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Deep Learning report

HAN Embedded Vision and Machine Learning

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Contents

[1 Introduction 3](#_Toc88129256)

[2 Problem statement 4](#_Toc88129257)

[3 Data augmentation and preprocessing 5](#_Toc88129258)

[4 CNN architecture and training 6](#_Toc88129259)

[5 Deploy and test 7](#_Toc88129260)

[6 Conclusion 8](#_Toc88129261)

[7 References 9](#_Toc88129262)

[Code appendices 10](#_Toc88129263)

# Introduction

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| --- | --- |
| Assignment | Introduce your Deep Learning (DL) portfolio and position it within the Embedded Vision landscape. What is the relevance of DL and convolutional neural networks (CNNs) to practical domains you are interested in? What do you want to learn yourselves? |
| Acceptance criteria | DL relation to EVD is discussed.  Personal interests and learning objectives in the context of DL are discussed |
| Size | Max 1 A4 |

# Problem statement

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| --- | --- |
| Assignment | 1. Update the objective stated in your Machine Learning (ML) portfolio 2. Also update the requirements table and prioritize these requirements. Think about how you would test or prove whether your final result has met a requirement. |
| Acceptance criteria | Problem definition is specific and measurable (SMART criteria, 2020).  Functional and technical requirements are listed and prioritized. |
| Size | Max 1 A4 |

# Data augmentation and preprocessing

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| Assignment | 1. Starting from your ML image set, increase the amount of data by augmentation. Argue the augmentation method chosen. Give a summary of the final data set. 2. Prepare your image data set to better expose the underlying patterns to CNNs *or* to reduce the complexity of CNNs. Think about image size, color (depth), enhancement, normalization, etc. Construct a preprocessing pipeline based on your findings. |
| Acceptance criteria | Data augmented, and method argued.  Preprocessing pipeline argued and implemented. |
| Size | Max 3 A4 |

# CNN architecture and training

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| --- | --- |
| Assignment | 1. Design and argue a CNN architecture (a net). Think about nr of layers, nr of neurons, pooling, activation functions, etc. Can you re-use pretrained layers from other nets? 2. Split your data into training, validation, and possibly test sets. 3. Train your CNN and optimize hyperparameters. Do you need to regularize? 4. Evaluate model performance using cross-validation and possibly re-train. How should performance be measured? Discuss trade-offs, e.g. precision/recall, and bias/variance. 5. To get a better feel and intuition for what kind of features the net has learned, visualize how an input gets transformed as it goes through your net. |
| Acceptance criteria | Architecture is designed and argued.  Data is split into stratified subsets and checked.  CNN is trained, cross-validated, and fine-tuned.  Performance is evaluated using appropriate methods.  Transformation of images is visualized. |
| Size | Max 5 A4 |

# Deploy and test

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| --- | --- |
| Assignment | 1. Deploy your net on your target machine (e.g. Raspberry Pi). Note that this step is optional; you can also choose to continue testing on your training machine. 2. Make a system test plan to check your SMART problem definition. 3. Run the net and perform tests. |
| Acceptance criteria | Net is deployed.  Test plan present.  Documentation of test results. |
| Size | Max 5 A4 |

# Conclusion

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| --- | --- |
| Assignment | 1. Discuss results and draw conclusions. 2. Reflect on your work in both the ML and DL portfolio. |
| Acceptance criteria | Results are concluded.  Generalization performance discussed.  ML and DL application to your dataset are compared. |
| Size | Max 2 A4 |

# References

Géron, A. (2019). *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow.* Sebastopol, Canada.: O’Reilly Media.

*SMART criteria*. (2020, 05 14). Opgehaald van wikipedia: https://en.wikipedia.org/wiki/SMART\_criteria

# Code appendices