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ESE S6 AI report

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# Introduction

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| --- | --- |
| Assignment | 1. Introduce your AI report and position it within the context of the ESE program or your semester project. What is the relevance of machine learning (ML) to practical domains you are interested in? What do you want to learn yourselves? Notice that more complex and challenging projects will be graded higher. A project is considered more complex and challenging if it deviates significantly from the given examples. This deviation can be obtained, for example, by using different sensors, by implementing new (pre)processing steps, different models etc. |
| Acceptance criteria | AI relation to ESE or semester project is discussed. |
| Size | Max 2 A4 |

# Problem statement

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| Assignment | 1. Define your objective, e.g. the example case, or alternatively, combine an ML objective within your main S6 project. Note that all stages for building an ML project should be covered, i.e. data analysis, model creation and deployment (refer to the ML workflow document). 2. List and prioritize requirements. Think about measurable parameters, e.g. what performance criterium will you use, what performance levels are you hoping to achieve? List and prioritize your functional requirements, think about technical requirements too, e.g. what sample rate. |
| Acceptance criteria | Problem definition is specific and measurable (SMART criteria, 2020).  Functional and technical requirements are listed and prioritized. |
| Size | Max 1 A4 |

# Data analysis

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| Assignment | 1. Design and implement a data capture application. Use it to label a data set using a controlled test set-up. 2. Propose, visualize, and argue features Are your features informative, discriminating, independent, explainable? Look for correlations or combinations. 3. Design preprocessor to extract the features. Does your data need filtering? Or cleaning? Do outliers need to be detected and removed? Do features need to be transformed or scaled? 4. Explore the resulting feature data, and discuss data quality Is your data set representative, sufficient, balanced, unbiased, etc.? |
| Acceptance criteria | Features engineered and argued.  Feature data is visualized and explored.  Preprocessor argued and implemented. |
| Size | Max 3 A4 |

# Model creation

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| Assignment | 1. Split your data into training, validation, (and possibly test) sets. 2. Train your ML model and optimize hyperparameters. Reduce overfitting by constraining the model. 3. Evaluate model performance by validation and possibly re-train. How should performance be measured? Discuss trade-offs, e.g. precision/recall, and bias/variance. |
| Acceptance criteria | Data is split into stratified subsets and checked.  Model is trained, cross-validated, and fine-tuned.  Model performance is evaluated using appropriate methods. |
| Size | Max 5 A4 |

# Deployment

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| Assignment | 1. Deploy your classifier on your target microcontroller. 2. Make a system test plan to check your SMART problem definition. Think about measurable parameters, e.g. what performance criterium will you use, what performance levels are you hoping to achieve, what sample rate, etc.? 3. Evaluate the performance of the deployed classifier in terms of duration of the calculation steps, e.g. by visualizing the duration in a histogram. 4. Run the model and perform tests. |
| Acceptance criteria | Preprocessing and classification pipeline deployed.  Test plan present.  Performance evaluated.  Documentation of test results. |
| Size | Max 5 A4 |

# Conclusion

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| --- | --- |
| Assignment | 1. Discuss results and draw conclusions. |
| Acceptance criteria | Results are concluded. |
| 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