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 | Students / |
|------|--------------------|--|-----------|---------------|
| | | | 2 Lecture | Evaluation |
| ML01 | Reinforcemen | Prepare a report about the content of the MatLab eBook; | Chapter | nnnn/ nnnn: - |
| | t Learning | "Reinforcement Learning with MATLAB, Part3: | ML1 | |
| | with MatLab | Understanding Training and Deployment" MathWorks | | |
| | | 2019; https://www.slideshare.net/HiteshMohapatra/reinforce | | |
| | | ment-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 | | |
| ML02 | Deep | See Moodle: "ML for Fraud-Sift Platform.pdf", | Chapter | nnnn/ nnnn: - |
| | Learning for | Sift Science Engineering – Article: "Deep Learning for | ML1 | |
| | Fraud Detection | Fraud Detection" by Ralf Carvalho and Alex Paino: | | |
| | | https://engineering.siftscience.com/deep-learning-fraud- | | |
| | | <u>detection/</u> Further information go to the internet. | | |
| ML03 | Chapter 1 of | Read and create a summary about the chapter 1 of | Chapter | nnnn/ nnnn: - |
| | Tom | "Introduction" of the book of Tom Mitchell. "Machine | ML1 | |
| | Mitchells | Learning", McGraw Hill, 1997: | | |
| | book. | 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. | | |
| ML04 | Usage of AI | Read and create a summary about the article of the | Chapter | nnnn/ nnnn: - |
| | for | Spluk Manager CIO magazine: "5 SCHRITTE ZUR | ML3 | |
| | Digitalization | TRANSFORMATION IHRES IT-UNTERNEHMENS | | |
| | | MIT KÜNSTLICHER INTELLIGENZ". See Moodle: | | |
| | | Splunk_German_SplunkCIO_WP_0918.pdf | | |
| ML05 | Artificial | See the following article in "Handelsblatt", June 2019: | Chapter | nnnn/ nnnn: - |
| | Intelligence | "Ethische Grenzfragen – wenn KI diskriminiert oder | ML3 | |
| | (AI) and | Leben gefährdet". See this in Moodle and use additional | | |
| | Ethics | 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 | | |
| | | | | |

| 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 Housing Prices and Square Footage of Iowa Homes | 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 The story of AlphaGo so far AlphaGo is the first computer program to defeat a professional human Go player, the first program to defeat a Go world champion, and arguably the strongest Go player in history. AlphaGo's first formal match was against the religning 3-times European Champion, Mr Fan Hu, in October 2015. Its 5-0 win was the first ever against a Go professional, and the results were published in full technical detail in the international journal, Nature. AlphaGo then went on to compete against legendary player Mr Lee Sedol, winner of 18 world titles and widely considered to be the greatest player of the past decade. AlphaGo's 4-1 victory in Seoul, South Korea, in March 2016 was watched by over 200 million people worldwide. It was a landmark achievement that asyents agreed was a decade shead of its time, and emend AlphaGo a de pan professional ranking (the highest certification) - the first time a computer Go player had ever received the accolade. During the games, AlphaGo played a handful of highly inventive winning moves, several of which - including move 37 in game two - were so supprising they overturned hundreds of years of received visions, AlphaGo somehow taught the world completely new knowledge about perhaps the most studied and contemplated game in history. Since then, AlphaGo has continued to surprise and maze. In January 2017, an improved AlphaGo version was revealed as the offine player "Master" which achieved 80 straight wins in celline fast time-control games against top international Go players. | Chapter ML6 | nnnn/ nnnn: - |
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| 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 | 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: - |