

# Machine Learning End-to-End – from the initial idea to the deployed solution

Degree programme: BSc in Computer Science | Specialisation: Mobile Computing

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Machine Learning (ML) has been a hot topic in computer science for several years now. For companies like Google, Amazon and Microsoft, ML has become a part of their core business. However, ML technologies are still rarely adopted by more conventional companies for the reason of their complexity. This thesis explores and describes the end-to-end process of a ML based system from an initial idea to a deployed solution and illustrates the power of related applications.

## Introduction

Machine Learning (ML) has the potential to transform many industries. Based on two projects, this bachelor thesis describes the development and evaluation of an ML based system. Moreover, it contains guidance to evaluate cloud solutions.

## Projects

The first project illustrates how Machine Learning could be used to predict the probability of a person being home at a particular time in the future. The system detects the presence of a person by means of network-scans from a small, low cost computer in the network. The prediction service is integrated into Google Home, a conversational assistant, which is voice controlled.

The second project makes use of smartphone capabilities: The precisely working sensors and the impressive computing power of these small form factor devices enable many interesting ML applications. This is demonstrated by the implementation of a keylogger,

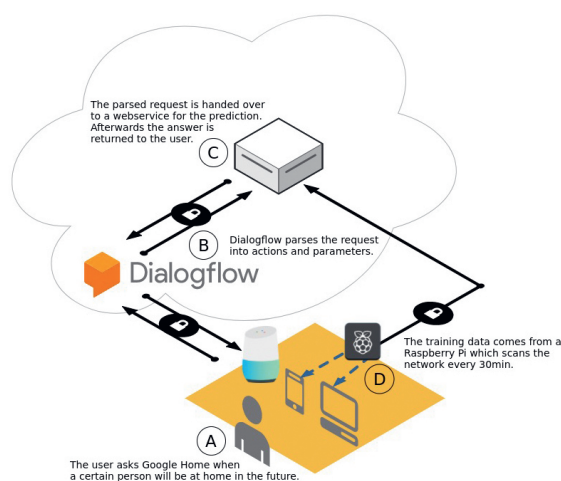
which analyses the sound of keystrokes. The related Android app includes a module, which records the sound and maps it to the related key. These data are then sent to a high-performance computer, which trains the prediction model. After training, the model gets distributed back to the phone. Using this model, the app can record keystroke-sounds and predict the corresponding pressed keys in real-time.

## Results

With the data of network-scans the presence of a person could be predicted with an accuracy of about 70%, which is already quite a meaningful information. The integration into Google Home shows an interesting way of interaction with such services. The keylogger project shows the feasibility for on-device predictions. It also illustrates the separation of data-collection, prediction and training. The first two happen on-device and the training on a separate, more powerful computer.



Michael Herren



System overview for the presence prediction



Recording setup for the keylogger