Université de Fribourg

Very Deep Learning

DEEPDRAW

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1 INTRODUCTION

For the very deep learning project, we decided to build, train and manage a neural network that can draw pictures of simple concept. We use the Quick Draw Dataset, a google's game, that provide a huge dataset of labelised simple drawing.

2 ABOUT QUICKDRAW-DATASET

The Quick Draw Dataset [1] is a collection of 50 million drawings across 345 categories, contributed by players of the game Quick, Draw ! [2]. The drawings were captured as timestamped vectors, tagged with metadata including what the player was asked to draw and in which country the player was located.

The Quick Draw game principle is to draw specific picture given by the computer. This one try to recognize, with machine learning, your drawing.

FIGURE 1 – Quick Draw example.

The Quick Draw Dataset provides preprocessed dataset. We choose to use the **Simplified Drawing files** preprocessed dataset. They've simplified the vectors, removed the timing information, and positioned and scaled the data into a 256x256 region. The data is exported in ndjson format with the same metadata as the raw format. We use a binary version of this format, for efficiency purpose.

3 GOALS

The final goal of this project is to reverse the principle given in the previous section : with give a class to the computer and this one try to draw the corresponding drawing.

4 DEEPDRAW CODE

Présenter les choix, les NN et tout ce merdier

1. https://github.com/googlecreativelab/quickdraw-dataset
2. https://quickdraw.withgoogle.com/#

4.1 Get the data

The size of the dataset presented an interesting challenge : at 7.1GB in the packed binary format, and even more once parsed into Python data types, it barely fits into memory. To solve this, we build an index file containing each drawing's id, class (and by extension the file where it can be found), and its offset within the file. The size of the resulting `index.csv` file is 1.6GB, small enough to be loaded into memory in a reasonable time.

Drawings are provided as a sequence of strokes, where each stroke is a sequence of (x, y) coordinates. This format isn't particularly suited for a Neural Network, thus the need to transform them. We implemented a `Rasterizer` class, responsible for converting such a sequence of strokes to a 256 by 256 rasterized image, using Bresenham's line algorithm [3]. This class is compatible with Torch's transormation framework and can be used in conjunction with other transformations, such as resizing or normalizing the image.

Another transormation class was implemented, `Sequencer`, which converts the drawing into a sequence of state vectors, for use in a Recurrent Neural Network [4]. This approach wasn't used, however.

4.2 First NN : GAN

Generative aversarial networks called GANs belong to the familly of generative models. Which we can define as a familly of model that takes a dataset containing samples from a distribution p_{data} and learns in someway to represents this distribution p_{model}. In this project we will judge the quality of this representation by generating some samples of p_{model}.

We choose to focus our work on generative models and GANs in particular because it's an interesting way to test our capacity to represent and play with the probability distribution of drawing ability of humans. The question is : can a model draw realistic samples of an object (an apple for example) as a human can do it, considering the high variability of the samples.

GANs can represent the samples distribution by using a Maximum likelihood estimation, this means that we choose some parameters for our model that maximize the likelihood of the training data, in a log space, because of numerical issues correlated to computers design.

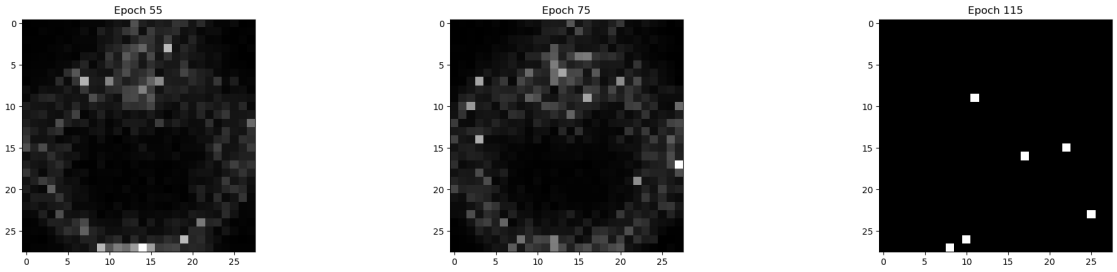
GAN framework

The framework is made of two parts. There is on generator that creates samples that belongs to p_{model} but which should come from the same distribution as the training set p_{data}. The other part consist of a discriminator.

4.3 Second NN : DCGAN

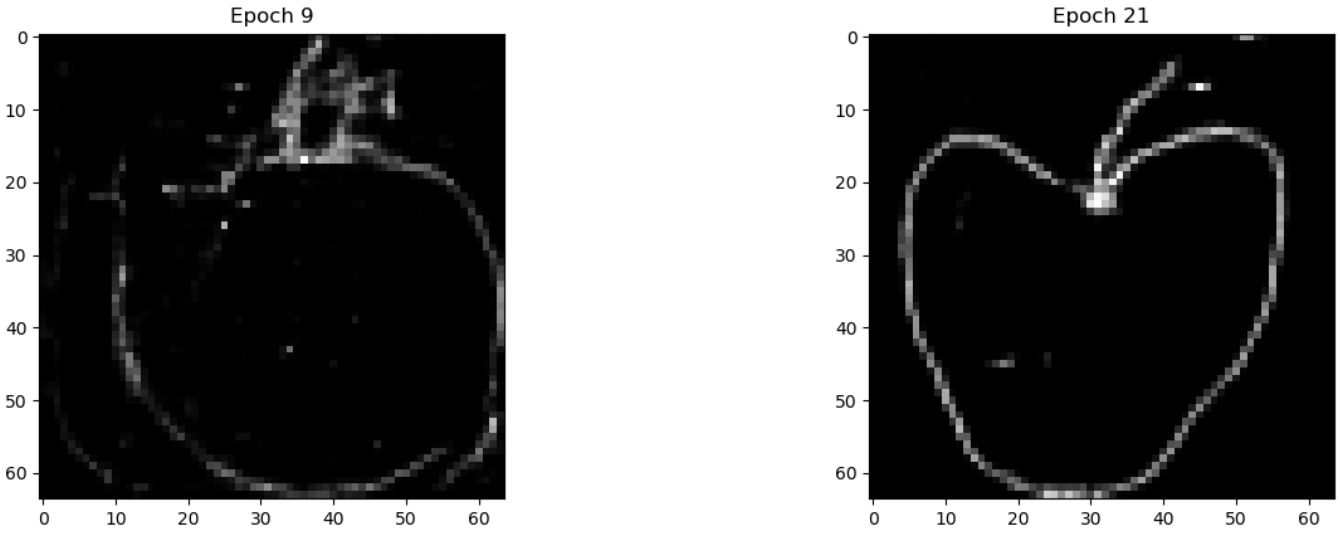
Discriminative...

3. https://en.wikipedia.org/wiki/Bresenham%27s_line_algorithm
4. https://arxiv.org/abs/1704.03477



(a) Epoch 55. **(b)** Epoch 75. **(c)** Epoch 115.

FIGURE 2 – Légende TODO



(a) Epoch 9. **(b)** Epoch 21.

FIGURE 3 – Légende TODO

5 PROBLEMS

Les problèmes qu'on a eu, outre les problèmes de natel de Mick...

6 RÉSULTAT

On présente les résultats et on nique des mères... histoire de fêter ça...

7 FURTHER WORK

Warsserstein
WaffenSS

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