iClicker

PROJET NUMÉRO 73

Étudiant : Sergiu Iacob
Encadrant : Marius Bilasco

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CHAPITRE 1

INTRODUCTION

1.1 LE CONTEXTE

Project for “PJI”... but also for Bachelor’s Thesis
At the time working at this project, 5 semesters as a student at... last semester erasmus student...

1.2 L’IDÉE

TL ;DR : Eye tracking using computer’s webcam ; move cursor with eyes.

1.3 MOTIVATION

I wanted a project that would help me learn... related to... (AI, ML) because I want to have a carreer as an...
Also, I was deeply motivated by doing something that could actually be used as a practical tool... or help anybody in a way...
Wanted to work on a series of experiments with MLPs, CNNs... in order to learn...

Question : Is it wrong to place images in the "introduction" chapter ?

1.4 LE BUT

1.4.1 OBJECTIFS ESSENTIELS

Cross-platform app
Base functionality : predict where the user’s looking on a grid 3x3. Based on the grid, we can "artifficially" move the cursor.

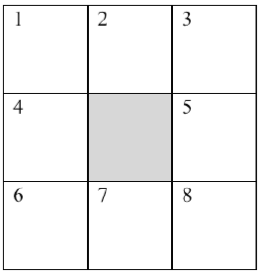

FIGURE 1.1
3x3 Grid

Looking at square 2 will move the cursor up by dy. Looking at square 6 will move it to the bottom-left by dx and dy and so on.

App easy to maintain : use concepts learn throughout university : classes, cohesion, SOLID principles *to mention that Python isn't exactly the best language to take OOP into consideration, but use OOP more like general guidelines

Left click = long blink with left eye, right click = long blink with right eye

1.4.2 OBJECTIFS PRÉFÉRABLES

If predicting the squares works well, try regression : try to predict the exact position of the cursor

Maybe find a way to click without using hands : maybe recognize when the user *says* "click" ?

Chapitre 2

À propos de l'application

2.1 Comment résoudre le problème

Mention exactly what the "problem" is : being able to accurately track one's eyes in order to move the cursor. TL ;DR : Will try to tackle this problem as a Machine Learning problem.
Why is Machine Learning suitable for this ?

2.1.1 Les réseaux de neurones

Mention general things about neural networks and why they work well with images.

2.2 Plan d'attaque

Question : is there a more formal french expression similar to "strategy" ?
Which title is better : "Plan d'attaque" où "Strategie" ?

2.2.1 Nécessités pour l'apprentissage automatique

Data. Bad data, bad algorithm. Good data, good algorithm.

Data processing. No data processing, no benefits. Good data processing, better algorithm.

2.2.2 Perceptrons multicouches

Will try to work with these and see how they act.

2.2.3 Réseau neurones convolutifs

Will try to work with these and see how they act.
Mention why these might be better for images.

2.2.4 Recherche d'autres méthodes

Will make some research to see other state of the art methods for solving problems similar to the one I have.

CHAPITRE 3

INFORMATIONS PRÉLIMINAIRES

3.1 MANIÈRE DE TRAVAILLER

VSC - Github
Link github repository here
Mention general guidelines : develop, test, develop, test. TODO : should start using branches when working on important features.

3.2 CONFIGURATION UTILISÉE

TODO : label this section and reference it wherever I mention "training took x seconds". Mention laptop model.
Emphasize on webcam resolution & quality.
Emphasize on no GPU & cpu speed.

3.3 INFORMATIONS TECHNIQUES

TODO : Section title – maybe find a better one ?

Technology name	Version	Useful links
Python3	3.6	`https://www.python.org`
Conda	4.8.0	`https://conda.io/`
...	...	...

Maybe mention important Python libraries used :

Library name	Version	Useful links
Keras	...	...
PyTorch	...	...
OpenCV	...	...

3.4 CONDITIONS REQUISES

Technical requirements : Every technology previously mentioned 3.3 should be installed

Currently only tested on MacOS, possible that Windows will give errors. Linux should work

Link github repository here and mention install instructions.

3.5 LIMITES

Some of the *CURRENT* limits are (current because more will appear, probably) : App only tested with 1 monitor.
If setup has multiple cameras, it chooses the first one it finds.
Mention training data collection : only me. I wear no glasses.
Emphasize on wearing glasses : might not work. To test this.

Mention necessity of good lighting.

Might only work on MacOS and Linux right now (will test to be sure).

CHAPITRE 4

LA COLLECTE DE DONNÉES

4.1 IMPORTANCE DES DONNÉES

“ Q : How many machine learning specialists does it take to change a light bulb ?
A : Just one, but they require a million light bulbs to train properly.
Q : How many machine learning specialists does it take to change a fluorescent light bulb ?
A : That wasn’t in the training data ! ”

Importanta datelor – exemple clare, conditii “controlate” de testare vs. conditiile in care utilizatorul foloseste aplicatia
Importanta varietatii datelor
.

4.2 DONNÉES NÉCESSAIRES

Datele cu care lucreaza aplicatia : imagini de la webcam.
Despre cea mai importanta parte : Capul. Ochi, postura capului

De mentionat ca elementele care vor fi folosite in fiecare experiment vor fi mentionate in cadrul experimentului respectiv.
E posibil sa nu fie folosite toate caracteristicile imaginii

Intrebare : Ar fi bine sa scriu cate ceva despre ochi ? Iris, pupila

4.3 ACQUISITION DE DONNÉES

4.3.1 SAUVEGARDE DES DONNÉES

Mentionez ca salvez datele pe “sesiuni”, definesc ce e o “sesiune”, ce salvez : rezolutia ecranului, rezolutia camerei webcam (deci rezolutia pozelor).
Imaginile sunt salvate *fara* modificari.

4.3.2 MOYENS D’ACQUÉRIR DES DONNÉES

Despre cele doua moduri de colectare de date pe care le-am implementat : “background” si “activ”.

Exemplu cu cod sursa, screenshot-uri, structura datelor in foldere etc.

CHAPITRE 5

TRAITEMENT DE L'INFORMATION

5.1 AVANTAGES DU TRAITEMENT DES DONNÉES

Why it might be good : only focus on what's important.
Eliminate noise from images.

5.2 TRAVAILLER UNIQUEMENT AVEC LES YEUX

How I extracted only the eyes, what libraries I used, everything related to this.
Place images with before and after.

5.3 EN UTILISANT SEULEMENT LE VISAGE

Another option : use the whole face and let the CNN do the hard work.

CHAPITRE 6

L'ENTRAÎNEMENT

6.1 LE MODÈLE

What's a model.

6.2 EN ENTRAÎNEMENT UN MODÈLE

Information about general parameters : for example epochs of training.
Serialize each model, save its configuration.
Mention what I mean by a model's configuration.

```
{
    "train_parameters": {
        "epochs": 100
    },
    "score": [
        7.1555709958233535,
        7.432588309638585,
        7.4325869143087715,
        7.432587050009465,
        7.432587050009465
    ],
    "training_time": 35320
}
```

LISTING 6.1
Example of a model's configuration

6.3 EN UTILISANT UN MODÈLE

Afterwards, same model used for prediction.
Data for prediction has to have the same format as the data the model was trained with.

CHAPITRE 7

PERCEPTRONS MULTICOUCHES

7.1 DEFINITION

Define MLP's.

7.2 EXEMPLES D'UTILISATION

Give some example of where these are used, their results and so on.

7.3 MES RÉSULTATS

About my results with MLP's.

About data used, parameters for the MLP, metrics (accuracy, how I defined the score) etc

CHAPITRE 8

RÉSEAU NEURONES CONVOLUTIFS

8.1 DEFINITION

Define MLP's.

8.2 EXEMPLES D'UTILISATION

Give some example of where these are used, their results and so on.
Just to show how citing would look like : DESHPANDE 2020

8.3 MES RÉSULTATS

Travaux en cours.

CHAPITRE 9

CONCLUSION

BIBLIOGRAPHIE

DESHPANDE, Adit (2020). *A begginer's guide to CNN*. Adit Deshpande. URL : https://adeshpande3.github.io/adeshpande3.github.io/A-Beginner's-Guide-To-Understanding-Convolutional-Neural-Networks/ (visité le 10 mar. 2020).