

# Emotion prediction

Adrien Lafage 12.2019

# **Business understanding**

## **I/ Identifying your business goals**

### **A/ Background**

With the development of social robots like Pepper (SoftBank Robotics), or LIKU (Personal Robot), we need to improve the interactions between humans and robots. And the body language is a part of it. The face is one of the most communicative part of the body, we can understand a lot of things from the facial expressions. Moreover we want to predict the emotions from EEG data, so we could understand better how emotions are created.

### **B/ Business goals**

What we intend to accomplish here is to provide a model that is predicting well emotions from people faces.

### **C/ Business success criteria**

The accuracy of the model will measure its efficiency, maybe some other measures will be taken in account to choose the best model.

## **II/ Assessing your situation**

### **A/ Inventory of resources**

What we have at our disposal is a laptop with a processor Intel Core i5 7th Gen, a database with 13686 face pictures annotated. Some other database may be added to this project, the more the better. Add to those things, we have some knowledge about machine learning and deep learning. By the way, we will use the Python framework, PyTorch. We might use also TensorFlow to compare the results.

### **B/ Requirements, assumptions, and constraints**

The deadline of the project is schedule to the 19th of December. The project

### **C/ Risks and contingencies**

What could delay the completion of the project are maybe not enough data to work with, the models take too much time to learn. Basically it depends a lot of the data we have or will have. If it's unbalanced or at some point not something that we can generalize.

### **D/ Terminology**

- **faces** are the instances for whom we will predict an emotion.
- **emotions** are the classes or the labels of our instances (faces).

### E/ Costs and benefits

Well since this is an academic project the cost of it, it's basically time and as benefits: knowledge and practice.

## **III/ Defining your data-mining goals**

### A/ Data-mining goals

To achieve this project, we will need squared pictures in grayscale of faces. The size of those pictures is not precisely settled yet, it will depend on the performance of the computer, we will use.

Then we will use this data to develop models to predict the emotions for new pictures.

### B/ Data-mining success criteria

The data-mining success criteria is the get at least two hundred face pictures for each emotion, so our model will have enough data to give relevant results.

## **Data understanding**

### **I/ Gathering data**

#### A/ Outline data requirements

As we said earlier, we need grayscale pictures with the same amount of pixels horizontally and vertically. These pictures have to be annotated with their corresponding emotion (i.e. happiness, neutral, anger, disgust, fear, surprise and sadness).

#### B/ Verify data availability

This data exists but as it is face pictures there are some confidentiality contracts that we need to sign. The data is not open source. That's why we are actually waiting for the main part of the data that we want to use. For now, we narrow the scope of the project to predict emotions from faces.

#### C/ Define selection criteria

What we will use is a database with annotated face pictures.

### **II/ Describing data**

What we have for now is in two parts, on one hand there is a folder with 13686 face pictures and on the other hand we have a .csv file with three columns and 13686 rows:

1. user.id: undefined but it's useless in this project.
2. image: the picture name in the image folder.
3. emotion: the emotion corresponding to an image.

### **III/ Exploring data**

Here the distribution of the emotions among our database:

- neutral: 6868 instances
- happiness: 5696 instances.
- surprise: 367 instances.
- sadness: 268 instances.
- anger: 251 instances.
- disgust: 207 instances.
- fear: 20 instances.
- contempt: 9 instances.

### **IV/ Verifying data quality**

The main problem of the data that we have is that the emotions are not distributed equally. And it might be a problem in the training of our models. That why it would be better if we add to this project another database. Nevertheless the database we have is kind of nice since the pictures have the same size and are on grayscale.

## **Planning your project**

Task 1: First of all we need to clean the data, there are some errors with the labels in the .csv file.(1h)

Task 2: Use K-Means to see if the similar images (small euclidean distance) correspond to the same emotion.(2h)

Task 3: Try some machine learning methods like K-NN and SVM.(10h)

Task 4: Learn PyTorch (10h)

Task 5: Create convolutional neural networks and find the best parameters. (20h)

Task 6: Present the results on a poster (15h)

Bonus: Create a program that uses the webcam of a laptop to predict the emotion in live. (10h)

Notes :

- The tasks might take some more time.
- The size of the images has to be taken in account for all models. It will affect their performance.