Interactive Intelligent Products

Project B Reflection

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25.01.2018

Preface

In 'Project B' we evaluated our first project and implemented changes based on feedback given by our peers and personal insights. Highlights were pivoting from a concept revolving around *training weights* to *weight training gloves*, greatly improving the dataset, and elaborate algorithm evaluation and parameter tuning. This all resulted in a more robust and reliable machine learning concept.

Key insights

The second iteration of the project has allowed me to become more comfortable in getting better performances out of machine learning algorithms. In a search for better performance we re-evaluated the previously established learning journey. We found that it could be improved on several parts.

Firstly: our training weights with embedded sensors were found to be unreliable. The difference in orientation of the device mattered greatly in terms of produced data, which is why we needed a way to standardize the orientation of the device. We fixed the orientation problem by radically changing the hardware — a non-obtrusive wearable solution was chosen to fix the problem. The result was a much cleaner source of data, and a more accurate model. I've learnt that it is essential to analyze the process of capturing data, as this can only be done once. The input data has to be good for the model to perform well.

Next was the dataset. Our previous prediction model had a quite satisfactory in-sample accuracy, but it struggled with newly introduced data. Part of the reason was the quite biased data set that was used to train the model: it was trained on a small dataset that was generated by one of the group members. We made the dataset more reliable by increasing the size by over 600%, and by recording movements of multiple participants. This allowed for more variety among the labeled data groups, and a more robust model overall.

Finally, we spent quite some time evaluating and testing common machine learning algorithms, including the *Radial Basis Function*, *K-Nearest Neighbour, Artificial Neural Network* and the *Support Vector Machine*. Additionally, we evaluated parameters of algorithms in order to boost the accuracy. With the parameter tuning it's important to consider both in-sample as out-of-sample accuracy. In the end, I found that for our problem of multi-class classification, a *Linear SVM* works best.

Future Application

This course has brought me a valuable new tool in adding extra depth to product designs by implementing machine intelligence. Throughout the curriculum I have learnt about the different types of learning — *Supervised-*, *Unsupervised-* and *Reinforcement Learning* — and improved my intuition regarding common machine learning algorithms. Something that I am very eager to do is to implement machine learning on data that is not based on physical sensors, such as website / application usage.

My vision on implementing machine learning in design is to provide *mass customization* of users' experiences, environment and system responses. One of my favourite commercial implementations of machine learning is *Spotify's Discover Weekly*: their algorithms are able to predict with incredible accuracy as to what music I would enjoy, based on my previous usage. I think this is absolutely brilliant: they have managed to create a product that distinguishes itself from other music streaming applications by creating personalized experiences for all its users.