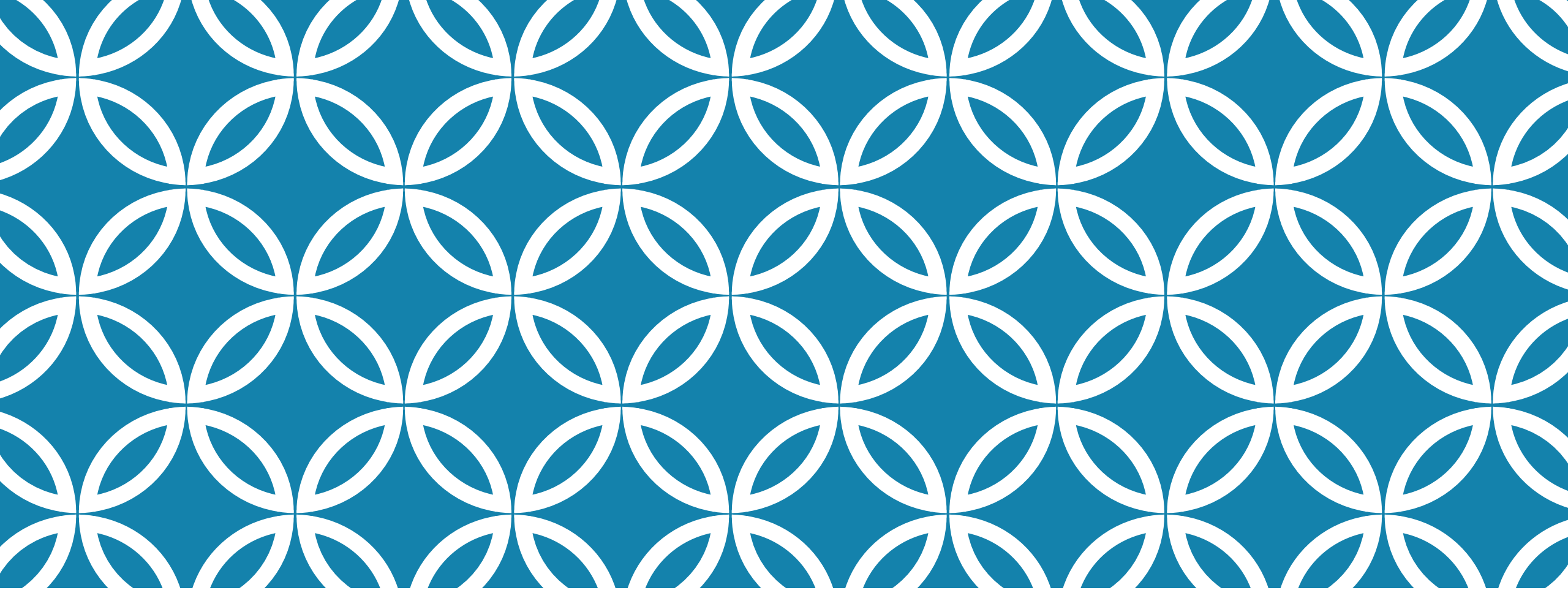


IMAGE2CODE

5/Jun/2019

CONTENTS

What is this?

Problem Statement

Progress

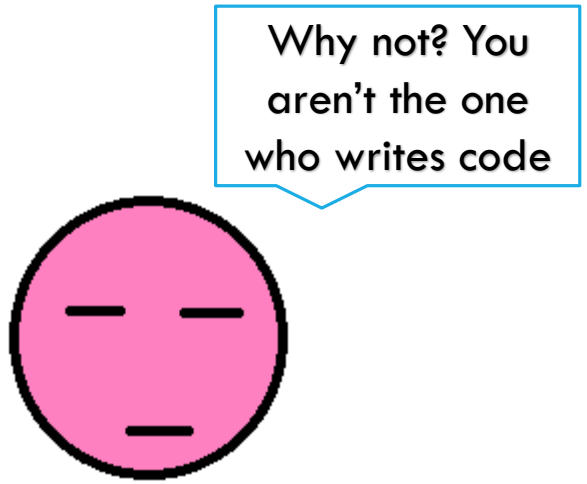
Current Results

WHAT IS THIS?

User Scenario 1

John – Designer

Know nothing about coding

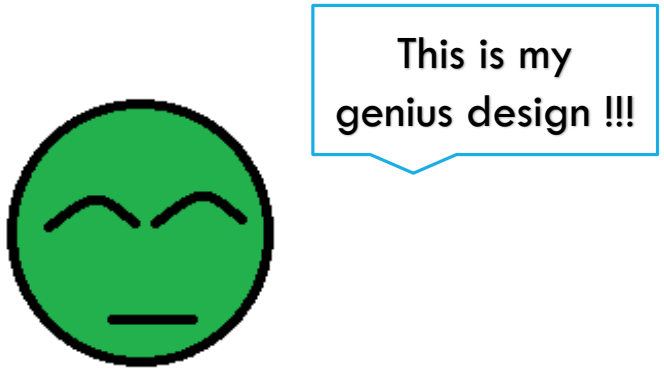


Bob – Web Developer

Care about nothing except coding

WHAT IS THIS?

User Scenario 1



John – Designer

Know nothing about coding

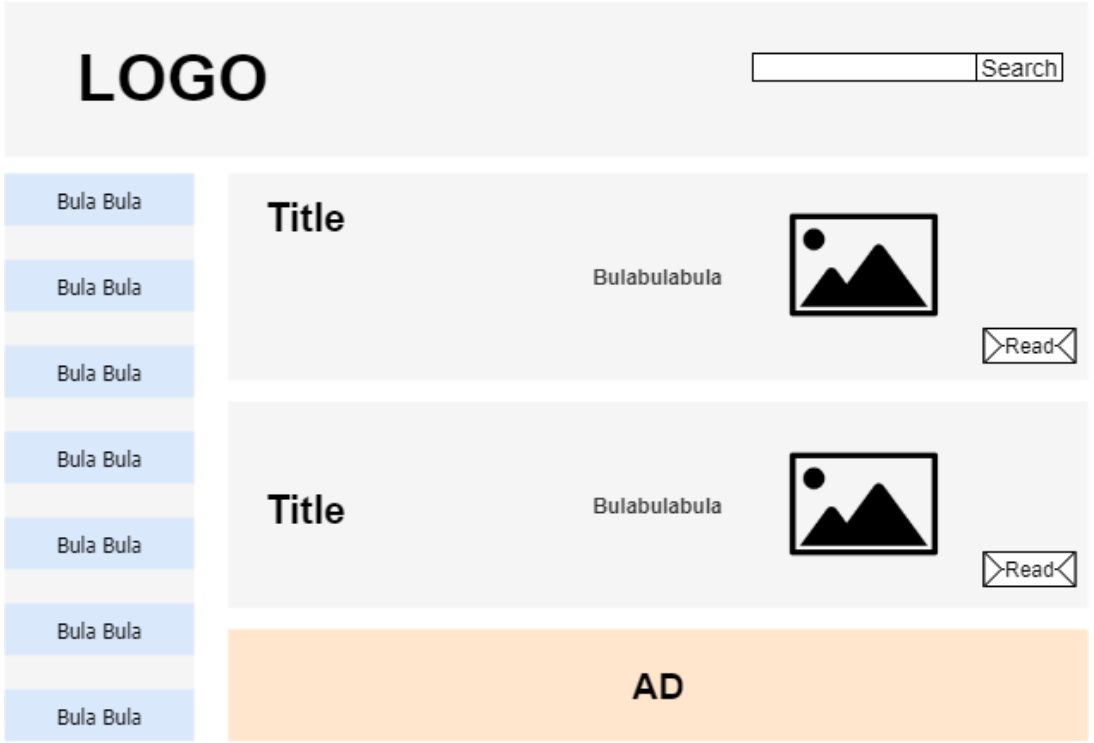


Image Prototype

WHAT IS THIS?

User Scenario 1

Okay, I will spend four days to transform this into code

Bob – Web Developer

Care about nothing except coding

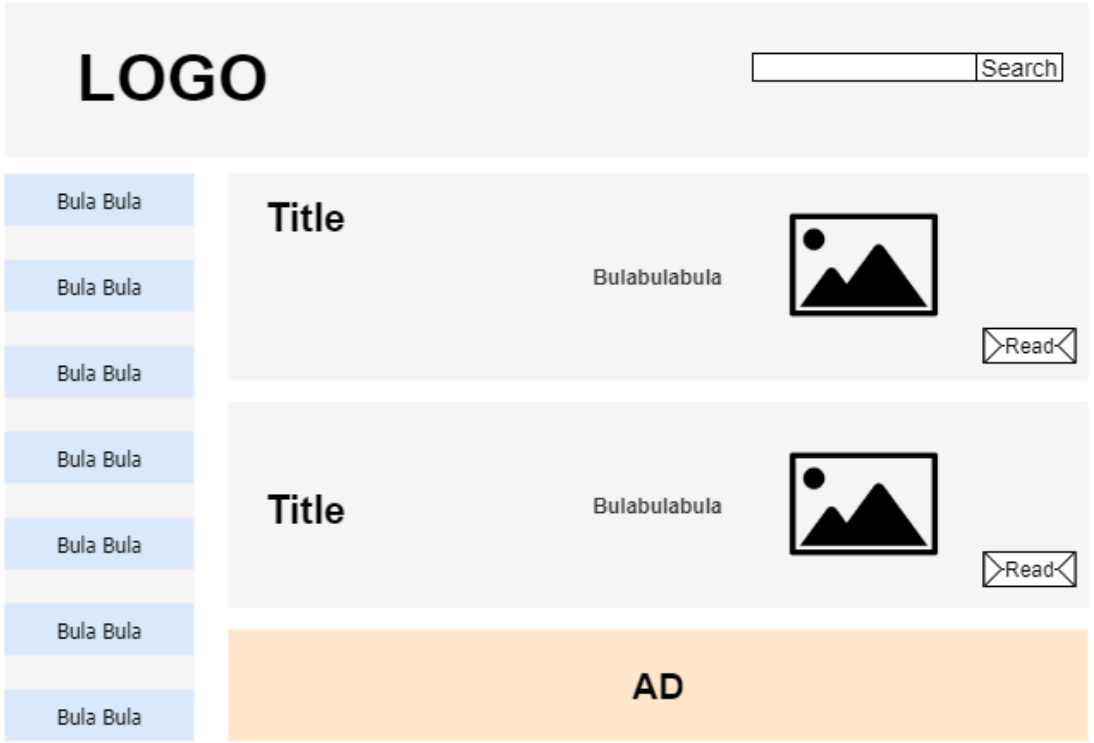


Image Prototype

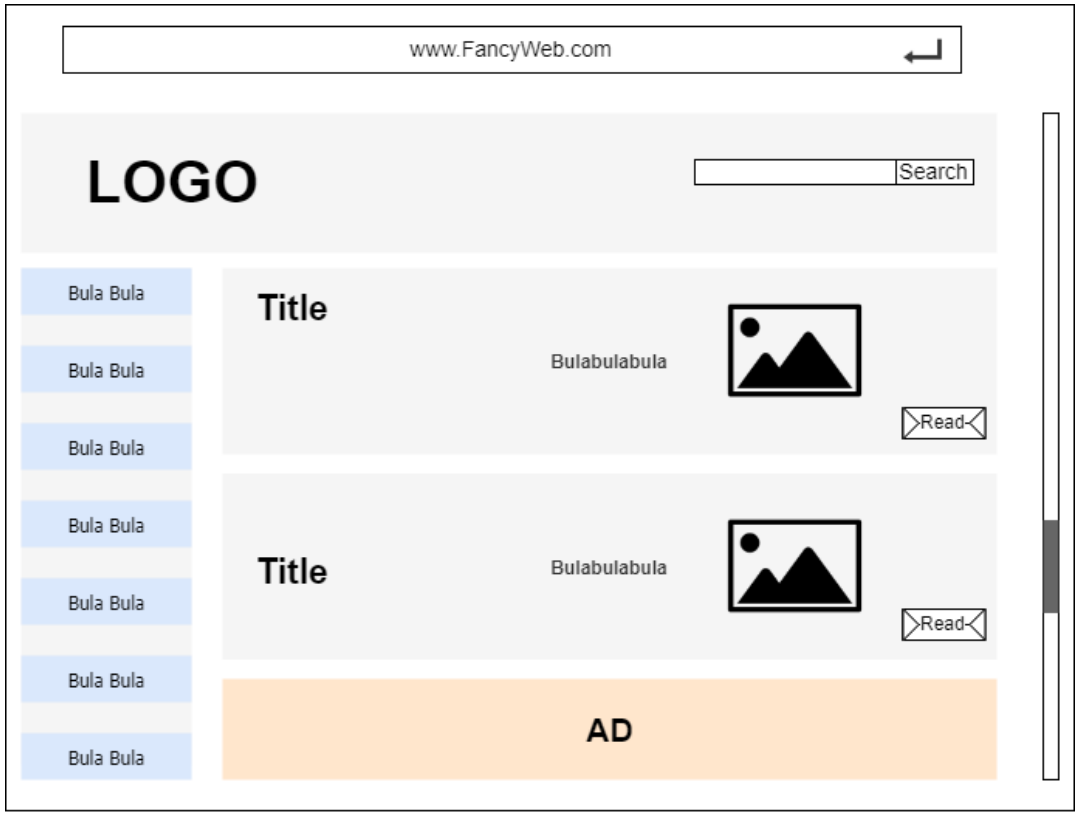
WHAT IS THIS?

User Scenario 1

OR, I can take several SECONDS to do so by using the IMG2CODE

Bob – Web Developer

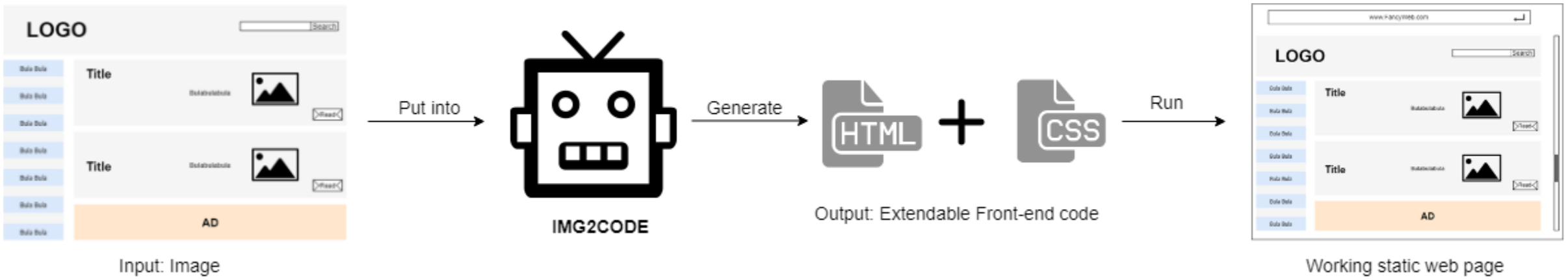
Care about nothing except coding



Working Static Webpage

WHAT IS THIS?

User Scenario 1: Image Design to Code



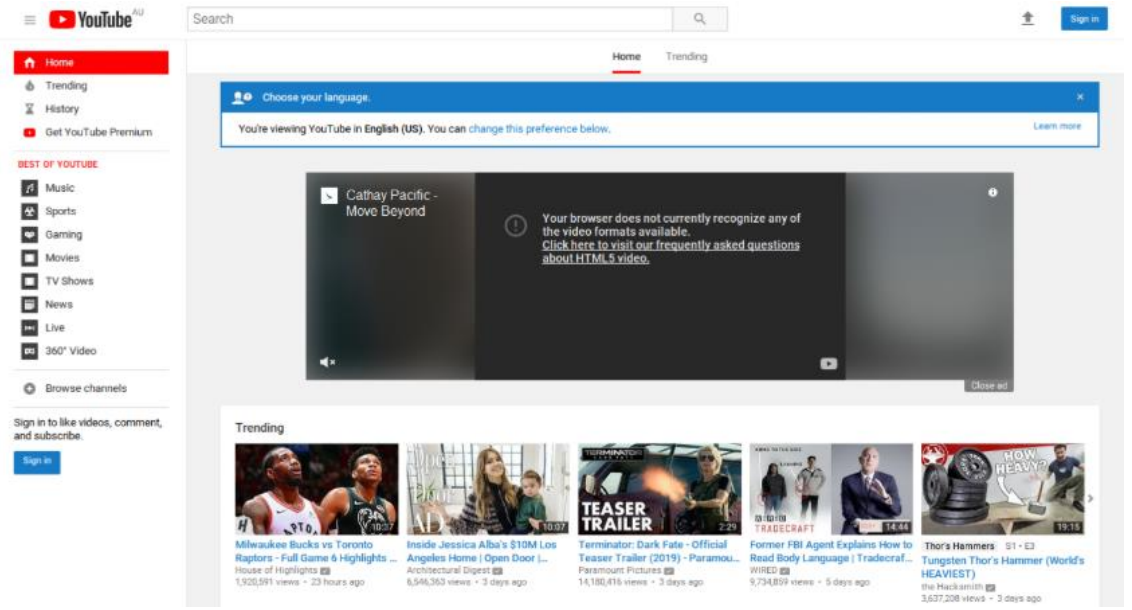
WHAT IS THIS?

User Scenario 2

Let me check Youtube

Bob – Web Developer

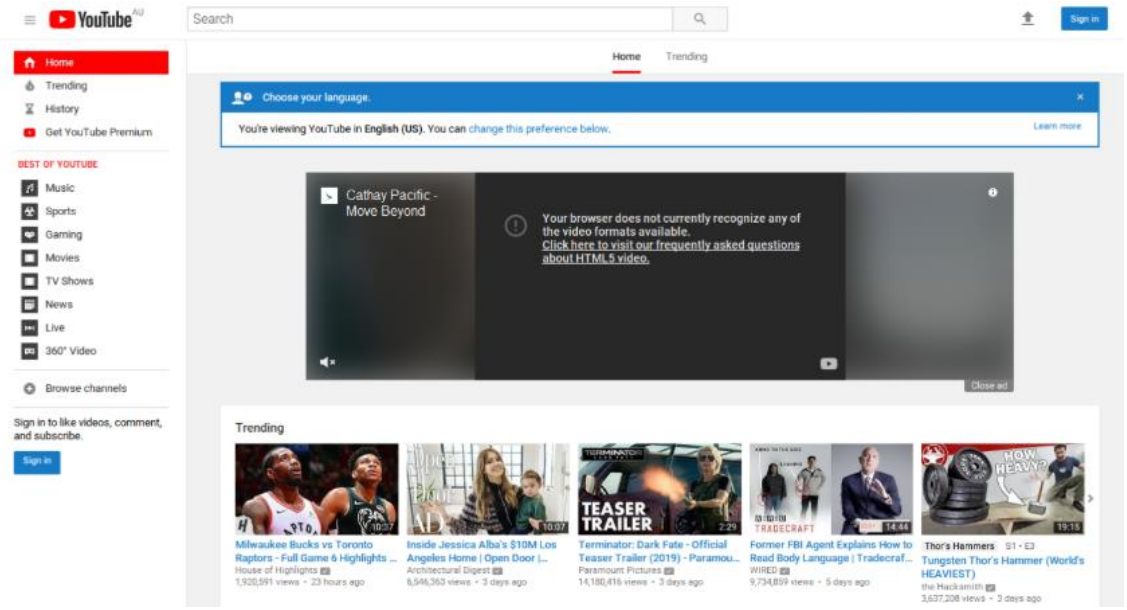
Care about nothing except coding



WHAT IS THIS?

User Scenario 2

This is what I want !!!
It would be perfect if I can have the similar design style !!!



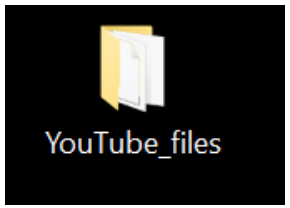
Bob – Web Developer

Care about nothing except coding

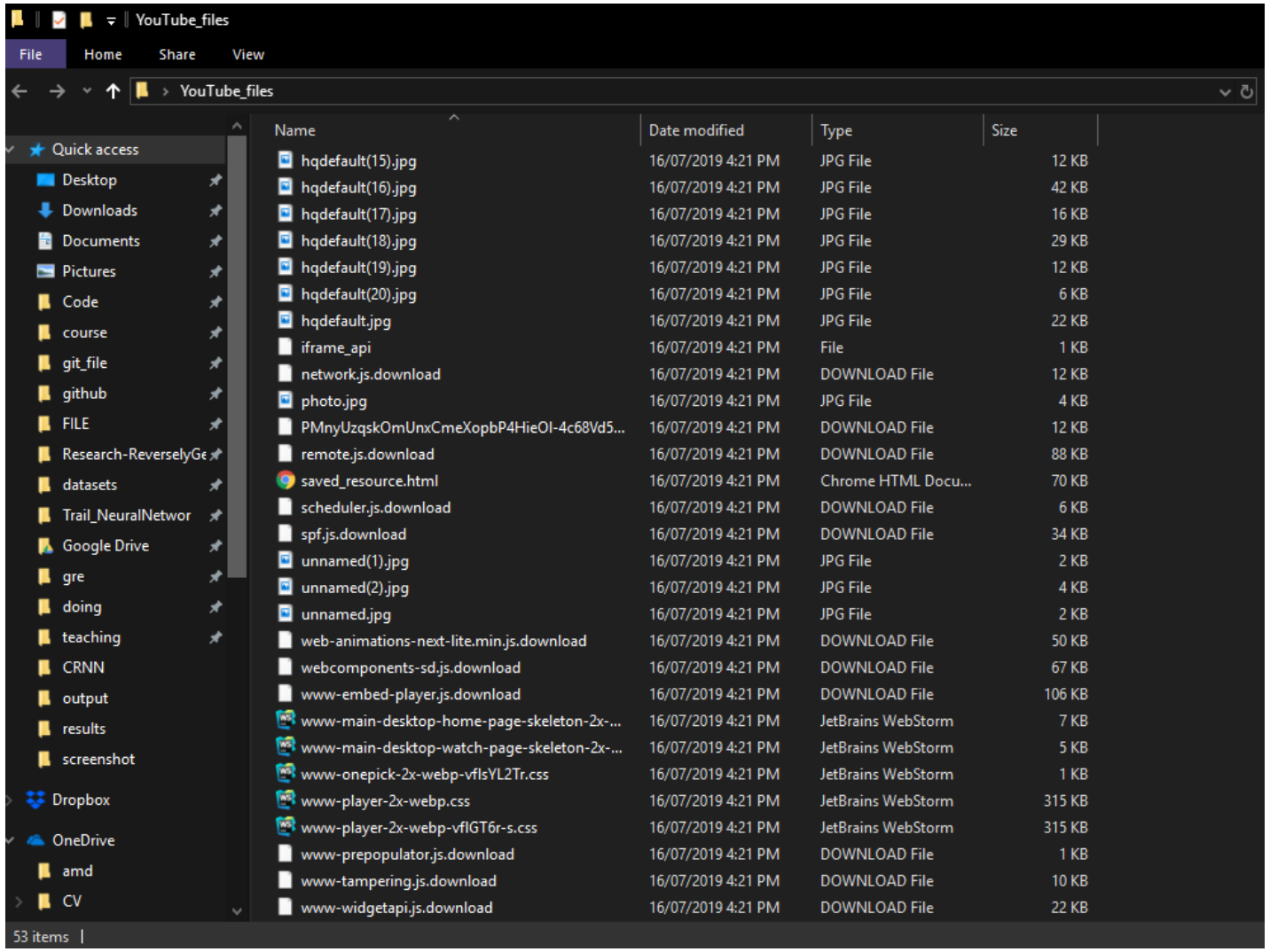
WHAT IS THIS?

User Scenario 2

Conventional Way to Reuse UI



Download the Source Code



WHAT IS THIS?

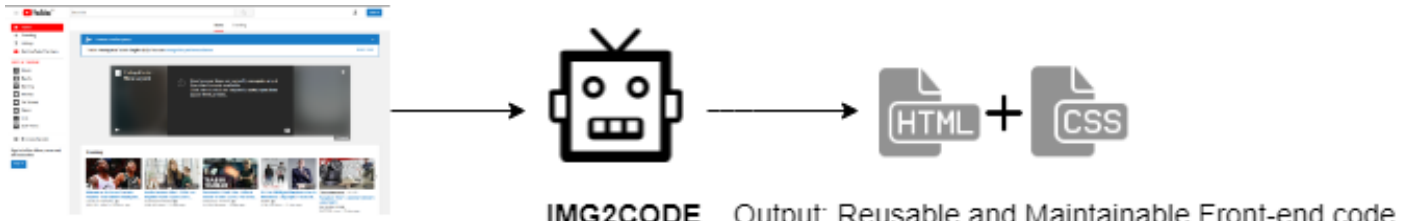
User Scenario 2

Conventional Way to Reuse UI

Analyze the Compressed Code

WHAT IS THIS?

User Scenario 2: Screenshot to Code – UI Reuse

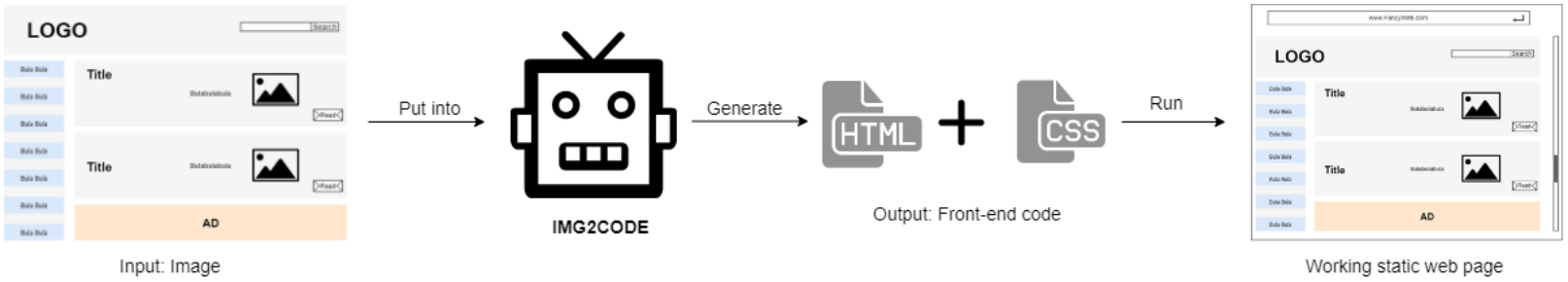


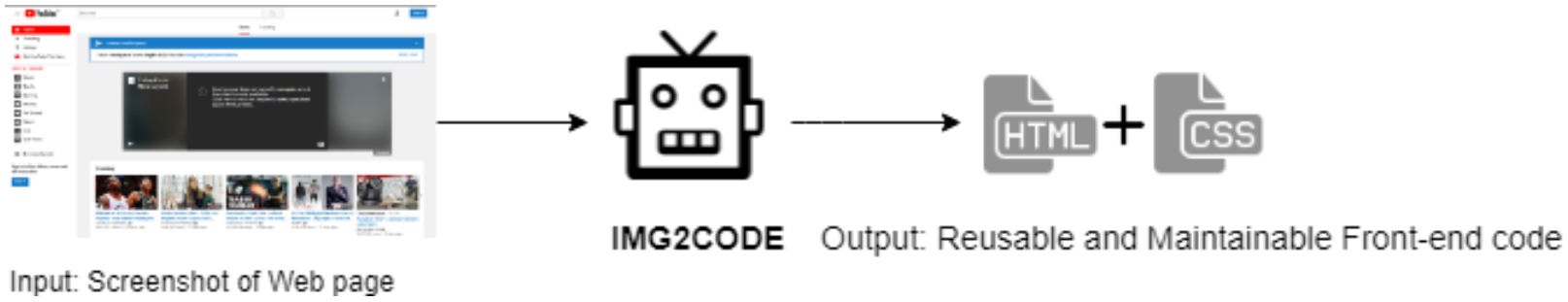

```
<!DOCTYPE html>
<html lang="en">
<head>
   <meta charset="UTF-8">
   <title>Title</title>
   <link rel="stylesheet" href="a.css" type="text/css">
</head>
<body>
<div class="generated_container">
    <div id="div0"></div>
    <div id="div1">
        <input id="input1">
        <input id="input2">
    </div>
    <div id="div2">
        <button id="button1">Button</button>
        <button id="button2">Button</button>
    </div>
    <div id="div3">
        <h1 id="h11">Text in H1</h1>
        <h2 id="h21">Text in H2</h2>
        <p id="p1">Text in p</p>
        <p id="p2">Text in p2</p>
    </div>
    <div id="div4"></div>
    <div id="div5"></div>
    <div id="img6"></div>
    <div id="img7"></div>
    <div id="img8"></div>
    <div id="img9"></div>
    <div id="img10"></div>
    <div id="img11"></div>
    <div id="img12"></div>
    <div id="img13"></div>
    <div id="img14"></div>
    <div id="img15"></div>
    <div id="img16"></div>
</div>
</body>
</html>
```

PROBLEM STATEMENT

Final Goal

Generate the front-end CODE from any given web page IMAGE





PROBLEM STATEMENT

Final Goal

Generate the front-end CODE from any given web page IMAGE

Sub Goals

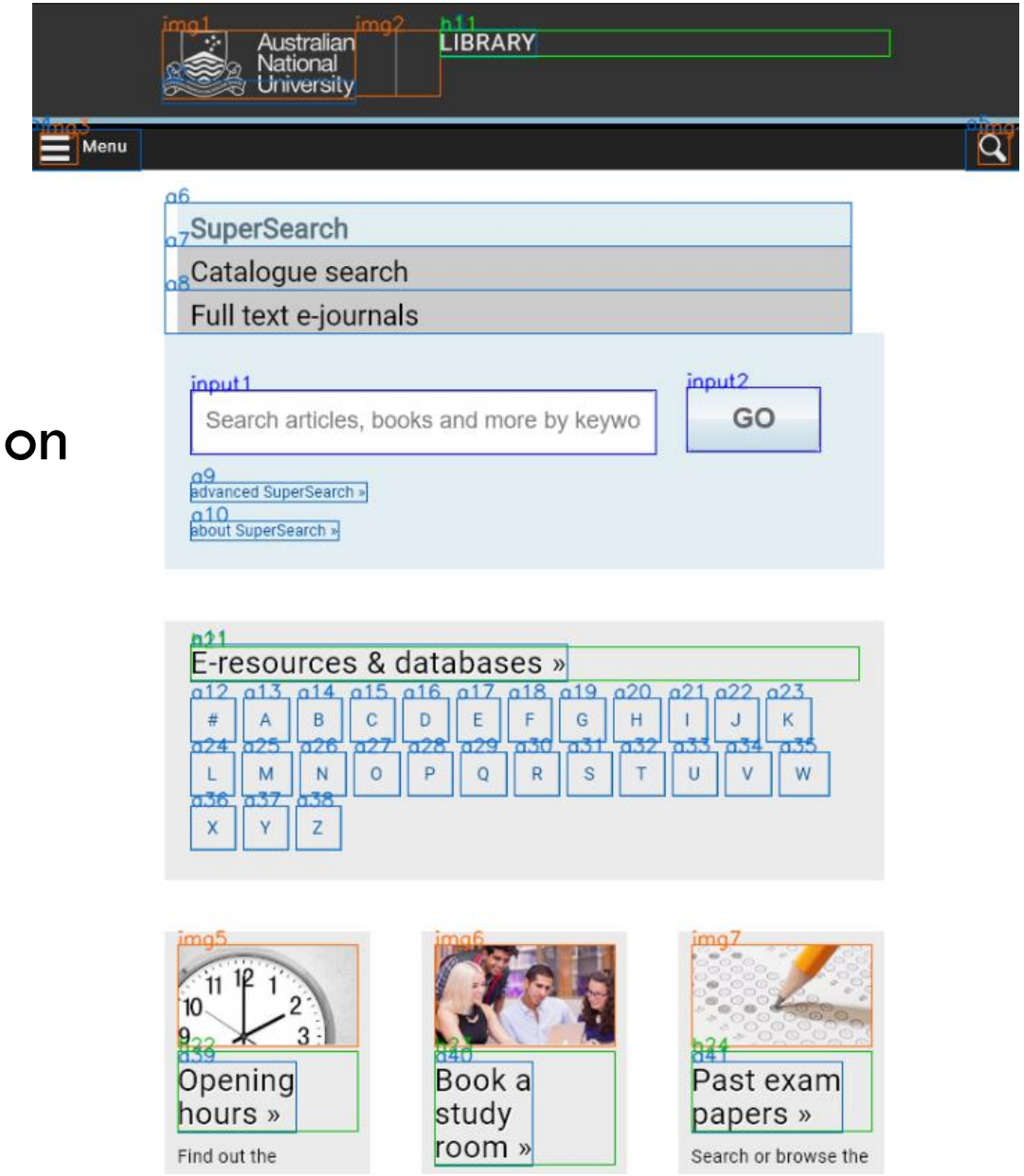
1. Detect and classify UI components (Button, Text, Image) on the input image

2. Reversely generate usable front-end code (HTML, CSS)

PROBLEM STATEMENT

UI Components Detection and Classification

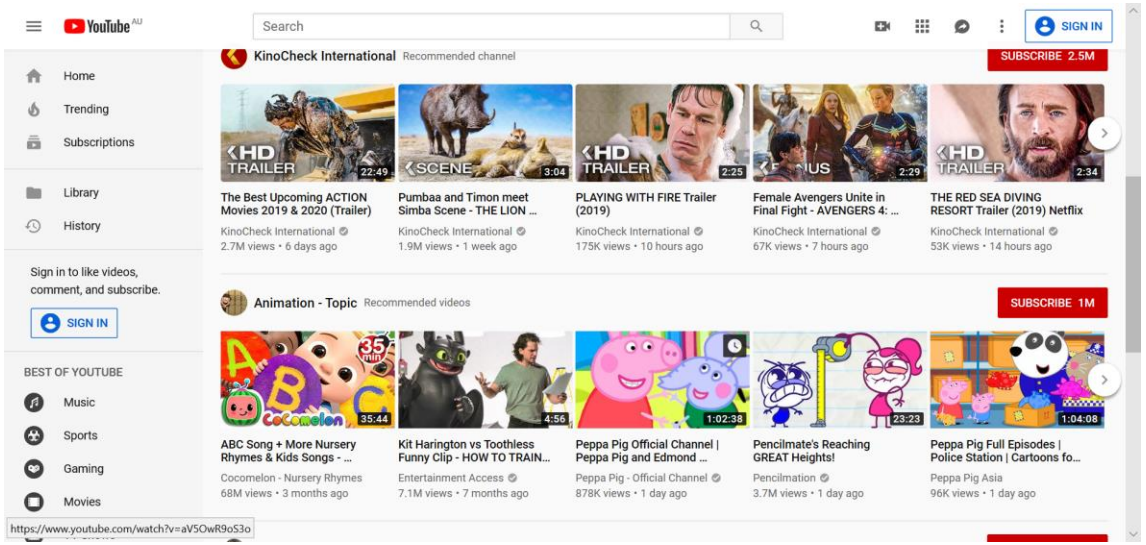
Tricky problem: Efficient detection of simple UI components



PROBLEM STATEMENT

UI Components Detection and Classification

Tricky problem: Misrecognize contents of the <img> as the web components.



PROBLEM STATEMENT

Maintainable Code Generating

Tricky problem: Make generated code easy to edit and extend.

```html
<!DOCTYPE html>
<html lang="en">
<head>
   <meta charset="UTF-8">
   <title>Title</title>
   <link rel="stylesheet" href="a.css" type="text/css">
</head>
<body>
<div class="generated_container">
    <div id="div0"></div>
    <div id="div1">
        <input id="input1">
        <input id="input2">
    </div>
    <div id="div2">
        <button id="button1">Button</button>
        <button id="button2">Button</button>
    </div>
    <div id="div3">
        <h1 id="h11">Text in H1</h1>
        <h2 id="h21">Text in H2</h2>
        <p id="p1">Text in p</p>
        <p id="p2">Text in p2</p>
    </div>
    <div id="div4"></div>
    <div id="div5"></div>
    <div id="img6"></div>
    <div id="img7"></div>
    <div id="img8"></div>
    <div id="img9"></div>
    <div id="img10"></div>
    <div id="img11"></div>
    <div id="img12"></div>
    <div id="img13"></div>
    <div id="img14"></div>
    <div id="img15"></div>
    <div id="img16"></div>
</div>
</body>
</html>
```

```css
#div0{
    width: 650px; height: 30px;
    margin-top: 10px; margin-left: 229px;
    position: absolute;
    border: grey solid 1px;
}
#div1{
    width: 56px; height: 29px;
    margin-top: 10px; margin-left: 1279px;
    position: absolute;
    border: grey solid 1px;
}
#div2{
    width: 186px; height: 28px;
    margin-top: 63px; margin-left: 21px;
    position: absolute;
    border: grey solid 1px;
}
#div3{
    width: 1056px; height: 79px;
    margin-top: 100px; margin-left: 269px;
    position: absolute;
    border: grey solid 1px;
}
#div4{
    width: 1060px; height: 511px;
    margin-top: 488px; margin-left: 267px;
    position: absolute;
    border: grey solid 1px;
}
#div5{
    width: 56px; height: 29px;
    margin-top: 544px; margin-left: 21px;
    position: absolute;
    border: grey solid 1px;
}
#img6{
    width: 850px; height: 264px;
    margin-top: 209px; margin-left: 372px;
    position: absolute;
    background: black;
}
```

PROGRESS

Attempts on UI Components Detection and Classification

1. End-to-End: Deep Learning

    Object detection method

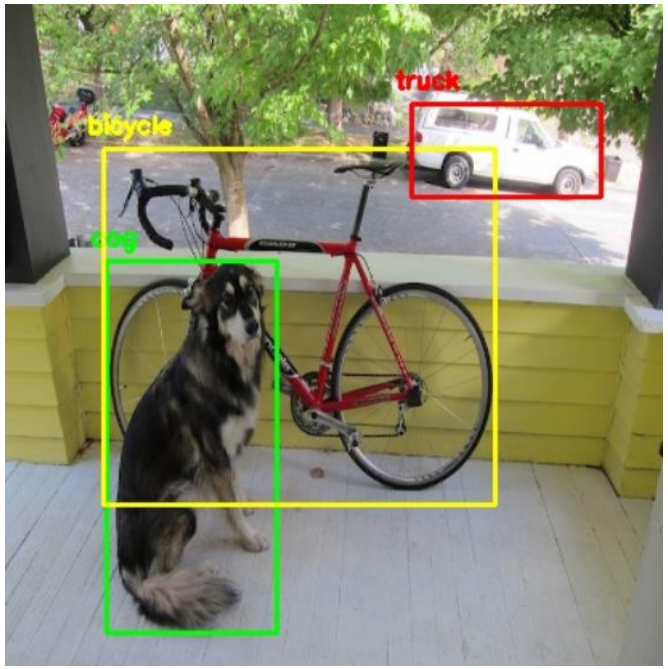
2. Divide and Conquer: Image Processing + Machine Learning

    Decompose elements and Classify them

PROGRESS

End-to-End
(Deep Learning)

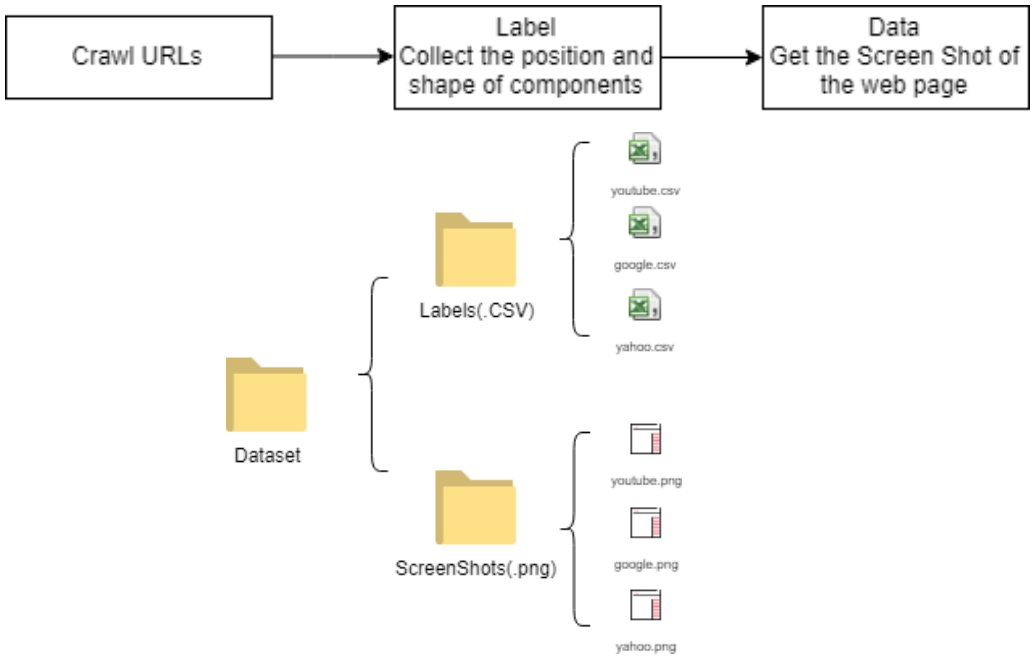
Refer to the Object Detection Method



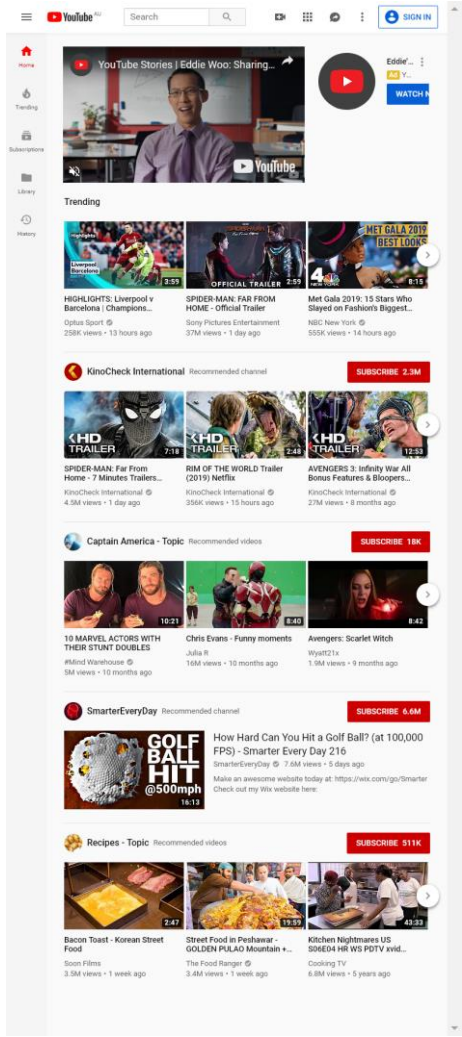
PROGRESS

End-to-End (Deep Learning)

Dataset Collection



	A	B	C	D	E	F
		bx	by	bw	bh	element
0		179	200	80	80	img
1		637	142	16	16	img
2		704	142	16	16	img
3		732	142	16	16	img
4		102	737	210	118	img
5		316	737	210	118	img
6		530	737	210	118	img
7		744	737	210	118	img
8		958	737	210	118	img
9		1172	737	210	118	img
10		102	1051	210	118	img
11		316	1051	210	118	img
12		530	1051	210	118	img
13		744	1051	210	118	img
14		958	1051	210	118	img
15		1172	1051	210	118	img
16		102	1415	210	118	img
17		316	1415	210	118	img
18		530	1415	210	118	img
19		744	1415	210	118	img
20		958	1415	210	118	img
21		1172	1415	210	118	img
22		102	1729	210	118	img
23		316	1729	210	118	img
24		72	16	80	24	a
25		16	-1000	148	37	a
26		461	8	40	40	a
27		509	8	40	40	a
28		557	8	40	40	a

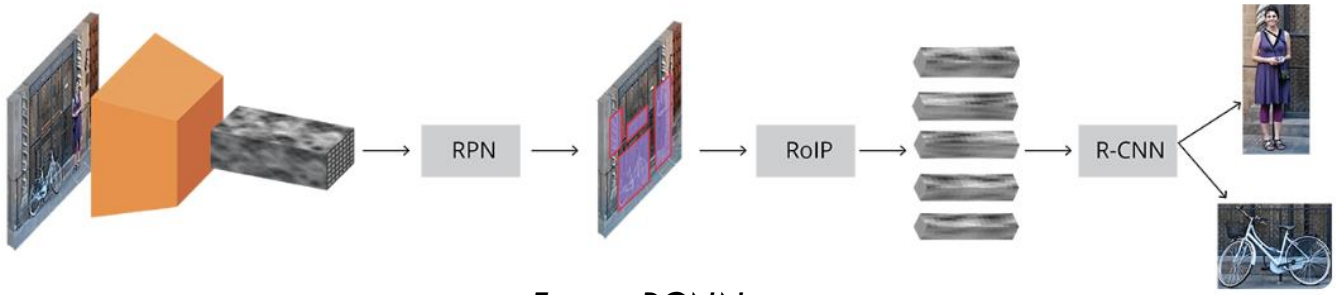


PROGRESS

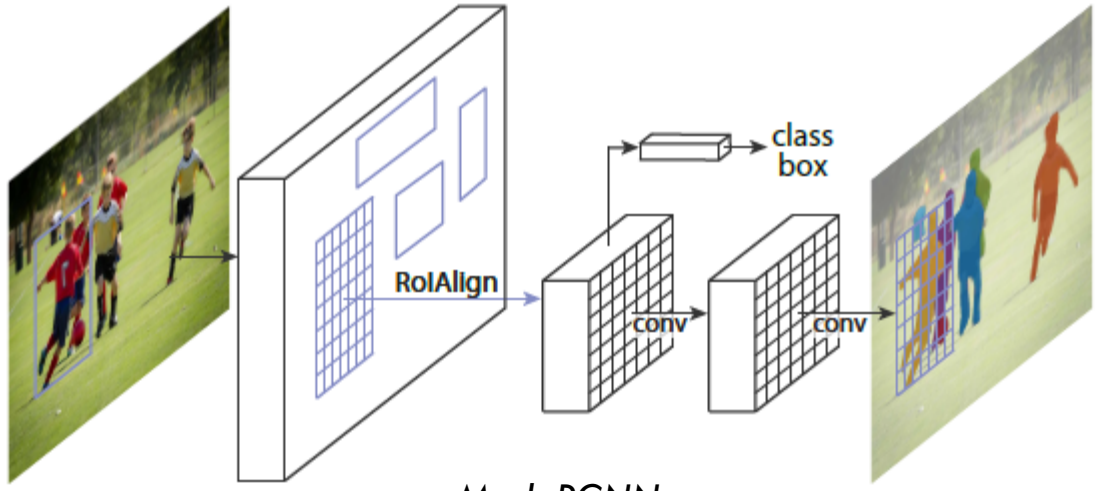
End-to-End
(Deep Learning)

Model Selection

1. YOLO v3
2. Faster RCNN
3. Mask RCNN



Faster RCNN



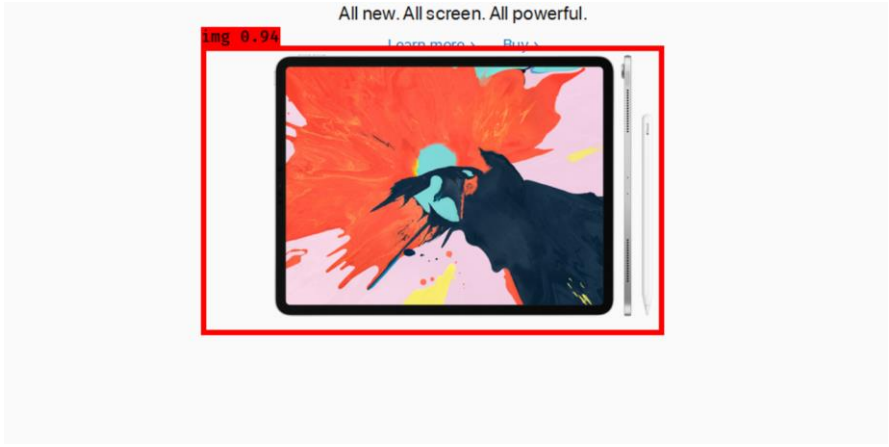
Mask RCNN

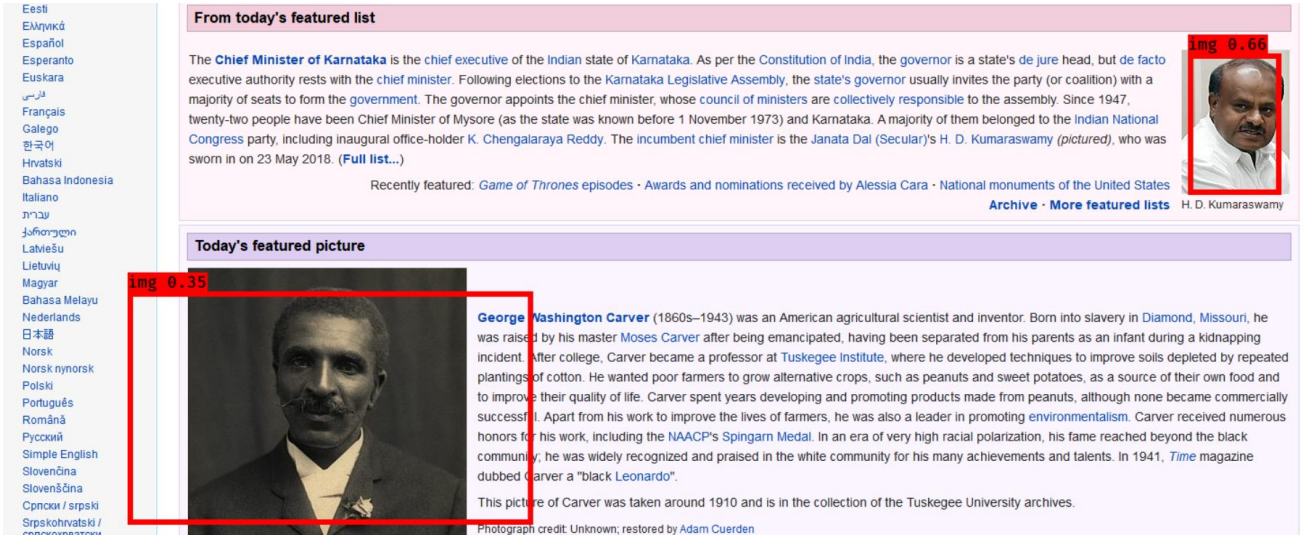
PROGRESS

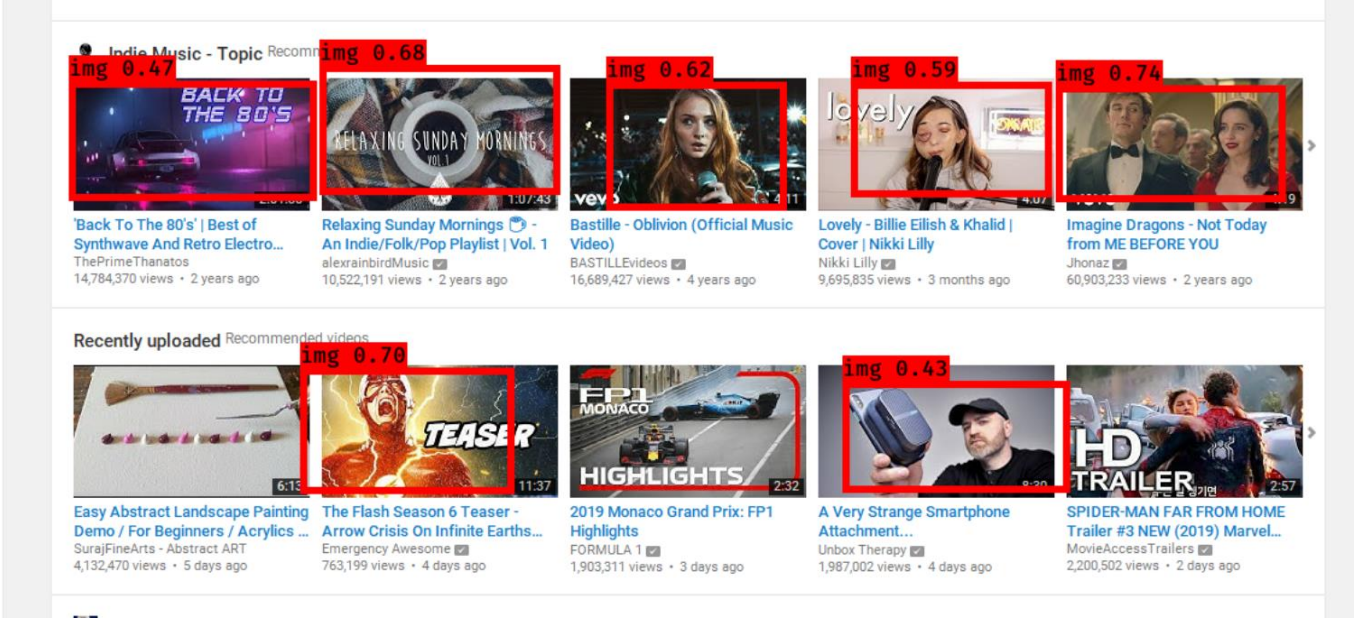
End-to-End
(Deep Learning)

Experiment:

YOLOv3 + VGG16 (Base Net)







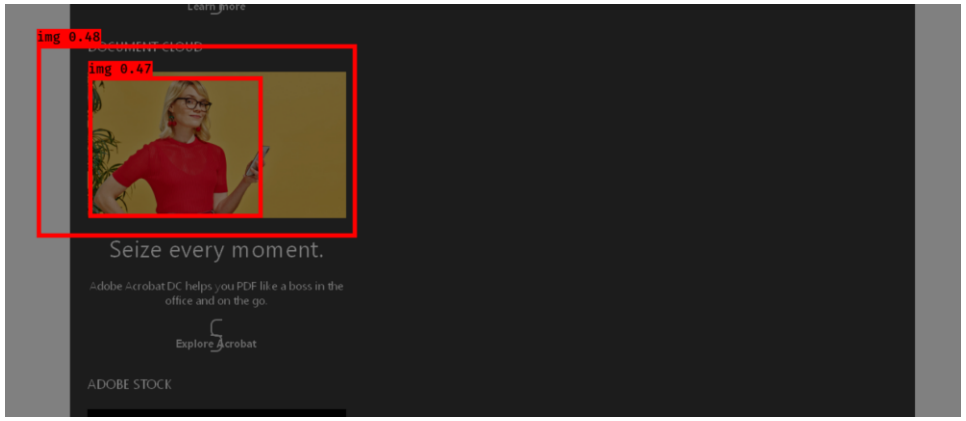
PROGRESS

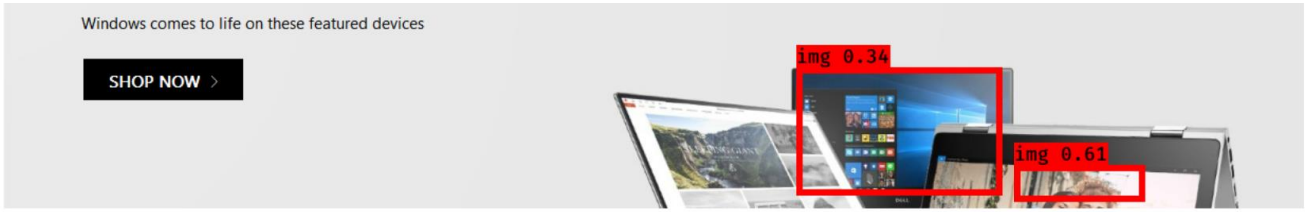
End-to-End
(Deep Learning)

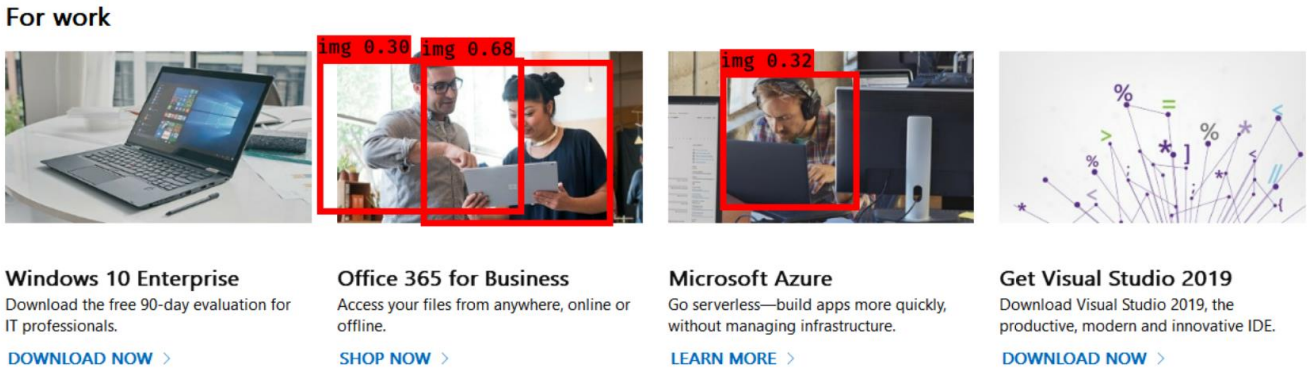
Experiment:

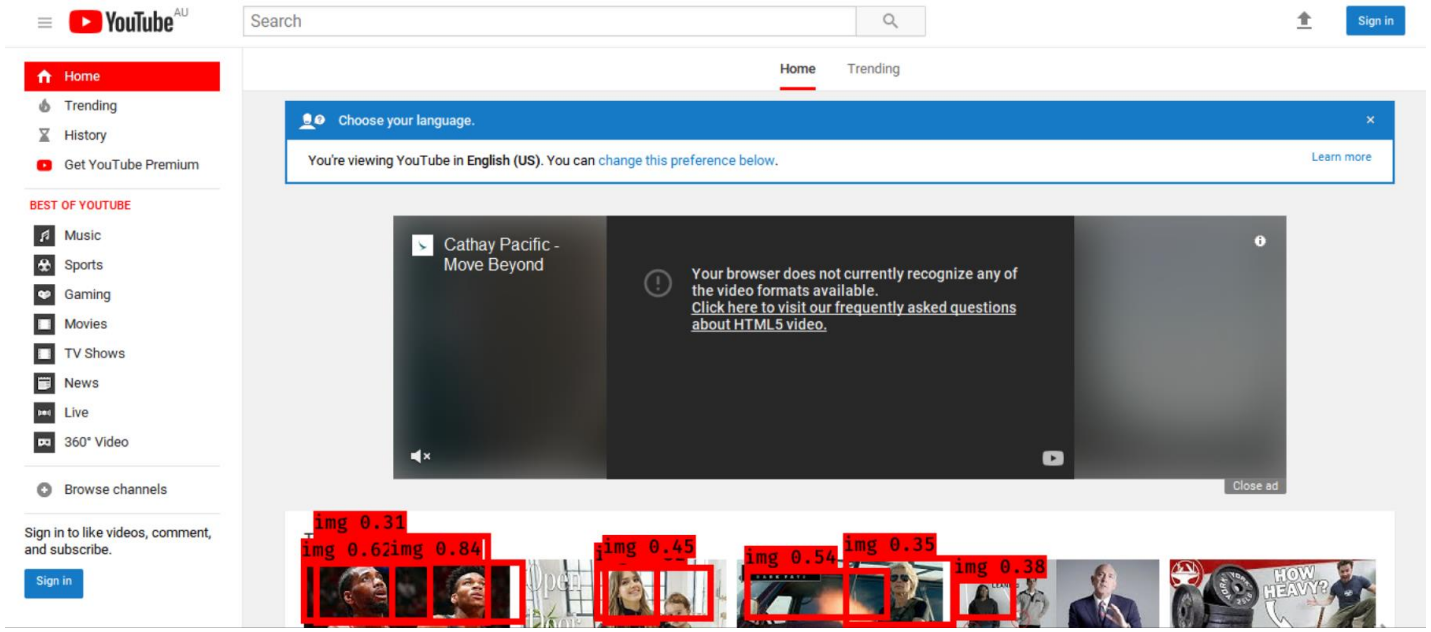
YOLOv3 + VGG16 (Base Net)

Trained on 1200 Images









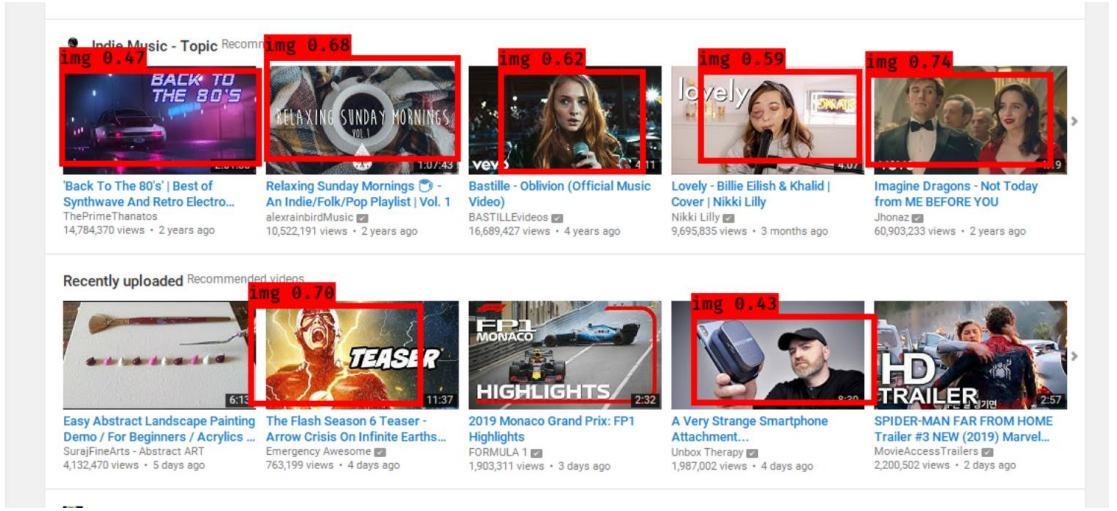
PROGRESS

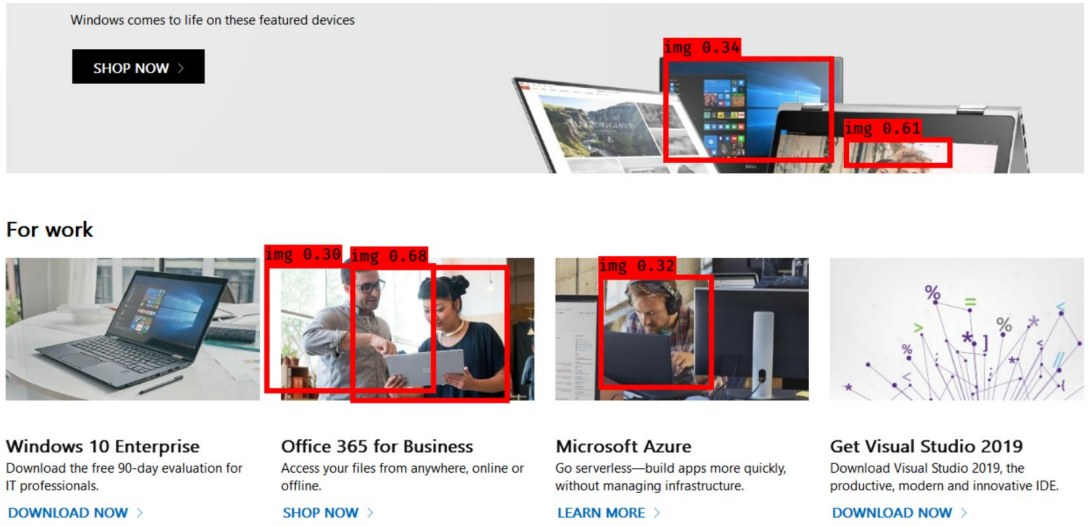
End-to-End
(Deep Learning)

Issues:

1. Hard to predict the accurate position of elements

2. Susceptible to the complex image elements on the screenshot





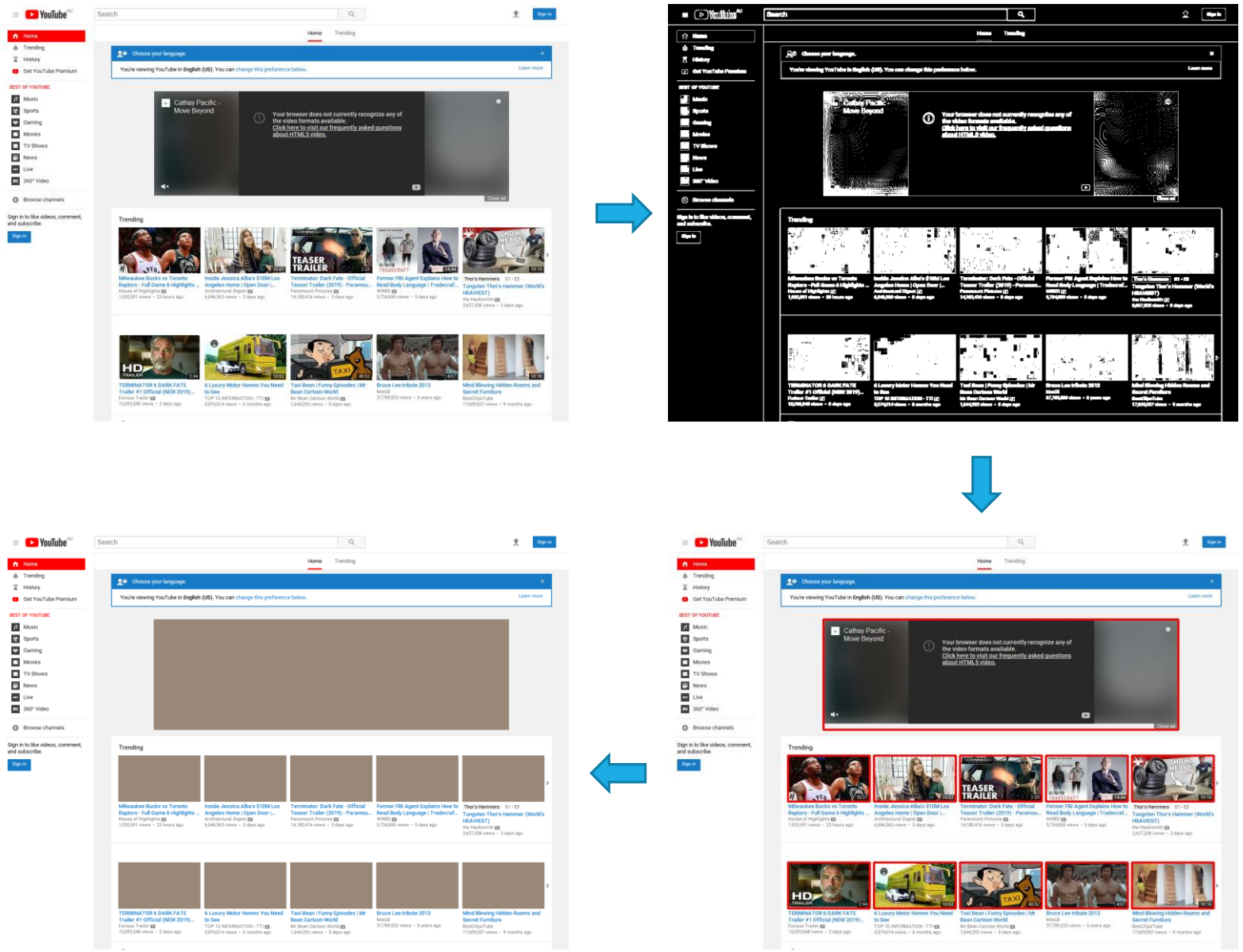
PROGRESS

Divide and Conquer (Computer Vision)

Process:

1. Detect and Separate the <image> components on the screenshot first

2. Classify the other UI components

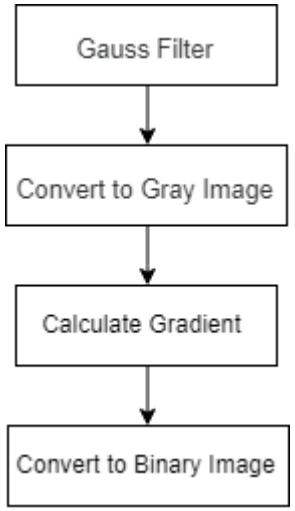


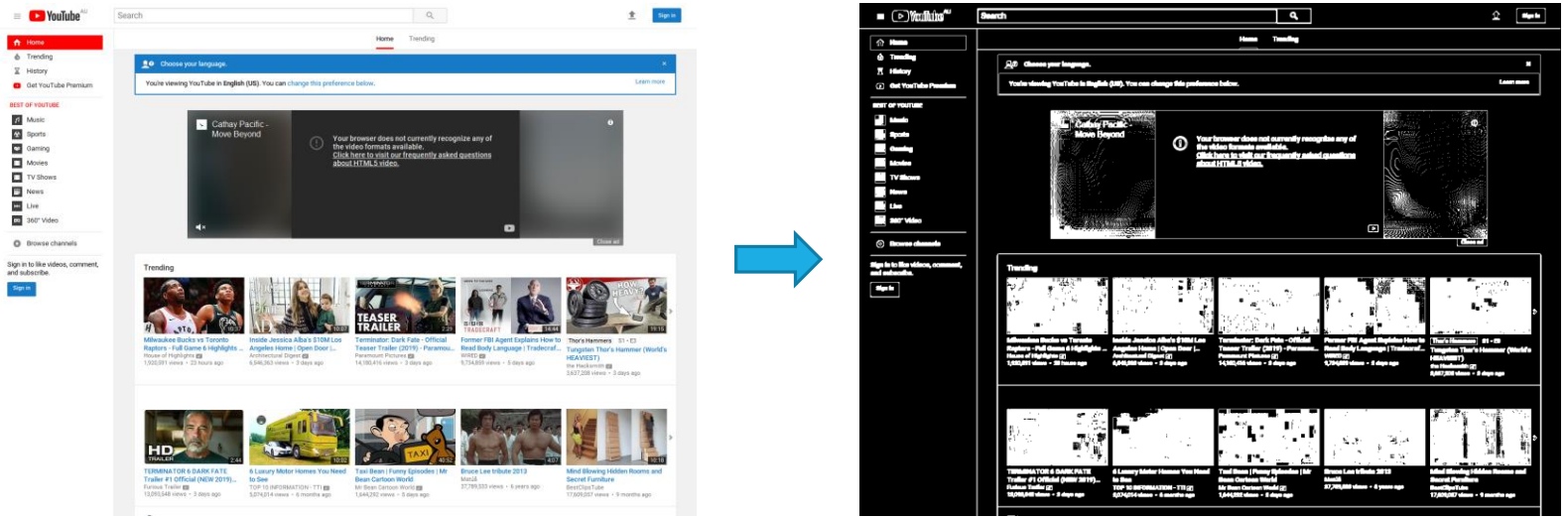
PROGRESS

Divide and Conquer (Computer Vision)

<Img> Detection:

Original Image Processing Algorithms





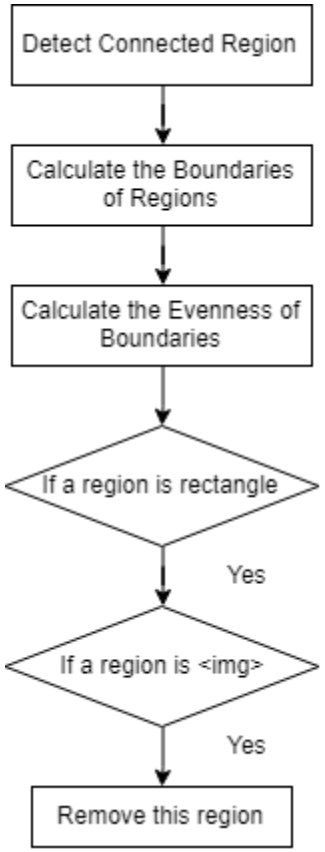
Pre-processing

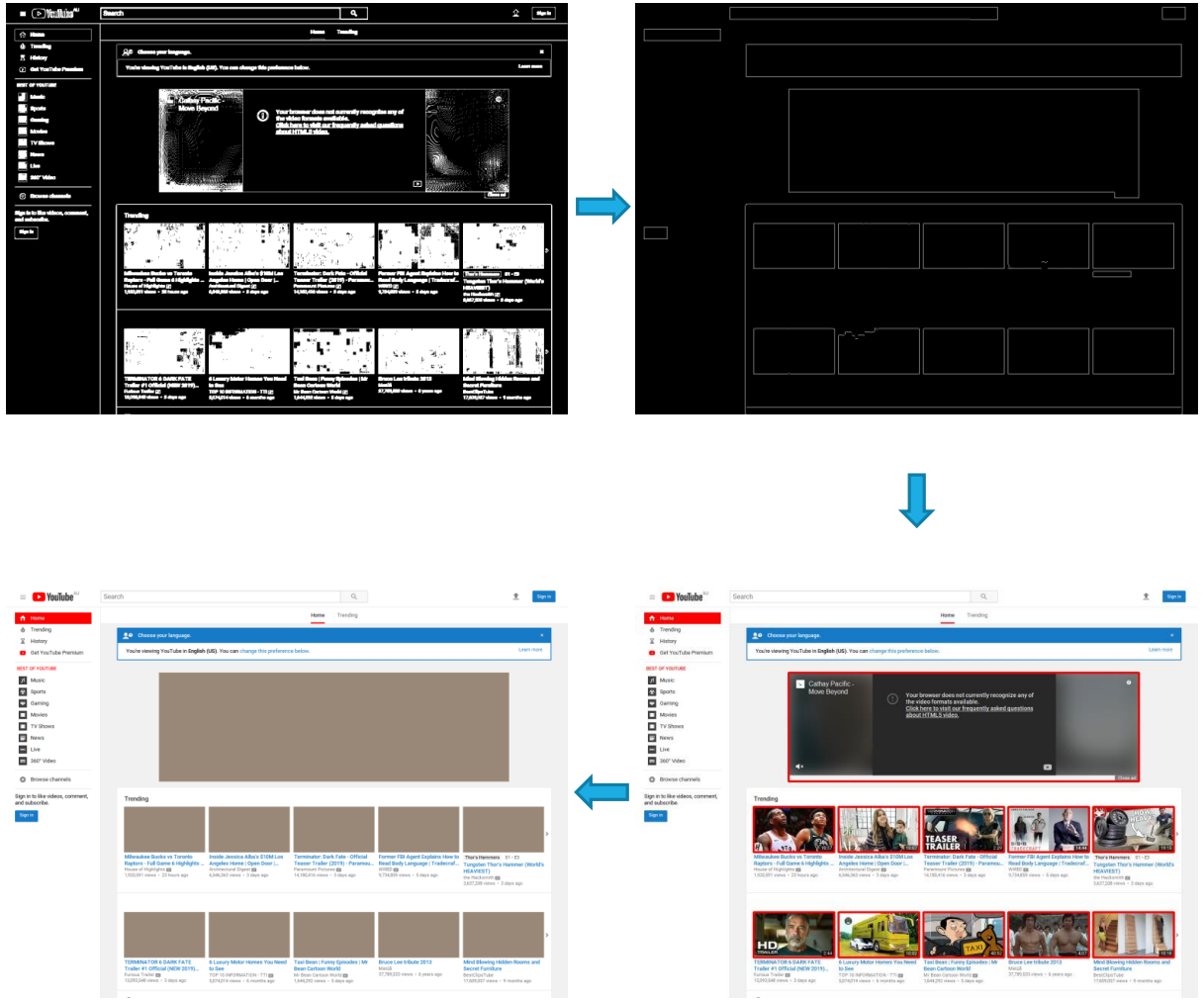
PROGRESS

Divide and Conquer (Computer Vision)

<Img> Detection:

Original Image Processing Algorithms





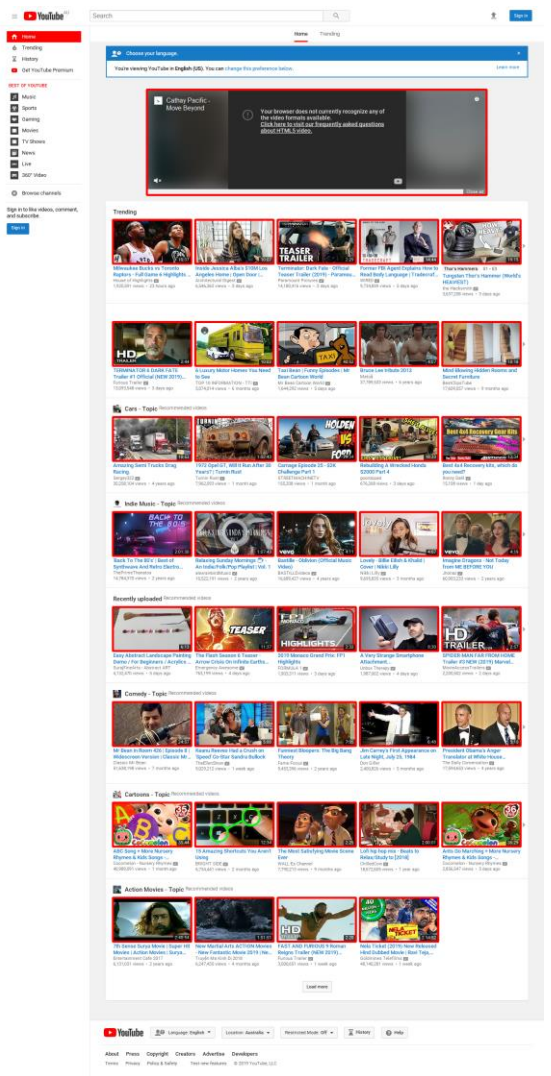
Region processing

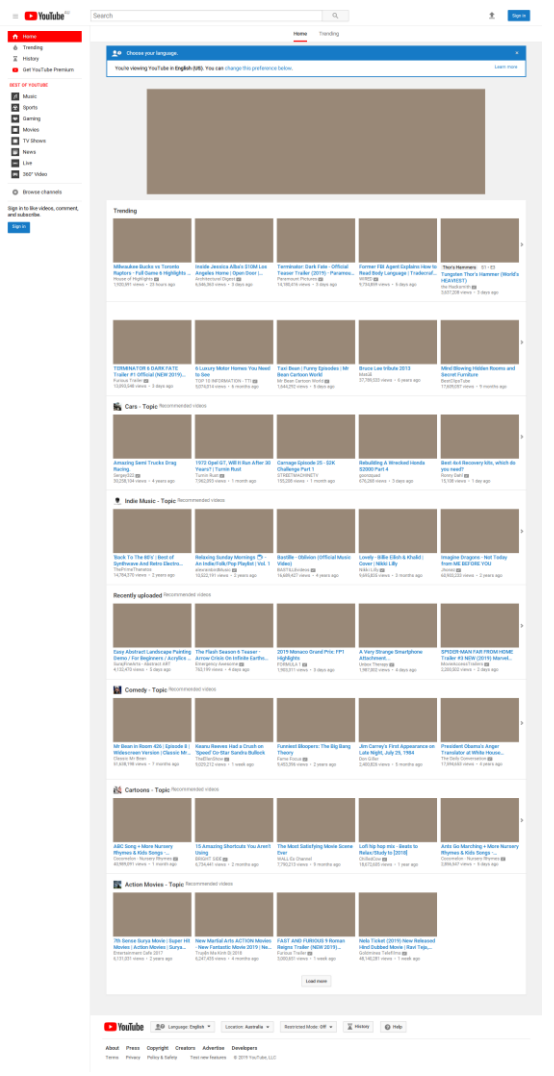
PROGRESS

Divide and Conquer (Computer Vision)

<Img> Detection:

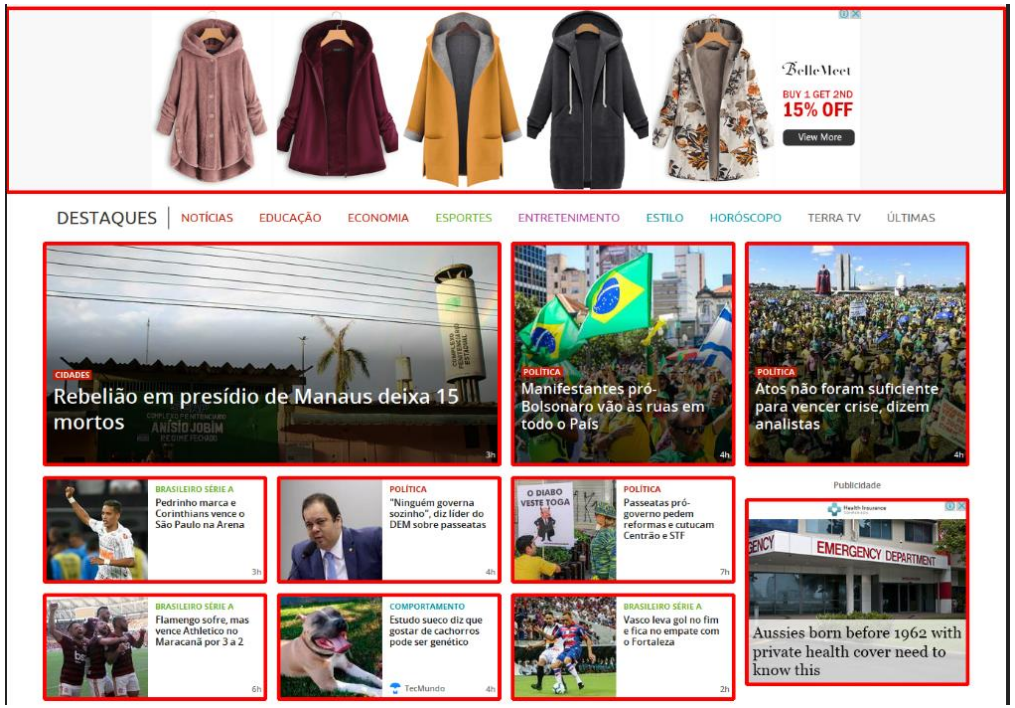
Original Image Processing Algorithms

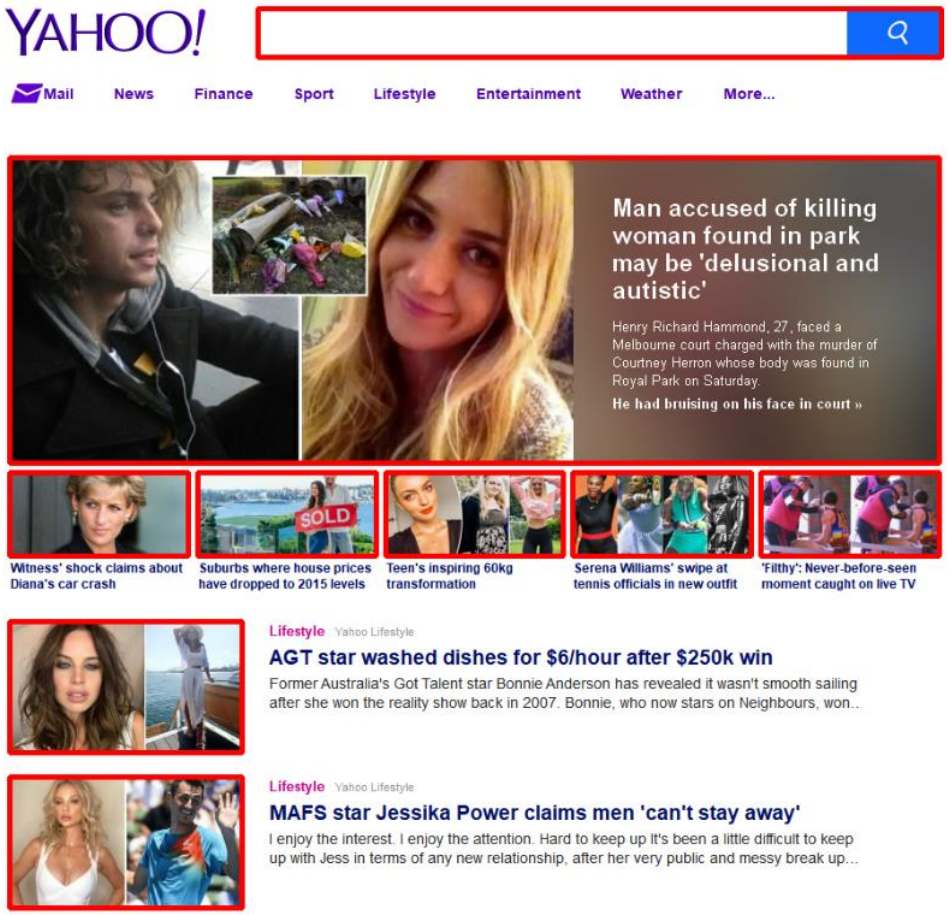




RESULTS

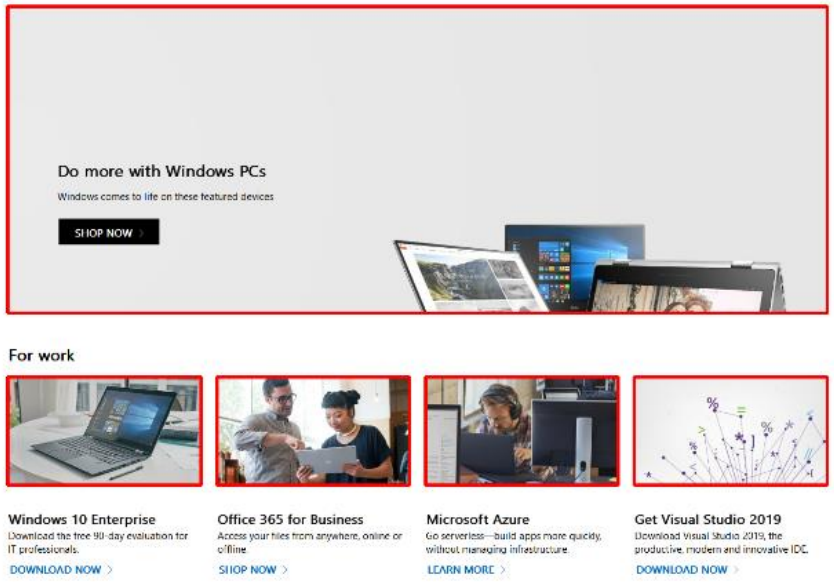
Image Detection

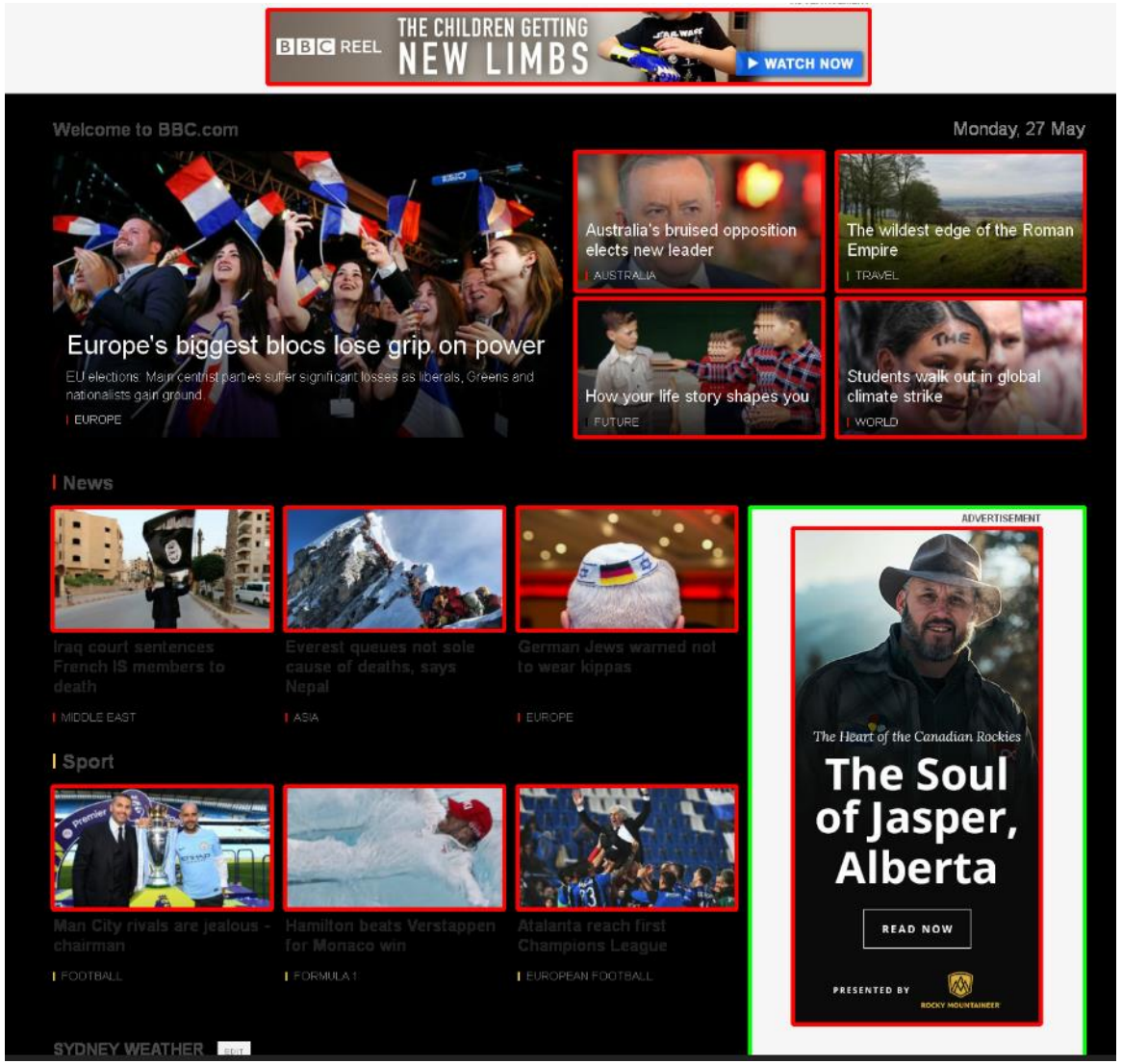




RESULTS

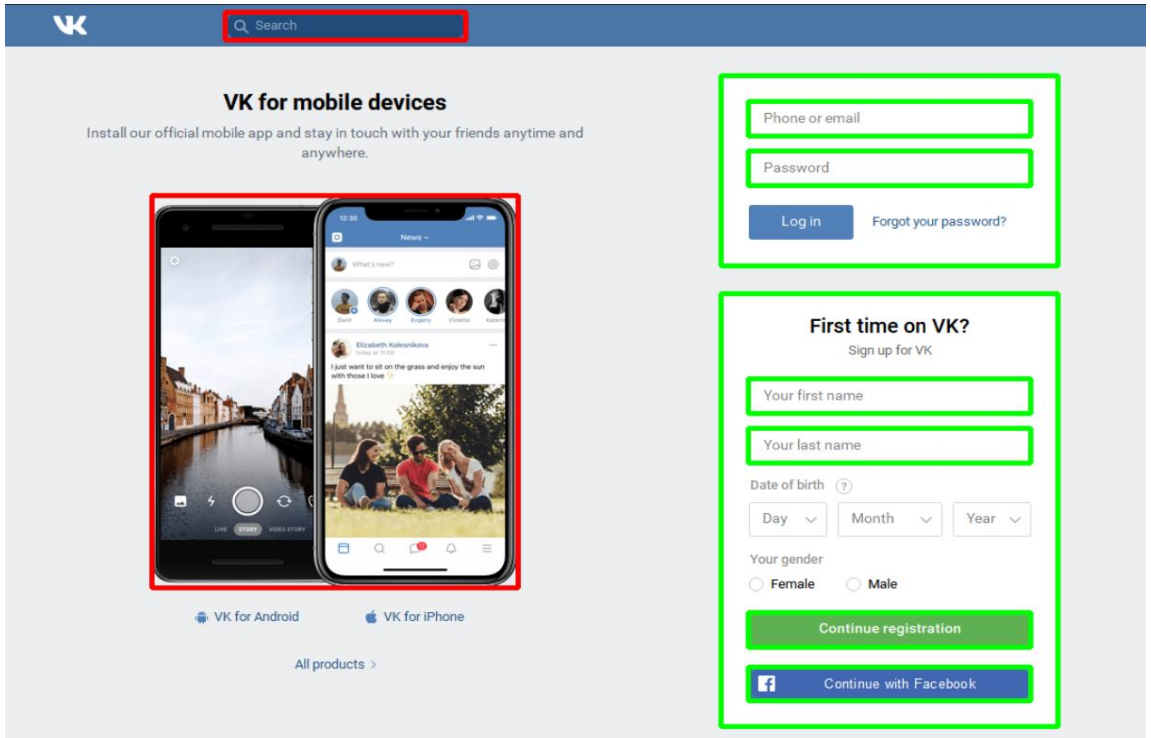
Image Detection

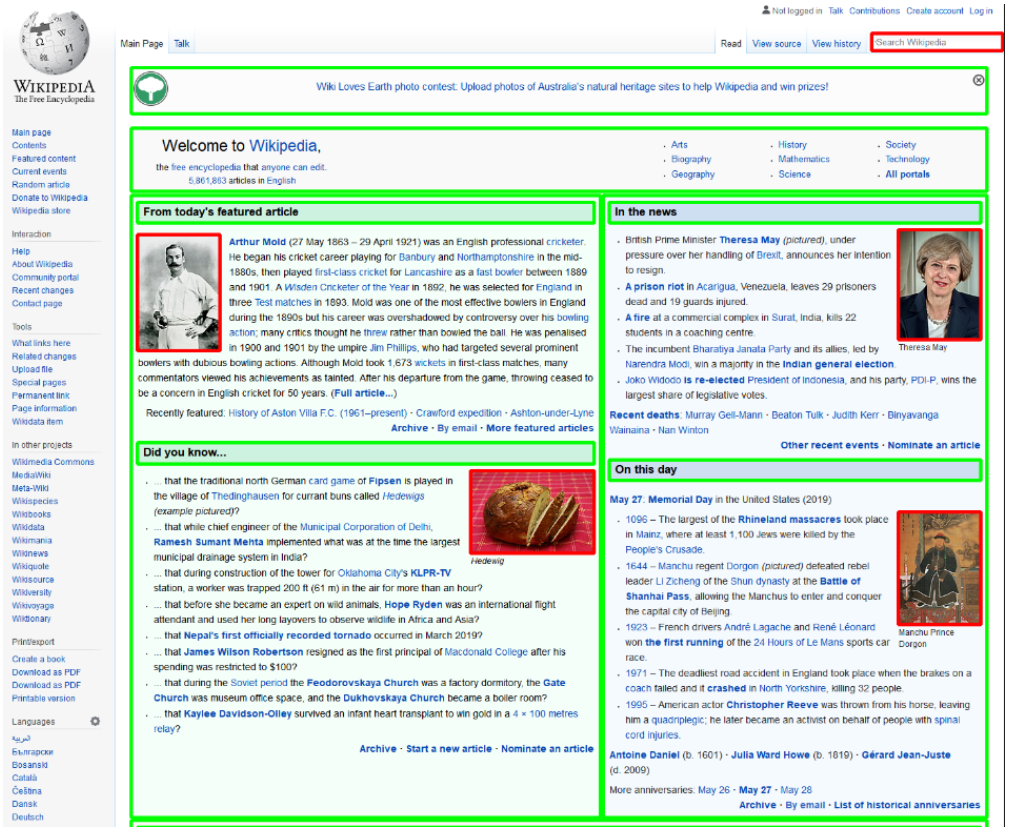




RESULTS

Image Detection





RESULTS

Code Generation

```html
<!DOCTYPE html>
<html lang="en">
<head>
   <meta charset="UTF-8">
   <title>Title</title>
   <link rel="stylesheet" href="a.css" type="text/css">
</head>
<body>
<div class="generated_container">
    <div id="div0"></div>
    <div id="div1">
        <input id="input1">
        <input id="input2">
    </div>
    <div id="div2">
        <button id="button1">Button</button>
        <button id="button2">Button</button>
    </div>
    <div id="div3">
        <h1 id="h11">Text in H1</h1>
        <h2 id="h21">Text in H2</h2>
        <p id="p1">Text in p</p>
        <p id="p2">Text in p2</p>
    </div>
    <div id="div4"></div>
    <div id="div5"></div>
    <div id="img6"></div>
    <div id="img7"></div>
    <div id="img8"></div>
    <div id="img9"></div>
    <div id="img10"></div>
    <div id="img11"></div>
    <div id="img12"></div>
    <div id="img13"></div>
    <div id="img14"></div>
    <div id="img15"></div>
    <div id="img16"></div>
</div>
</body>
</html>
```

```css
#div0{
    width: 650px; height: 30px;
    margin-top: 10px; margin-left: 229px;
    position: absolute;
    border: grey solid 1px;
}
#div1{
    width: 56px; height: 29px;
    margin-top: 10px; margin-left: 1279px;
    position: absolute;
    border: grey solid 1px;
}
#div2{
    width: 186px; height: 28px;
    margin-top: 63px; margin-left: 21px;
    position: absolute;
    border: grey solid 1px;
}
#div3{
    width: 1056px; height: 79px;
    margin-top: 100px; margin-left: 269px;
    position: absolute;
    border: grey solid 1px;
}
#div4{
    width: 1060px; height: 511px;
    margin-top: 488px; margin-left: 267px;
    position: absolute;
    border: grey solid 1px;
}
#div5{
    width: 56px; height: 29px;
    margin-top: 544px; margin-left: 21px;
    position: absolute;
    border: grey solid 1px;
}
#img6{
    width: 850px; height: 264px;
    margin-top: 209px; margin-left: 372px;
    position: absolute;
    background: black;
}
```

FUTURE WORK

Image Processing

1. Simple UI components detection and classification (Object Detection)
2. Text detection (OCR)

Code Generation

1. Extendable and maintainable code
2. Fit to real developer's usual practice