

Pattern Recognition Lessons Learned

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May 29, 2022

Through this project we were first able to learn to coordinate among a relatively large group without necessarily having direct contact. The challenge here was to distribute the tasks according to each other's strengths, weaknesses and interests. It was sometimes difficult to establish an equitable allocation of tasks. We therefore decided to structure this report as a personal testimony for each member of the group. Each statement is here addressed in the first person.

1. Antoine Demont

These projects were a nice application of the notions presented during the lecture. It was also interesting to work with bigger amount of data than the previous work I have done during my studies, meaning that a working solution is not sufficient but it should be an efficient solution too. Finding the best way to solve a problem rather than simply solving it is an important skill to develop, with the goal that the most efficient one can become the first one that comes to my mind when faced with similar problems. One other key aspect of these tasks, and more generally of computer sciences, was data visualisation. They allowed me to improve my skills as well as showed me other metrics than the traditional precision value.

Working in a group of 5 is also different from my previous work, as most of the group projects I have done where groups of 2 or 3. This require a better organisation as well as consistency in our code, which is more similar to a real world situation. Making the code as clear as possible such that every group member is able to understand what is done increases in difficulty the more persons work on it. A note on these tasks, I sometimes felt like they were not big enough for a team of 5. If one person is motivated, it quickly reduces the remaining part of the job of the group ending with one person not really being able to participate to the project.

Due to our limited time we could not work on the graph matching task, but I think those give a good overview of the different methods used for pattern recognition. It was also nice to use Dynamic Time Warping, to show that it is also possible to obtain good results without the need to train a machine learning model when it seems nowadays that using machine learning is the go-to solution for everything regardless of the problem.

2. Boris Mottet

On the MNIST exercices, it was interesting to use different methods even if I knew already of the dataset. I liked more Dynamic Time Warping exercices because it was new to me and we could have descent results on non-trivial tasks.

It was not easy to coordinate the amount of work for each member in a task. It was not always simple to join a project in its late stage because you need to understand well what has already be done. Nonetheless, I think we did a pretty good job at that by making the code as understandable as possible. Moreover, we were also available to other members to clarify aspect of the tasks by messages or video calls.

Allowing us to use any librairy we want is a great way to show us how to effectively use the methods learned in class, but it doesn't help understand the concept behind them, albeit the lectures does a great job at it.

3. François-Xavier Wicht

These projects were interesting in that they allowed us to touch on many subjects and to work with different libraries and methods. I noticed that some seemingly difficult classification problems, such as detecting whether a signature has been forged, could easily be solved using techniques learned in class. Moreover, these different projects allowed me to realise some typical trade-offs like between precision and recall. Although now obvious, it is clear that classification can never be perfect, either we manage to capture all the elements by decreasing the precision of our classifier or we omit some elements but increase our precision. This kind of classification problem can be applied to many other problems.

I was able to work in another course on the de-anonymisation of users in the Bitcoin P2P network. There, for the adversary, it is also a problem of classification. She has to map each transaction to a server. There is indeed deanonymisation when a transaction can be mapped to a server in the network. So it's a bit of a classification problem with one item per class at each time. The techniques described in the paper were all trivial for me thanks to this project and I could even implement some of them easily. Classification problems are everywhere and this project helped me to build a toolbox for my future professional and academic life.

4. Martin Poplawski

5. Vincent Carrel

The first project was not that interesting, as MNIST is something which I have already worked on for multiple different previous project. The permuted MNIST was a nice addition to the task, while the MLP results were expected, I was surprised by the CNN results. We got a $>97\%$ precision which was wild for me. I could imagine some patterns reappearing after permutation, but considering that the same pattern at a different position would get remap to something else, I was not expecting this kind of result. Given a bit more time, I was also hopping to implement a method to infer the permutation given the dataset. Obviously the pixels which are white on every single image could no be processed, but given enough images, it would have probably been possible to remap all the other pixel to their initial position.

During both the second and the third project, we worked with Dynamic Time Warping, and I was really positively surprised by the results obtained. During the preparation of the Keyword spotting, I was not really expecting much considering our features used, but when the first results came through, it was really cool realizing that it works quite well even with only a few basic features. Therefore it was a good experiment to work again with it on the signature validation. Overall this was a really busy semester, so we didn't spend as much time as we wanted to/should on the last project, but we still got some decent results.

Overall it was a different experiment from the classic work in pairs or group of 3, organizing the work between ourself was actually a part of the challenge in itself, not repeat some work already done, wait for the results of someone else, etc...