



How we used Python to introduce teenagers to the fun of programming

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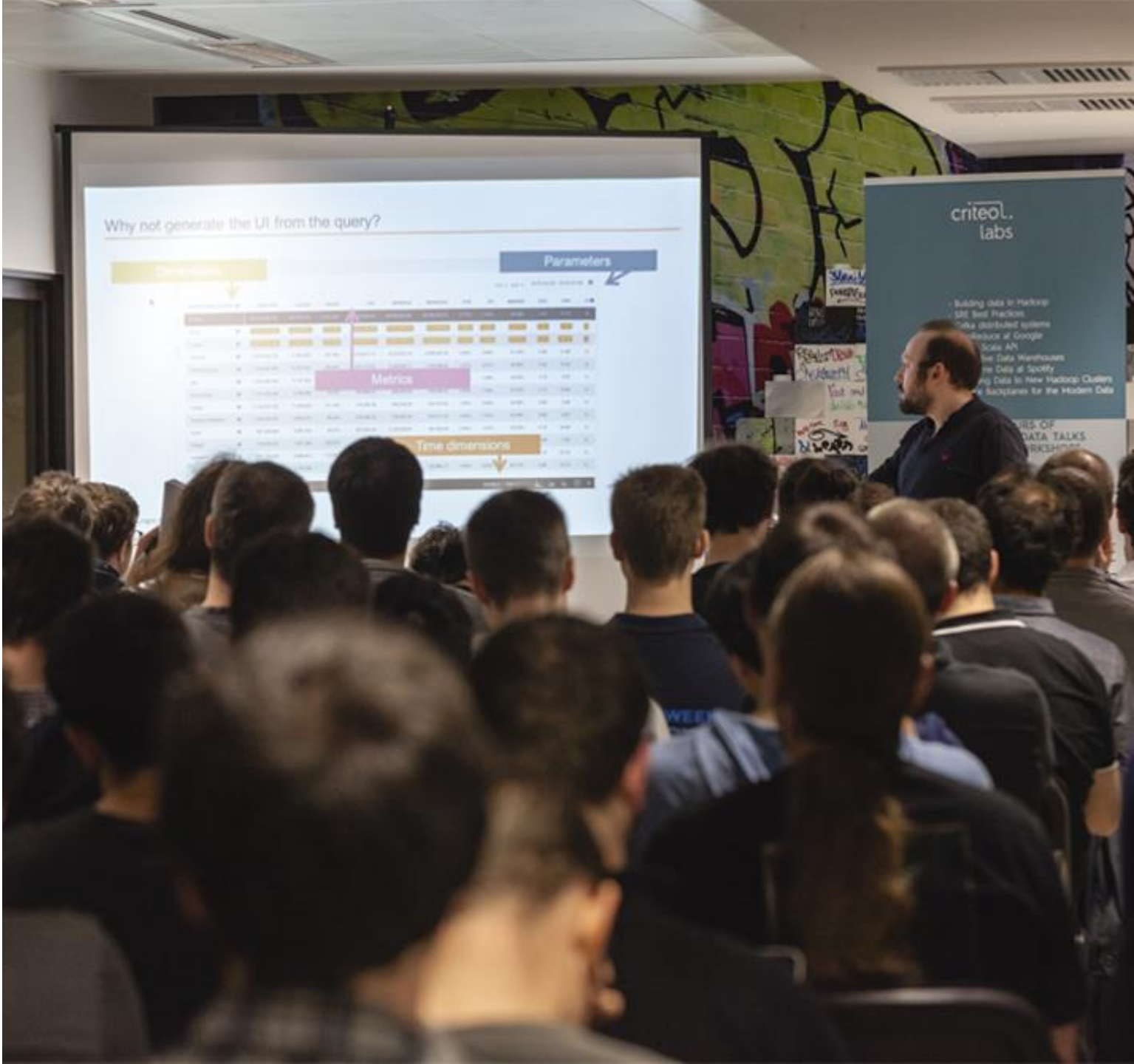
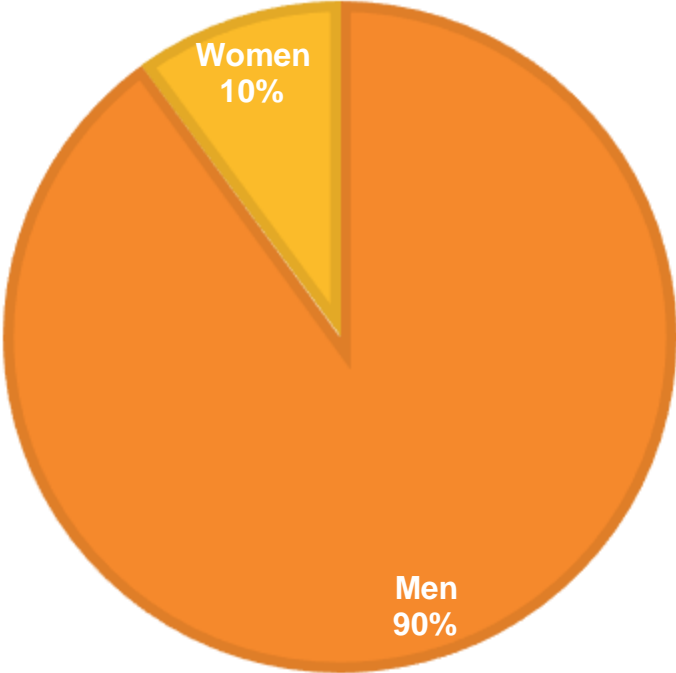
 @amy8492



Problem



CRITEO R&D EMPLOYEES WORLDWIDE



Stereotypes vs. reality



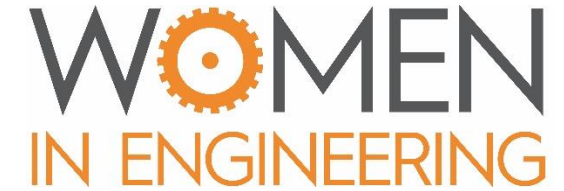
- Women under-representation is a fairly recent phenomenon
- Many women programmers throughout history
- We want the young people to embark!



A day to discover computer science jobs



- Meet women engineers
- Visit our Criteo Paris office
- Have fun & get some swag
- Actually write some code



Preparing the coding part

- Discover computer science
- Motivate career choice in computer science



The time constraint



1h30



**MUST
HAVE**

No bugs



- Setup and check all the computers
- Prepare code



Mentoring



- Pair programming
- Unblocker
- Questions



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Objectives

Have fun & Be creative



- Music, games, images and video, robots
- Immediate feedback



Discover a real programming language



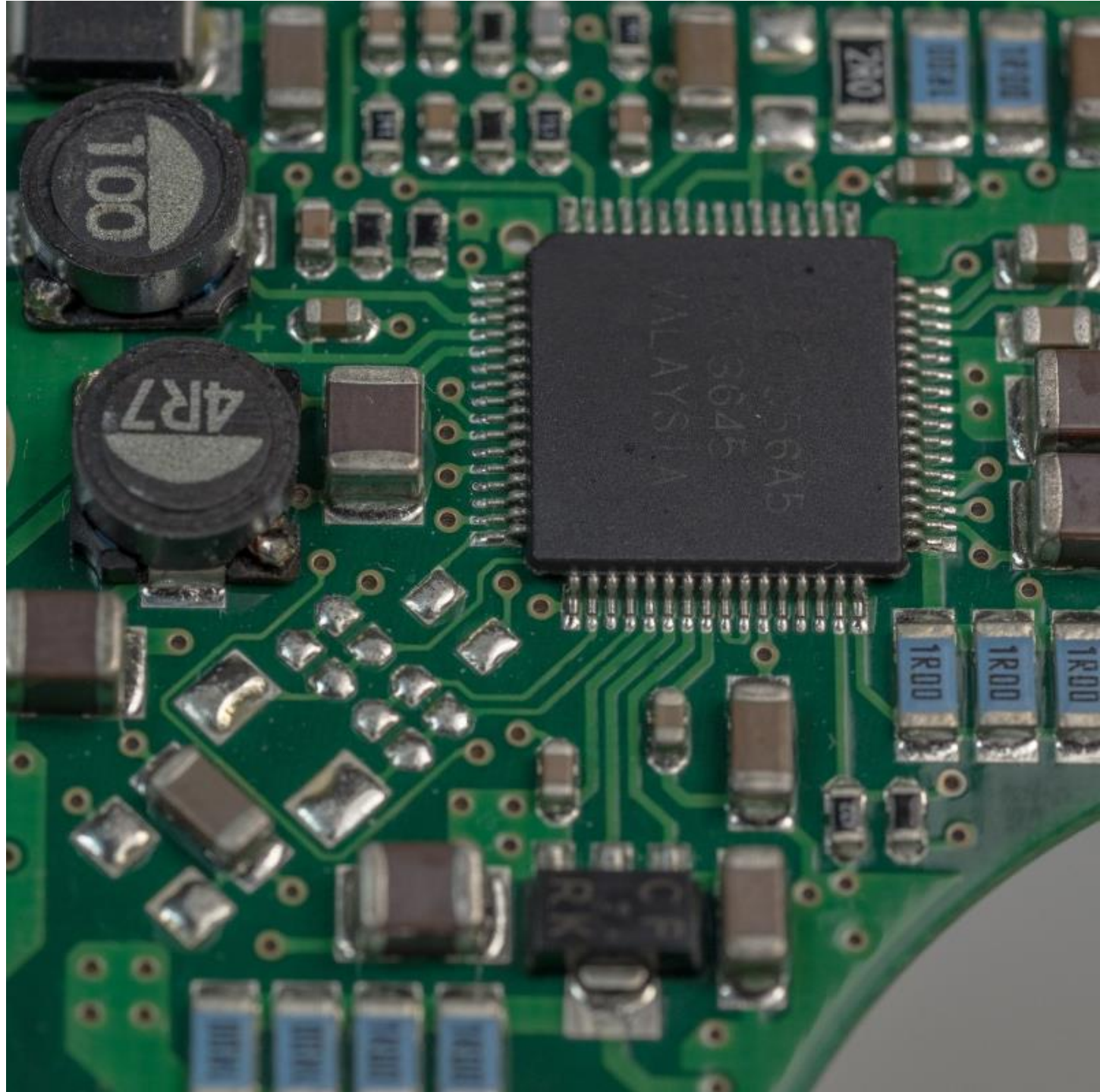
- Reads like english
- Multi-purpose
- Rich ecosystem
- Used by professionals



Discover computer science topics



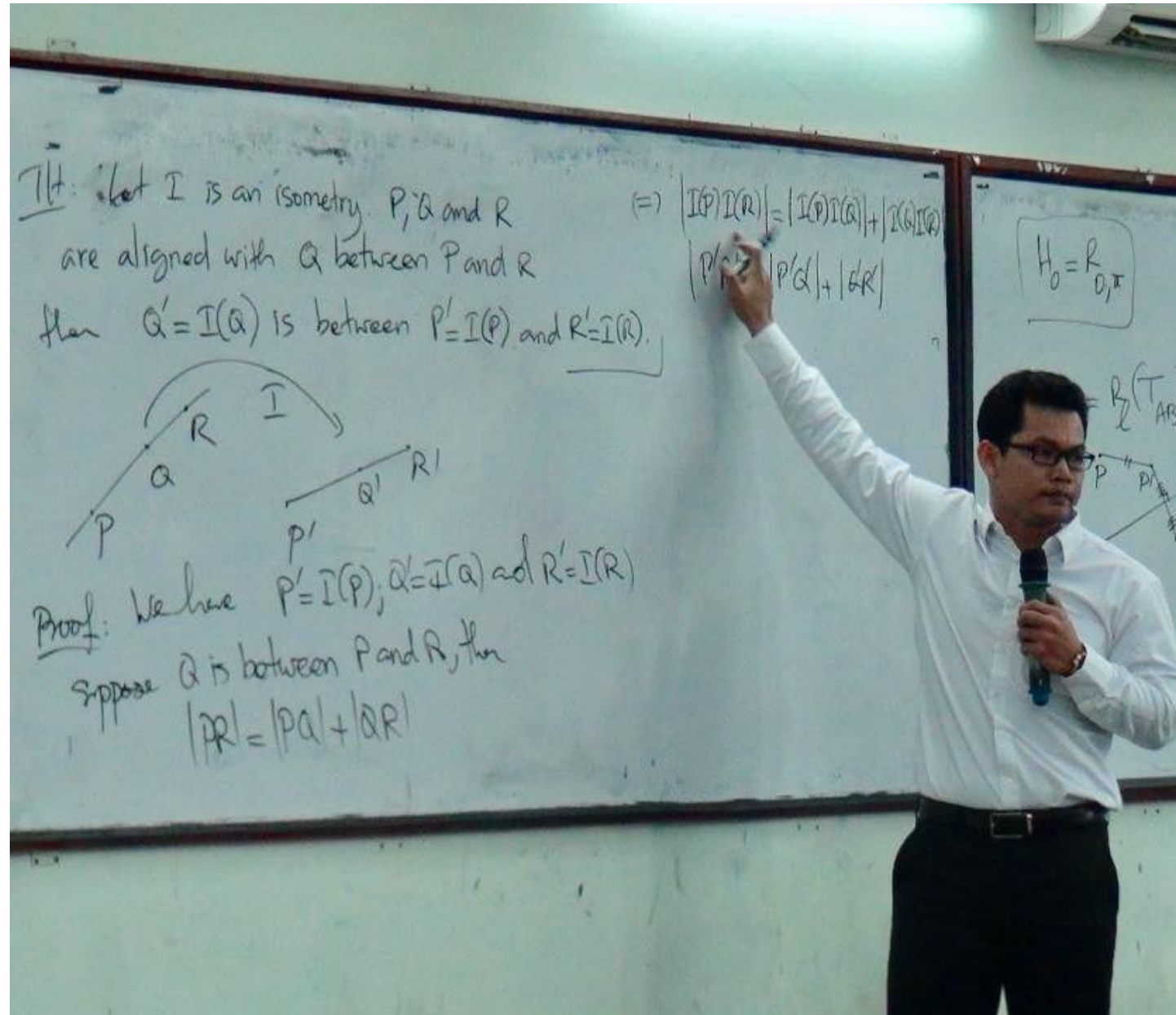
- Robots
- Games
- Video & pictures processing
- Data processing
- Artificial intelligence
- ...



Apply what you already know



- High school Maths
- High school Physics
- English!



Progress



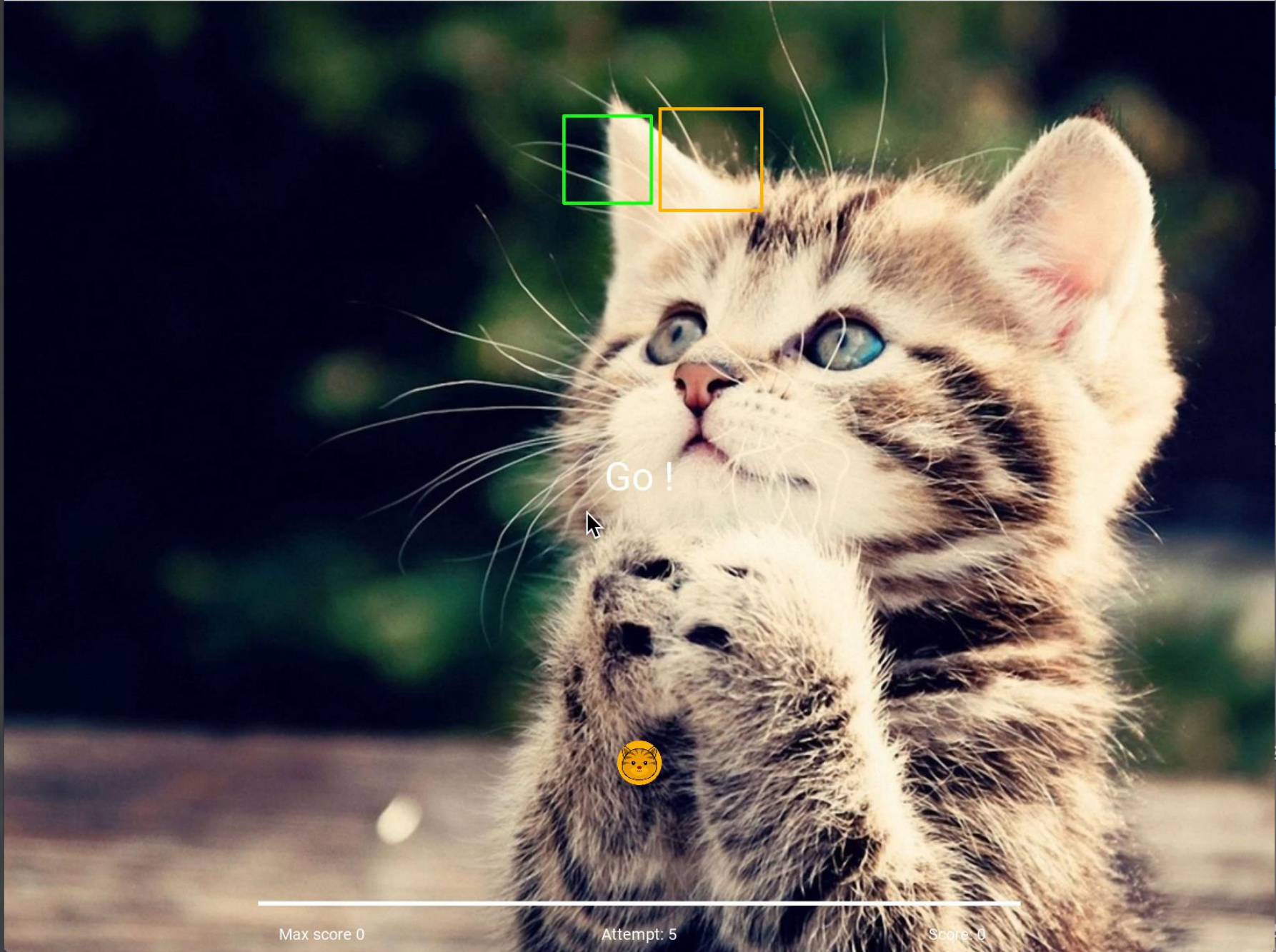
- It feels good to learn
- Step-by-step discoveries



Color-switch alike game

Go !





DOCX (Autosaved) Maven

critic ML Screen Shot 2017-06...16

RL

chator mignon

Presentation1

PPG.pptx

Screen Shot 2017-11-...14.49.13

Screen S 2017-10...16

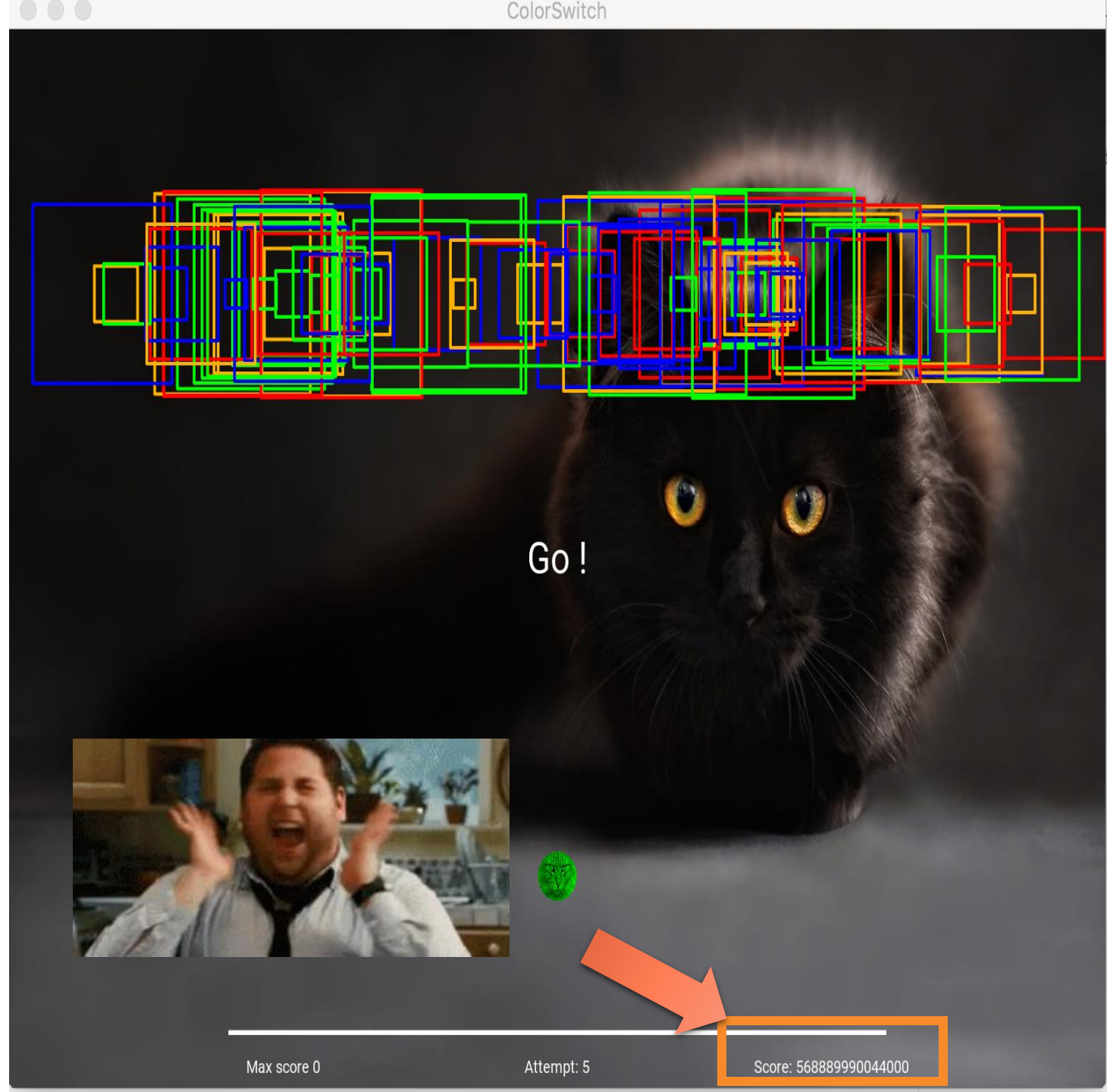
Screen Shot 2017-11-...19.53.23

Presentation [Autosaved]

Have fun & Be creative



- Have fun
 - > Play Games
 - > Win the Game
 - > Be the best at your game !
- Be creative:
 - > change the game's set up
 - > change the rules
 - > change the graphics
 - ...



Discover a real programming language



- Simple functions
 - for loops
 - if conditions

```
from kivy.animation import Animation
# import kivy properties
from kivy.properties import NumericProperty

# import classes
from anim_rectangle import *

class AnimBall(Widget):
    r = NumericProperty(0)
    g = NumericProperty(0)
    b = NumericProperty(1)

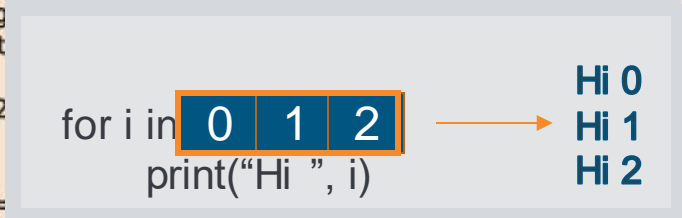
    def __init__(self, **kwargs):
        super(AnimBall, self).__init__(**kwargs)
        size = Window.width / 50 + Window.height / 50
        self.width = size
        self.height = size
        self.x = (Window.width / 2 - self.width / 2)
        self.y = (Window.height / 5 - self.height / 2)
        color = RandomColor()
        self.r, self.g, self.b = color.update_color()
        self.add_rectangles(10)

    def on_touch_down(self, *args):
        initial_y = Window.height / 5 - self.height / 2
        initial_x = (Window.width / 2 - self.width / 2)
        y = Window.height / 10 + self.y
        max_y = 2*Window.height - self.height / 2
        if self.y + y < max_y:
            Animation.cancel_all(self)
            animation = Animation(x=initial_x, y=initial_y)
            animation += Animation(x=initial_x, y=initial_y, duration=0.3, t='in_cubic')
            animation.start(self)

    def add_rectangles(self, nb_rectangles):
        # add nb rectangles
        self.add_widget(ClockRect())

# It's here the file to modify for the ex_4

# 1 the objective is to modify add_rectangles to add multiple rectangles
# use a loop: for
# use range()
```



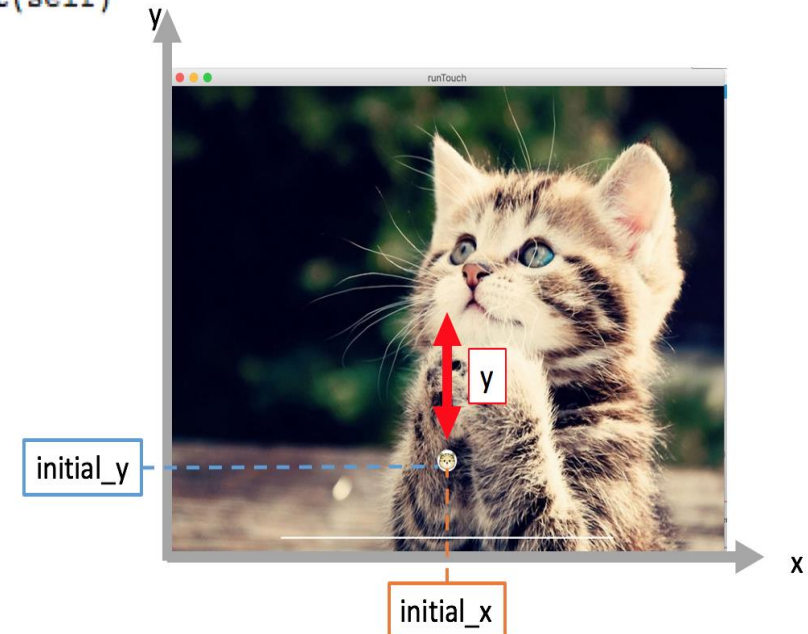
Discover a real programming language



- Simple functions
 - for loops
 - if conditions
- Using libraries: Kivy
 - Learn to look for information on the web!
 - read the documentation

```
1 # to run the application
2 from kivy.uix.widget import Widget
3 from kivy.base import runTouchApp
4 from kivy.core.window import Window
5 # animation/ mouvement
6 from kivy.animation import Animation
7 # import kivy properties
8 from kivy.properties import NumericProperty
9
```

```
def on_touch_down(self, touch):
    initial_y = Window.height / 5 - self.height / 2
    initial_x = (Window.width / 2 - self.width / 2)
    y = Window.height / 5 + self.y
    # jump!
    animation = Animation(x=initial_x, y=y, duration=0.4, t='linear')
    animation += Animation(x=initial_x, y=initial_y, duration=0.4, t='linear')
    animation.start(self)
```



Discover computer science topics

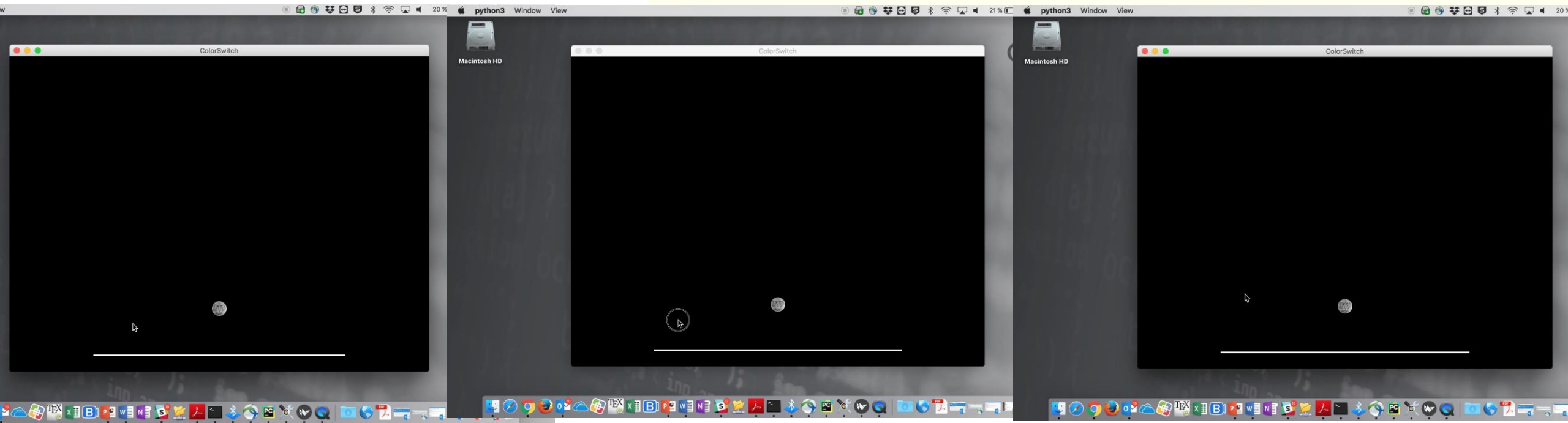


- Create games:
 - Action on clicks
 - Animation

```
class AnimBall(Widget):
```

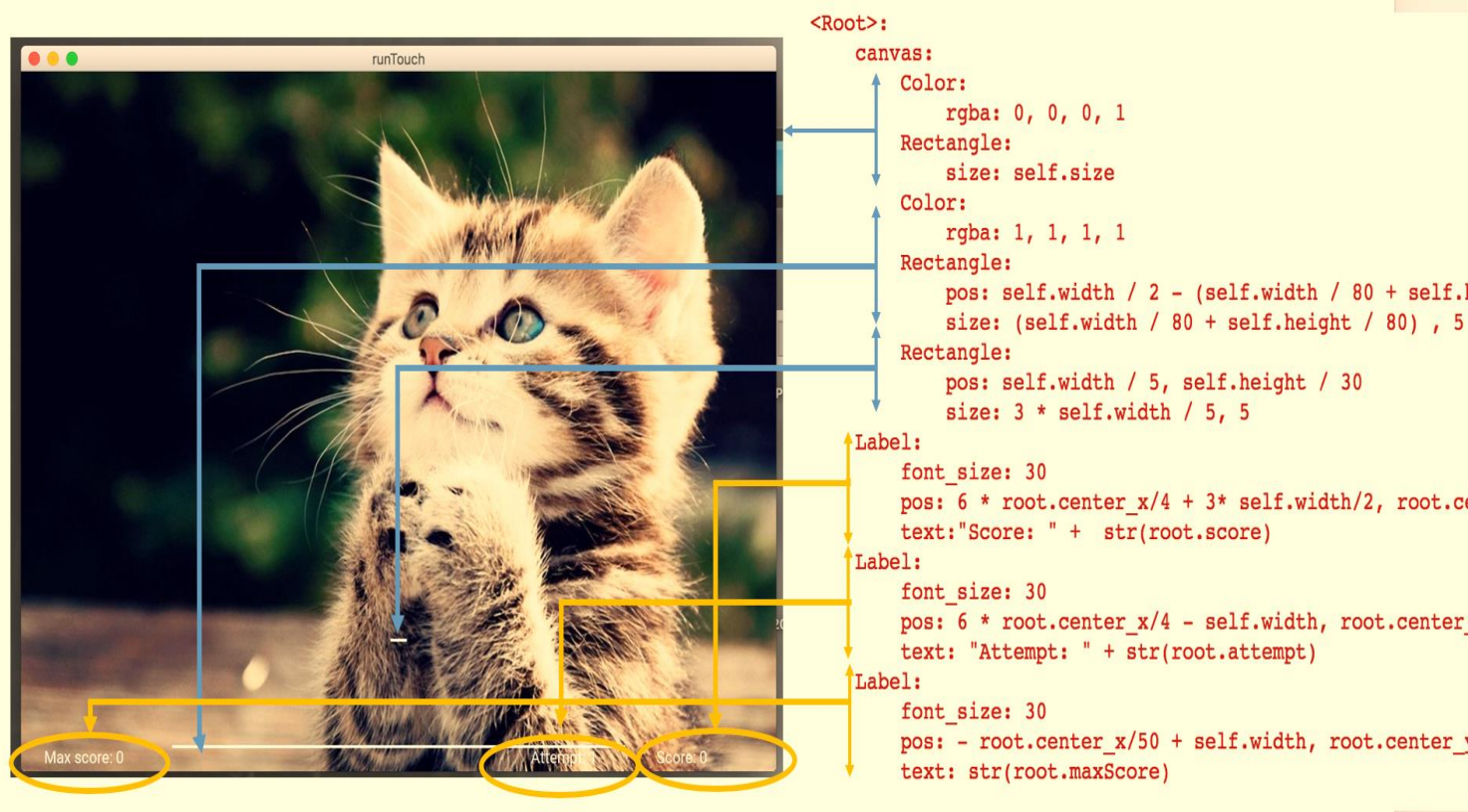
```
    def __init__(self, **kwargs):  
        super(AnimBall, self).__init__(**kwargs)  
        size = Window.width / 50 + Window.height / 50  
        self.width = size  
        self.height = size  
        self.x = (Window.width / 2 - self.width / 2)  
        self.y = (Window.height / 5 - self.height / 2)
```

```
    def on_touch_down(self, touch):  
        initial_y = Window.height / 5 - self.height / 2  
        initial_x = (Window.width / 2 - self.width / 2)  
        y = Window.height / 5 + self.y  
        # jump!  
        animation = Animation(x=initial_x, y=y, duration=0.4, t='linear')  
        animation += Animation(x=initial_x, y=initial_y, duration=0.4, t='linear')  
        animation.start(self)
```



Discover computer science topics

- Create games:
 - Action on clicks
 - Animation
 - Graphics



```
<Root>:
canvas:
    Color:
        rgba: 0, 0, 0, 1
    Rectangle:
        size: self.size
    Color:
        rgba: 1, 1, 1, 1
    Rectangle:
        pos: self.width / 2 - (self.width / 80 + self.height / 80), 5
        size: (self.width / 80 + self.height / 80), 5
    Rectangle:
        pos: self.width / 5, self.height / 30
        size: 3 * self.width / 5, 5
    Label:
        font_size: 30
        pos: 6 * root.center_x/4 + 3* self.width/2, root.center_y
        text:"Score: " + str(root.score)
    Label:
        font_size: 30
        pos: 6 * root.center_x/4 - self.width, root.center_y
        text: "Attempt: " + str(root.attempt)
    Label:
        font_size: 30
        pos: - root.center_x/50 + self.width, root.center_y
        text: str(root.maxScore)
```

It's here the file to modify for the ex_2

```
# 1: <AnimBall>:
```

```
# Add an image for AnimBall. use: source: '../images/cat_ball.jpg' in Ellipse
```

```
# 2: <Root>:
```

```
# Add an image for the Root. Use: source: '../images/cat1.jpg' in the right rectangle
```

```
# Add The text maxScore
```

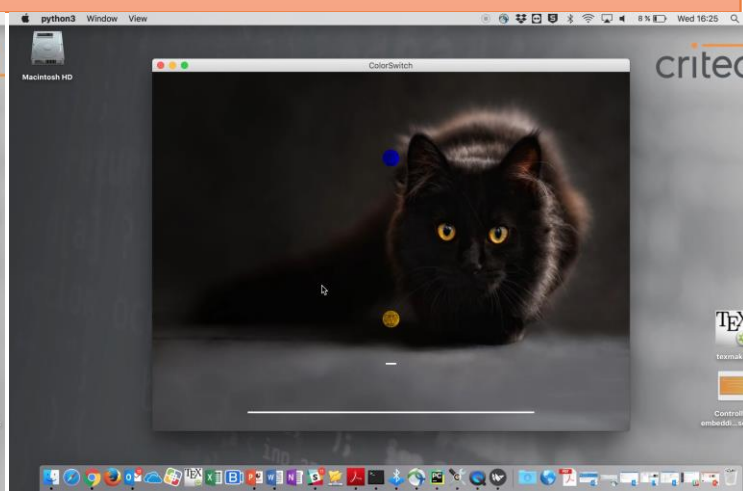
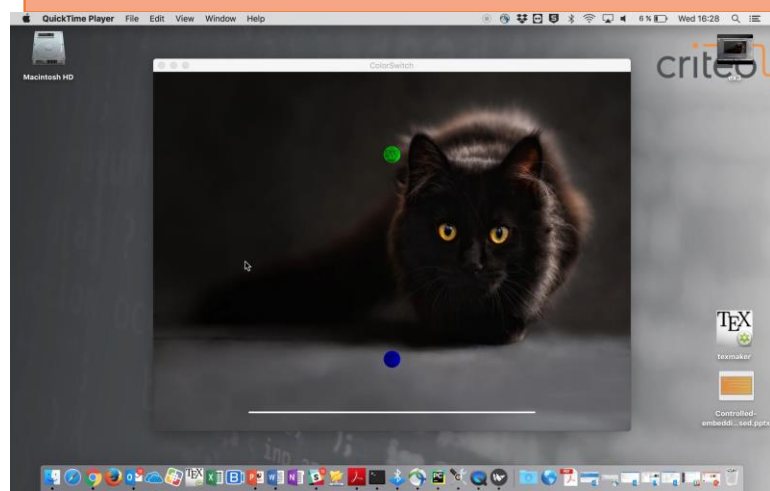
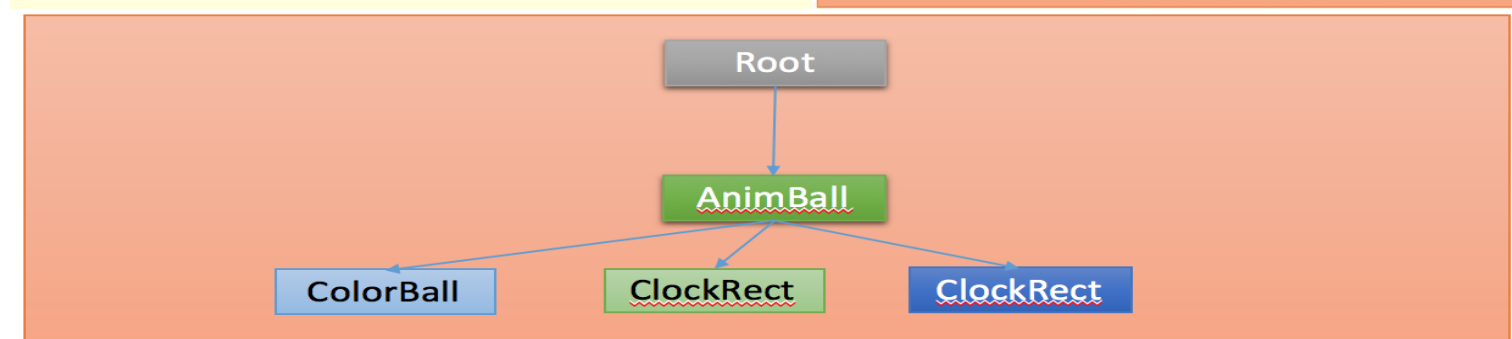
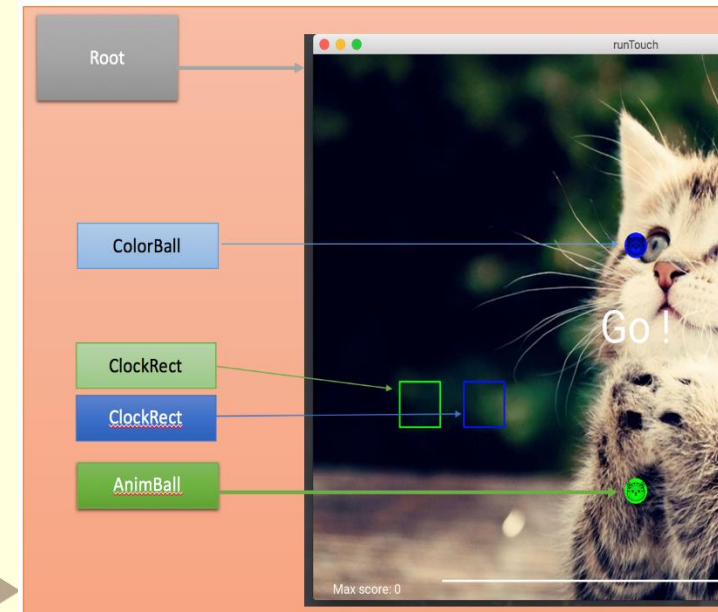
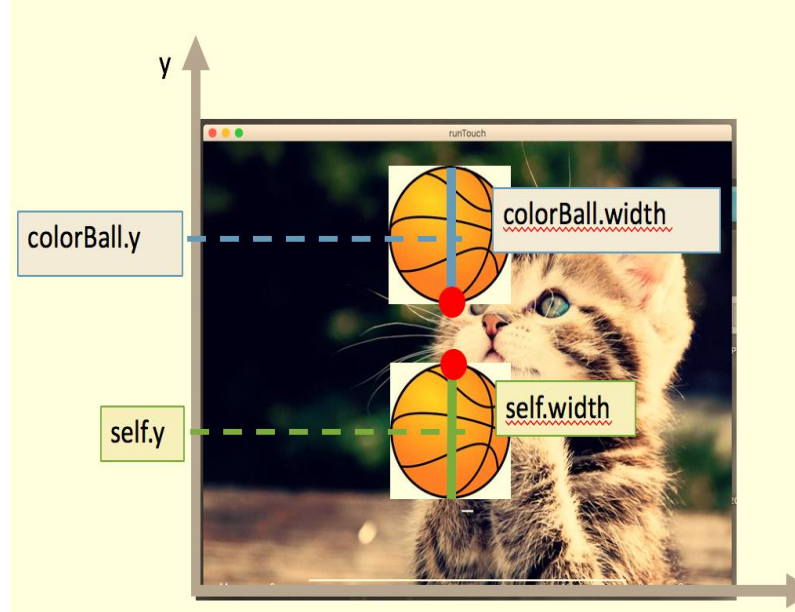
```
# 3: <ColorBall>:
```

```
# ColorBall is missing lets code it ! we want a ball similar to AnimBall
```

For more details see <https://kivy.org/docs/api-kivy.lang.builder.html>

Discover computer science topics

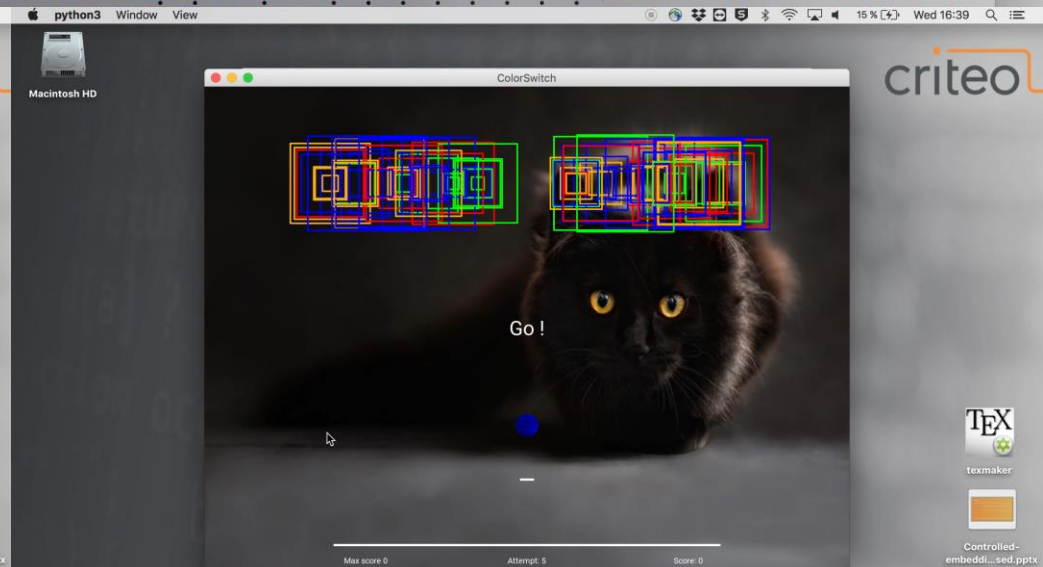
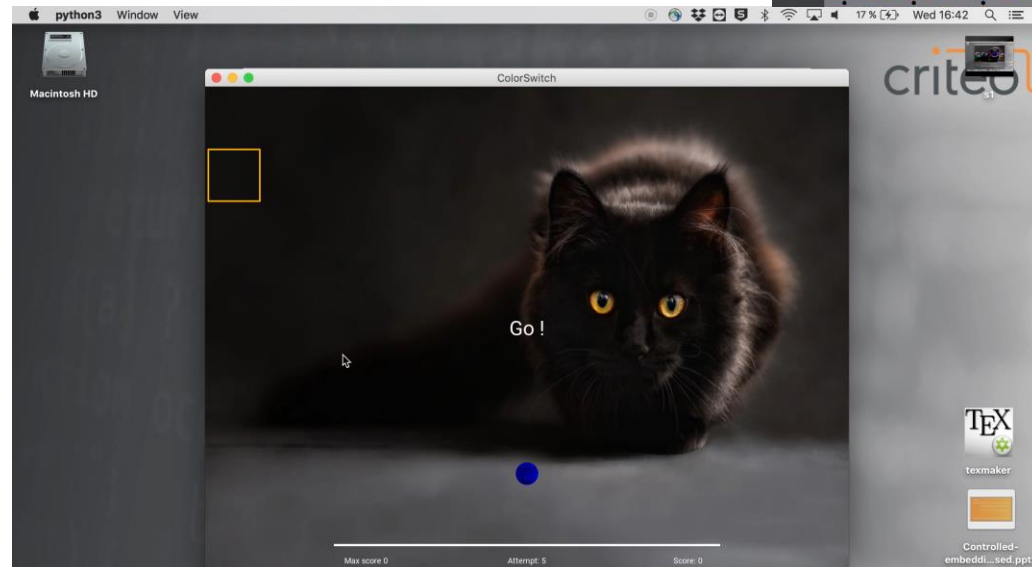
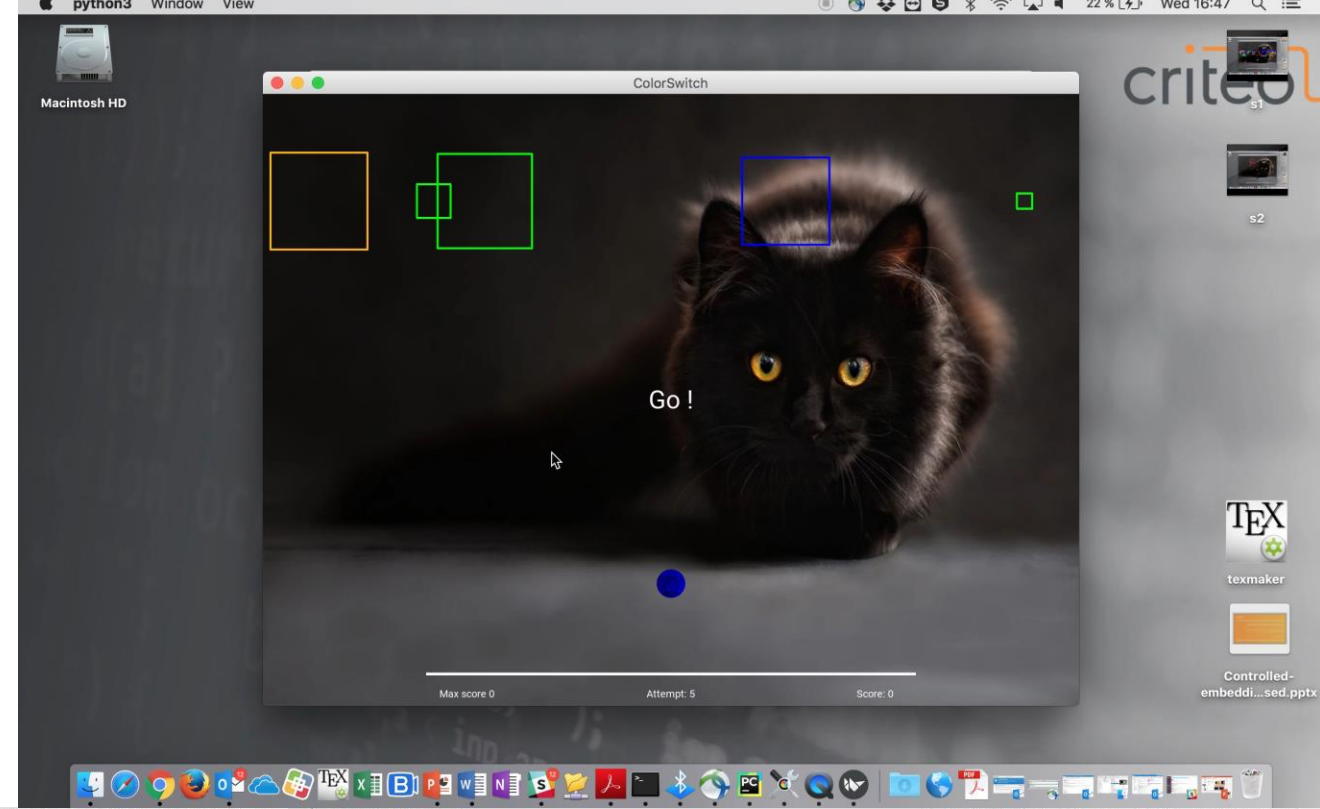
- Create games:
 - Action on clicks
 - Animation
 - Graphics
 - Frame displays
 - Widget interactions (master and slave)



Discover computer science topics



- Create games:
 - Action on clicks
 - Animation
 - Graphics
 - Frame displays
 - Widget interactions (master and slave)
 - Progress
 - Game hacking



Apply what you already know



- Physics

- Use positions to check collisions
 - Increase the speed

- Math

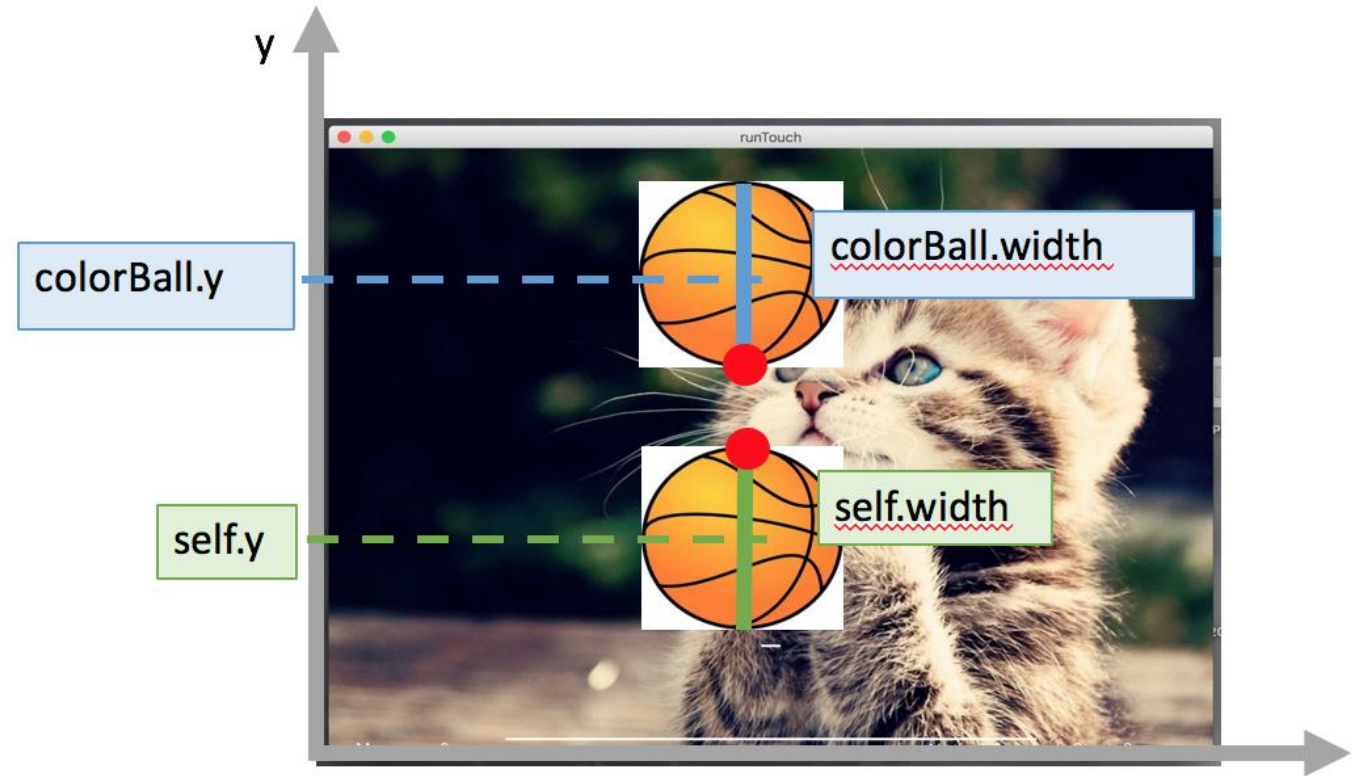
- Use variables to automate changes

- Logic

- Realistic animation
 - Scoring rules

- Geometry and drawings

- Create the widgets graphics



Progress



- Workshop + presentation
- Increase difficulty
- Discover different parts of the game
- Let's hack and play the game !



A photograph of five kittens of various breeds (ginger tabby, white, and dark tabby) sitting on a light-colored surface and looking upwards. The background features a window with white curtains and a framed picture on the wall. The text 'Crazy filters' is overlaid in a stylized orange font.

**Crazy
filters**

Get creative



- Teens love Snapchat & Instagram
- Even basic image processing is fun
- Use the webcam for immediate feedback



Python



- Powered by Kivy & Numpy
- Boosted with OpenCV

- GUI to ease testing
- Commented in french



```
4
5 from ui.crazyfiltersapp import CrazyFiltersApp
6
7 if __name__ == '__main__':
8     CrazyFiltersApp().run()
9
```

main.py

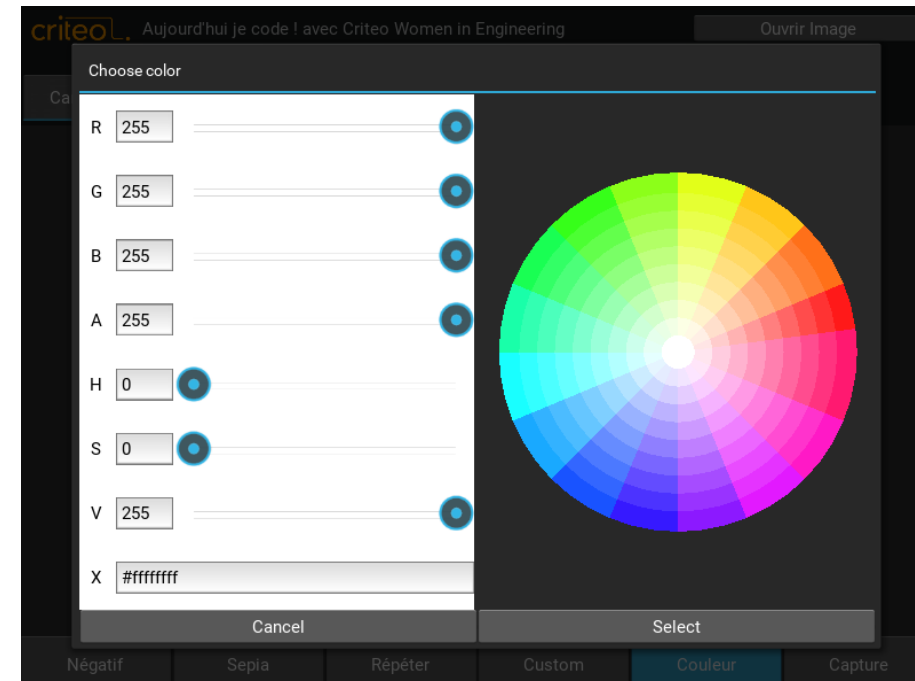
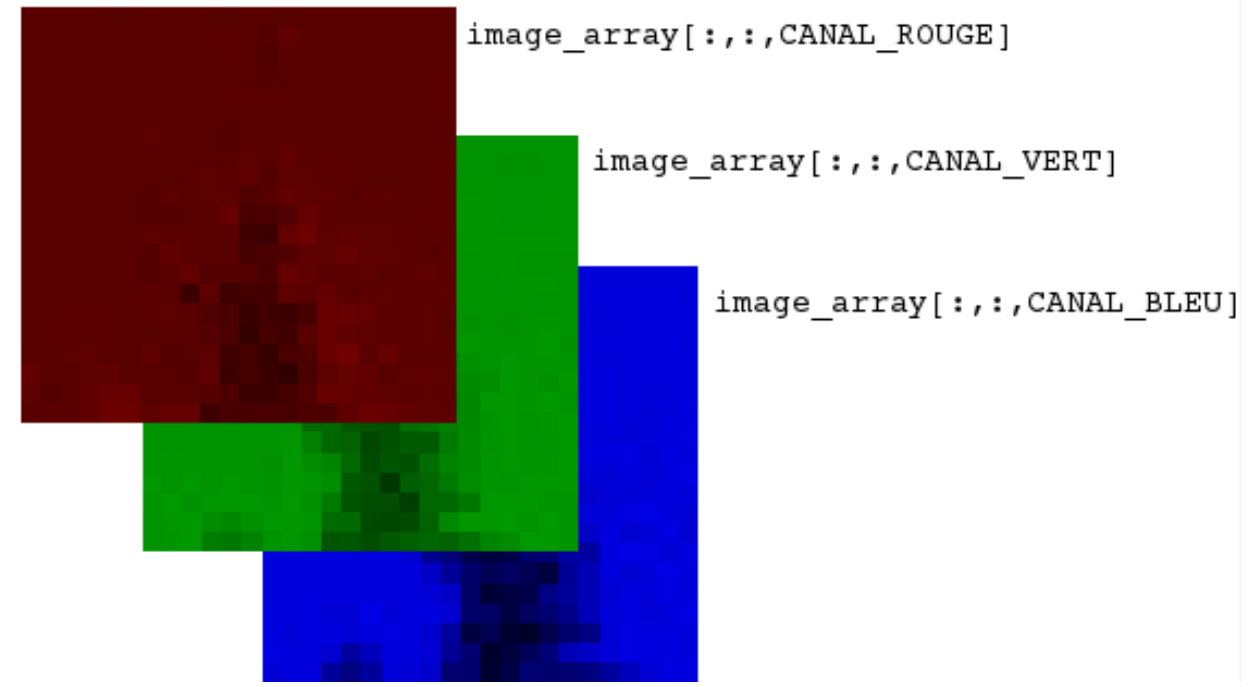
```
2 Dans ce module, tu trouveras des définitions
3
4 Il est recommandé de lire le Readme ou d'
5 avant de se lancer dans le code.
6 """
7 import os
8 import numpy as np
9 import cv2
10
```

transforms.py

Image processing



- Digital images
- Use RGB color system to create custom colorizations



From simple to complex



- Draw rectangles
- Draw flags
- Combine effects
- Use OpenCV...

... AI inside !!!

```
image_array[:, :, CANAL_VERT] = 0  
image_array[:, :, CANAL_BLEU] = 0
```

```
image_array[0:10, :, :] = 0
```

```
h, w, c = image_array.shape  
image_array[:, (w - 10):w, :] = 255  
image_array[:, 10:20, :] = 255
```

```
image_array = 255 - image_array
```

Demo time!

Maths to the rescue



- The image coordinate system
- How do you draw a star?



```
angle = -np.pi / 2 + rotate
px = max_radius * np.cos(angle)
py = max_radius * np.sin(angle)
list_of_points = [(px, py)]
for _ in range(nb_branch):
    angle += np.pi / nb_branch
    px = min_radius * np.cos(angle)
    py = min_radius * np.sin(angle)
    list_of_points.append((px, py))
    angle += np.pi / nb_branch
    px = max_radius * np.cos(angle)
    py = max_radius * np.sin(angle)
    list_of_points.append((px, py))
return list_of_points
```




Feedback

Students



« avoir passé une journée chez Criteo m'a apporté bien plus que je ne l'imaginais. »

« j'ai particulièrement aimé cette joie qui nous a été communiquée, jointe à l'envie de créer et de programmer en découvrant de nouvelles choses. »



Teachers



- Exercises are not easy!



Take-aways



- Close mentoring
- Competition helps creativity
- Don't hide code difficulty



We're doing it again soon!



- Contact CGénial if you want to participate



Checkout our code on <https://github.com/criteo/je-code-crazy-filters>



Journée portes ouvertes à Criteo

Vendredi 30 Novembre 2018
de 09:30 à 17:00

- > 60 étudiants à la découverte de l'univers et des métiers du code,
- > Des exercices ludiques et guidés par des développeurs et ingénieurs,
- > Et beaucoup de surprises !

criteo
labs

WOMEN
IN ENGINEERING

En partenariat avec:
FONDATION
CGénial