List of Topics for DHBW Seminar Paper in the Lecture "Overview of Machine Learning (ML)" – Student-Course 18C, WS2020 (without evaluation)

Effort(hours)/Pages/Language/Deadline: 6-8 hours/8-10 pages/English/11.12.2020,18:00
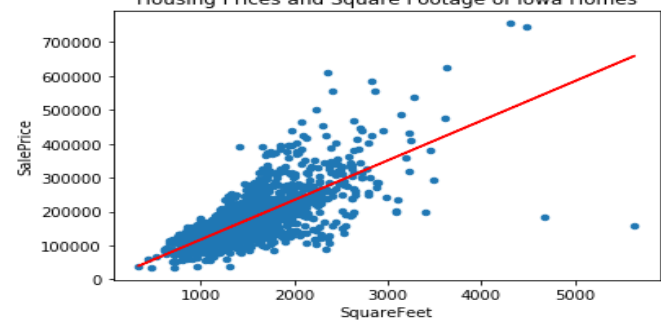**Evaluation**: Dr. Hermann Völlinger (send the paper to hermann.voellinger@gmail.com)
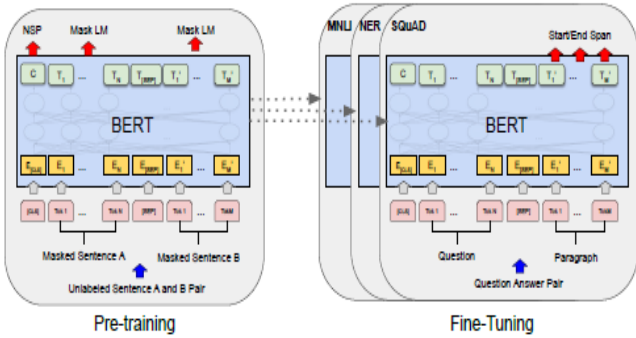**Groupwork**: Teams of two students.
References:

- Dr. Hermann Völlinger: Script of the Lecture "Machine Learning - Concepts & Algorithms ", DHBW Stuttgart; WS2020
- Dr. Hermann Völlinger and Other: "Homework/Exercises of the Lecture *ML - Concepts & Algorithms* ", DHBW Stuttgart; WS2020

No	Topic	Details	Reference 2 Lecture	Students / **Evaluation**
ML01	**Reinforcement Learning with MatLab**	Prepare a report about the content of the MatLab eBook; "*Reinforcement Learning with MATLAB, Part3: Understanding Training and Deployment*" MathWorks 2019;https://www.slideshare.net/HiteshMohapatra/reinforcement-learning-ebook-part3 See also in Moodle of Course 18C a copy of this book. Look also in the internet for additional information about Part1 and Part2…	Chapter ML1	nnnn/ nnnn: -
ML02	**Deep Learning for Fraud Detection**	See Moodle: "ML for Fraud-Sift Platform.pdf", Sift Science Engineering – Article: "Deep Learning for Fraud Detection" by Ralf Carvalho and Alex Paino: https://engineering.siftscience.com/deep-learning-fraud-detection/ Further information go to the internet.	Chapter ML1	nnnn/ nnnn: -
ML03	**Chapter 1 of Tom Mitchells book.**	Read and create a summary about the chapter 1 of "Introduction" of the book of Tom Mitchell. „Machine Learning", McGraw Hill, 1997: https://www.cs.cmu.edu/~tom/mlbook.html. In especially have closer look to the examples of ML. See also a copy of this book in Moodle.	Chapter ML1	nnnn/ nnnn: -
ML04	**Usage of AI for Digitalization**	Read and create a summary about the article of the Spluk Manager CIO magazine: "**5 SCHRITTE** ZUR TRANSFORMATION IHRES IT-UNTERNEHMENS MIT KÜNSTLICHER INTELLIGENZ". See Moodle: *Splunk_German_SplunkCIO_WP_0918.pdf*	Chapter ML3	nnnn/ nnnn: -
ML05	**Artificial Intelligence (AI) and Ethics**	See the following article in „Handelsblatt", June 2019: "Ethische Grenzfragen – wenn KI diskriminiert oder Leben gefährdet". See this in Moodle and use additional information from the internet. Give an answer to the questions "Can we program Ethics into AI?" What can happen when a "strong" AI takes over the control and no person can stop it? See also Stanley Kubrick's famous movie from 1968: "*2001: A Space Odyssey*" https://www.youtube.com/watch?v=XHjIqQBsPjk HAL 9000: "I'm sorry Dave, I'm afraid I can't do that" https://www.youtube.com/watch?v=ARJ8cAGm6JE&t=42s	Chapter ML3	nnnn/ nnnn: -

ML06	**Decision Trees and Predictive Maintenance**	Read and create a summary about a special part of article/dissertation from Hans W. Dörmann Osuna: "Ansatz für ein prozessintegriertes Qualitätsregelungssystem für nicht stabile Prozesse". See Moodle or the following link to the article: http://d-https://elearning.dhbw-stuttgart.de/moodle/mod/folder/view.php?id=122175 For the two chapters: „7.1 Aufbau des klassischen Qualitätsregelkreises" and Chapter „7.2. Prädiktive dynamische Prüfung".	Chap. ML4	nnnn/ nnnn: -
ML07	**Decision Trees (with GINI) for Predictive Maintenance**	See Homework 3.2: Calculate the Decision Tree for UseCase "Predictive Maintenance" on slide p.77. Do the following steps: 1. Calculate the Frequency Matrices for the features „Temperatur", „Druck" and „Füllstand" 2. Define the Root-node by calculating the **GINI-Index** for all values of the three features. Define the optimal split-value for the root-node (see slide p.67) 3. Finalize the decision tree by calculation of GINI-Index for the remaining features "Temp." and "Füllst." **Task**: Create and describe the algorithms to automate the calculation of the steps 1. to 3.	Chap. ML4	nnnn/ nnnn: -
ML08	**Decision Trees (with ID3) &Pred. Maintenance**	Do the same as in SW07 but use the ID3 method. Create and describe the algorithms to automate the calculation of the steps 1. to 3. Use the concepts and the links of the lecture. Use the two measures used in information theory, called **entropy** and **information gain.**	Chap. ML4	nnnn / nnnn -
ML09	**Linear Regression Methods for UseCase "House Pricing"**	Describe the logic of the "*House Pricing"* Use-Case with simple- (sLR) or multiple Linear Regression (mLR) Method. See the YouTupe Video: "Regression II: Degrees of Freedom EXPLAINED | Adjusted R²": https://www.youtube.com/watch?v=4otEcA3gjLk and see the video, which shows the coding of a sLR using Keras library & Python. Repeat the coding with this dataset and optional show the coding for a mLR(k=2) solution . See: https://www.youtube.com/watch?v=Mcs2x5-7bc0	Chap. ML5	nnnn/ nnnn: -

ML10	**Deep Neural Network – UseCase UC4**	UC4 – Deep Neural Network – **"Google AlphaGo"** – Read the article and create a summary about the content: https://storage.googleapis.com/deepmind-media/alphago/AlphaGoNaturePaper.pdf	Chapter ML6	nnnn/ nnnn: -
ML11	**Semantic Search – "Predictive Basket"**	Evaluate the AI Technology of Fact-Finder - see UC3 in ML5: "Semantic Search-Predictive Basket with Fact-Finder" https://www.youtube.com/watch?v=vSWLafBdHus&feature=youtu.be See also the following video about Computer Linguistic (NLP) and AI within Fact-Finder: https://www.fact-finder.com/resources.html Automatisch, personalisiert, selbstlernend. FACT-Finder generiert Produktvorschläge anhand von Predictive-Analytics-Modellen und Machine-Learning-Algorithmen.	Chapter ML6	nnnn/ nnnn: -
ML12	**Natural Language Processing (NLP) with BERT"**	Read and summaries the main results of the article about BERT. See Ref. **[BERT]** in lecture script**:** Jacob Devlin and Other: **"BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding"**; Google(USA); 2019 (also in Moodle). See See also this **Google AI** Blog in Moodle: "BERT_State-of-the-Art Pre-training for NLP.pdf" https://ai.googleblog.com/2018/11/open-sourcing-bert-state-of-art-pre.html	Chap. ML6	nnnn/ nnnn: -