential

8 to get to the letter F
\+ 1 to signal “F”

---

9 total cost

A	B	C	D	1	2
E	F	G	H	3	4
I	J	K	L	M	N
O	P	Q	R	S	T
U	V	W	X	Y	Z
5	6	7	8	9	0

Q: What is the cost to signal the word "FAN"?

A. 26
B. 28
C. 29
D. 30
E. 31

A	B	C	D	1	2
E	F	G	H	3	4
I	J	K	L	M	N
O	P	Q	R	S	T
U	V	W	X	Y	Z
5	6	7	8	9	0

Breaking Bad Algorithm

https://www.youtube.com/watch?v=pWso-qRaIlM#t=26s

Example of cost counting: Letter F

2 to get to the “E” row
1 to signal the “E” row
2 to get to “F” in the row
+1 to signal “F”

---

6 total cost

A	B	C	D	1	2
E	F	G	H	3	4
I	J	K	L	M	N
O	P	Q	R	S	T
U	V	W	X	Y	Z
5	6	7	8	9	0

Breaking Bad Algorithm

Q: What is the cost to signal the word "FAN"?

A. 17
B. 18
C. 19
D. 20
E. 21

A	B	C	D	1	2
E	F	G	H	3	4
I	J	K	L	M	N
O	P	Q	R	S	T
U	V	W	X	Y	Z
5	6	7	8	9	0

Activity

Activity: Algorithms in Action

Find a word that works better the Sequential way.

Find a word that works better the Breaking Bad way.

Which algorithm is better and why?

Rules:

- Both words must be at least 4 letters!
- Use the same chart

Discussion

Activity: Algorithms in Action

Your signal algorithms used

decomposition: breaking the problem down into smaller tasks

abstraction: describing the solution in a general way that's applicable no matter what order the letters/numbers are in the table

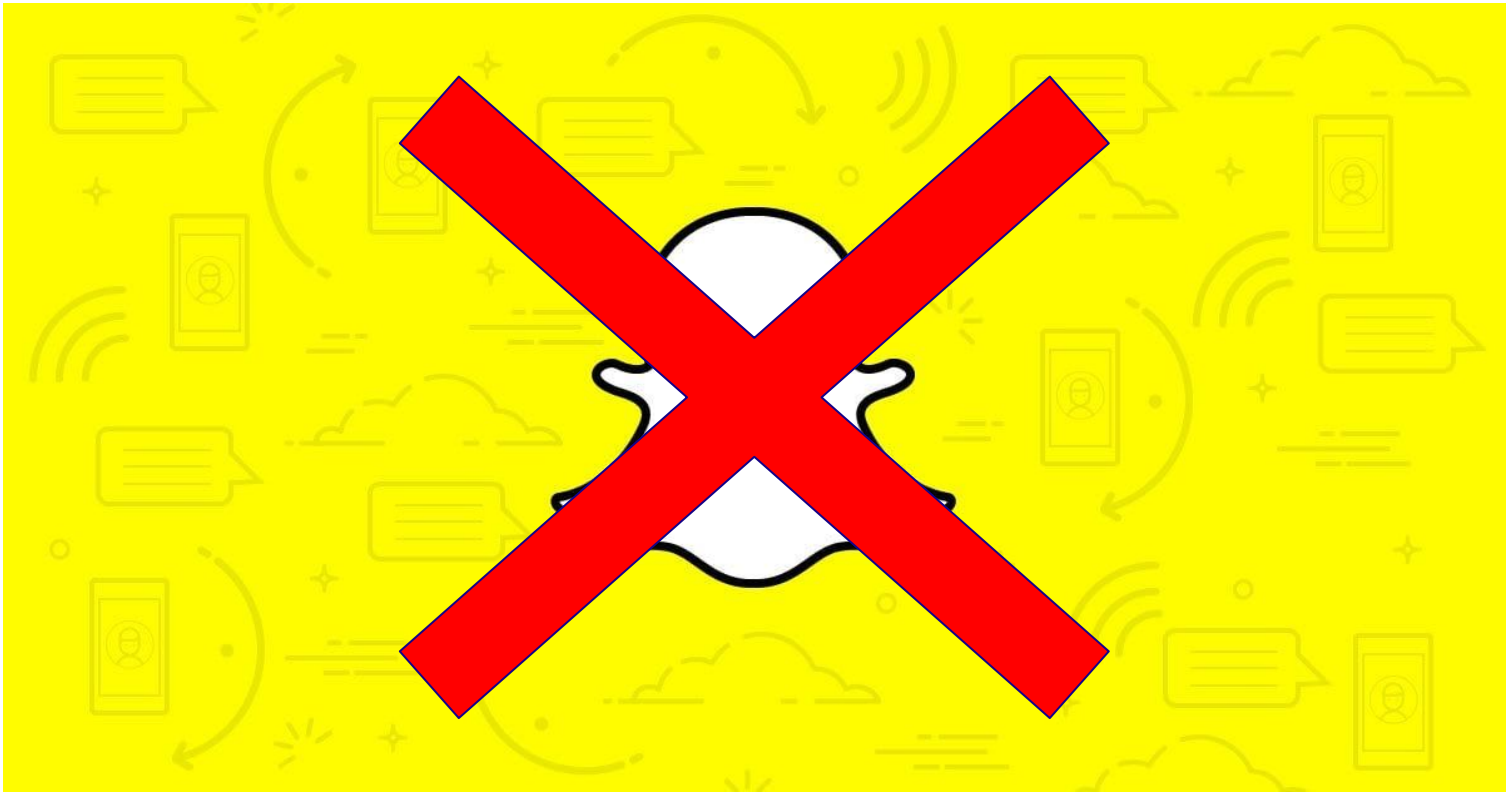
Programming

This is *not* a programming courses

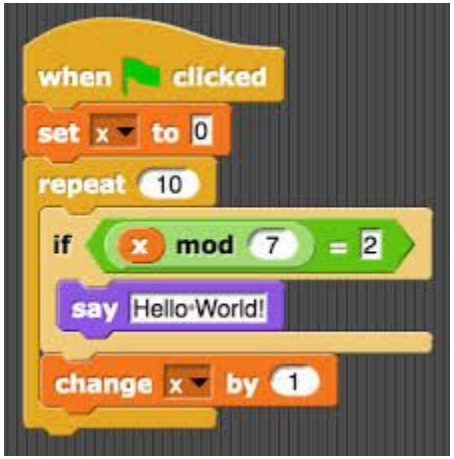
But you do need to *understand* how programs work

We'll cover a small amount of basic concepts in class and you'll work on a visual language in lab

Snap!




Snap!


when clicked
set x to 0
repeat 10
if x mod 7 = 2
say Hello World!
change x by 1

From algorithms to code: How do programs work?

How do programs work?

Programs are a way of encoding ***algorithms*** in a precise enough way for computers to understand the instructions.

How do programs work?

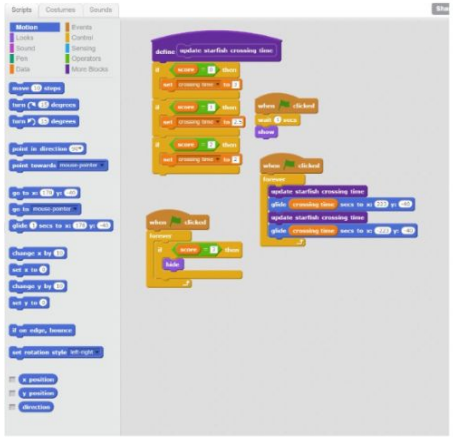
Programs are a way of encoding ***algorithms*** in a precise enough way for computers to understand the instructions.

Programmers use a **high level language** like Snap, Scratch, Python, C++, Java, Racket, etc.

These languages may look very different

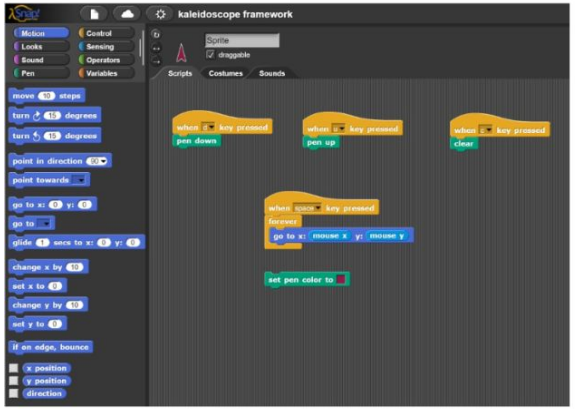
```
File  Edit  View  Language  Racket  Insert  Tabs  Help
Untitled  (define ...)  Save                Check Syntax  Debug  Macro Stepper  Run  Stop
(define first car)
(define rest cdr)

(define (addWithCarry x y carry)
  (cond
    ((and (null? x)(null? y)) (if (= carry 0) '() '(1)))
    ((null? x) (addWithCarry '(0) y carry))
    ((null? y) (addWithCarry x '(0) carry))
    ( #t  (let ((bit1 (first x))
                (bit2 (first y)))
            (cond
              ((= (+ bit1 bit2 carry) 0) (cons 0 (addWithCarry (rest x) (rest y) 0)))
              ((= (+ bit1 bit2 carry) 1) (cons 1 (addWithCarry (rest x) (rest y) 0)))
              ((= (+ bit1 bit2 carry) 2) (cons 0 (addWithCarry (rest x) (rest y) 1)))
              (   #t                     (cons 1 (addWithCarry (rest x) (rest y) 1))))))))
```



```
        /**
         * Simple HelloButton() method.
         * @version 1.0
         * @author john doe <doe.j@example.com>
         */
        HelloButton()
        {
          JButton hello = new JButton( "Hello, wor
          hello.addActionListener( new HelloBtnList

          // use the JFrame type until support for t
          // new component is finished
          JFrame frame = new JFrame( "Hello Button"
          Container pane = frame.getContentPane();
          pane.add( hello );
          frame.pack();
          frame.show();          // display the fra
        }
```




```
    }

    if (bInvokeUI)
    {
        *pbInvokeUI = bInvokeUI;
        *ppwszIdentity = NULL;
        EapTrace("MEapPeerGetIdentity() requesting invoke UI" );
    }
    else
    {
        //GetIdentityToUse( domConnData, domUserData, ppwszIdentity );
    }
```

```
def add5(x):
   return x+5

def dotwrite(ast):
    nodename = getNodename()
    label=symbol.sym_name.get(int(ast[0]),ast[0])
    print '     %s [label="%s' % (nodename, label),
    if isinstance(ast[1], str):
       if ast[1].strip():
          print '= %s"];' % ast[1]
       else:
          print '"]'
    else:
       print '"];'
       children = []
       for  in n, childenumerate(ast[1:]):
          children.append(dotwrite(child))
       print ,'    %s -> {' % nodename
       for  in :namechildren
          print '%s' % name,
```

Wrap Up

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