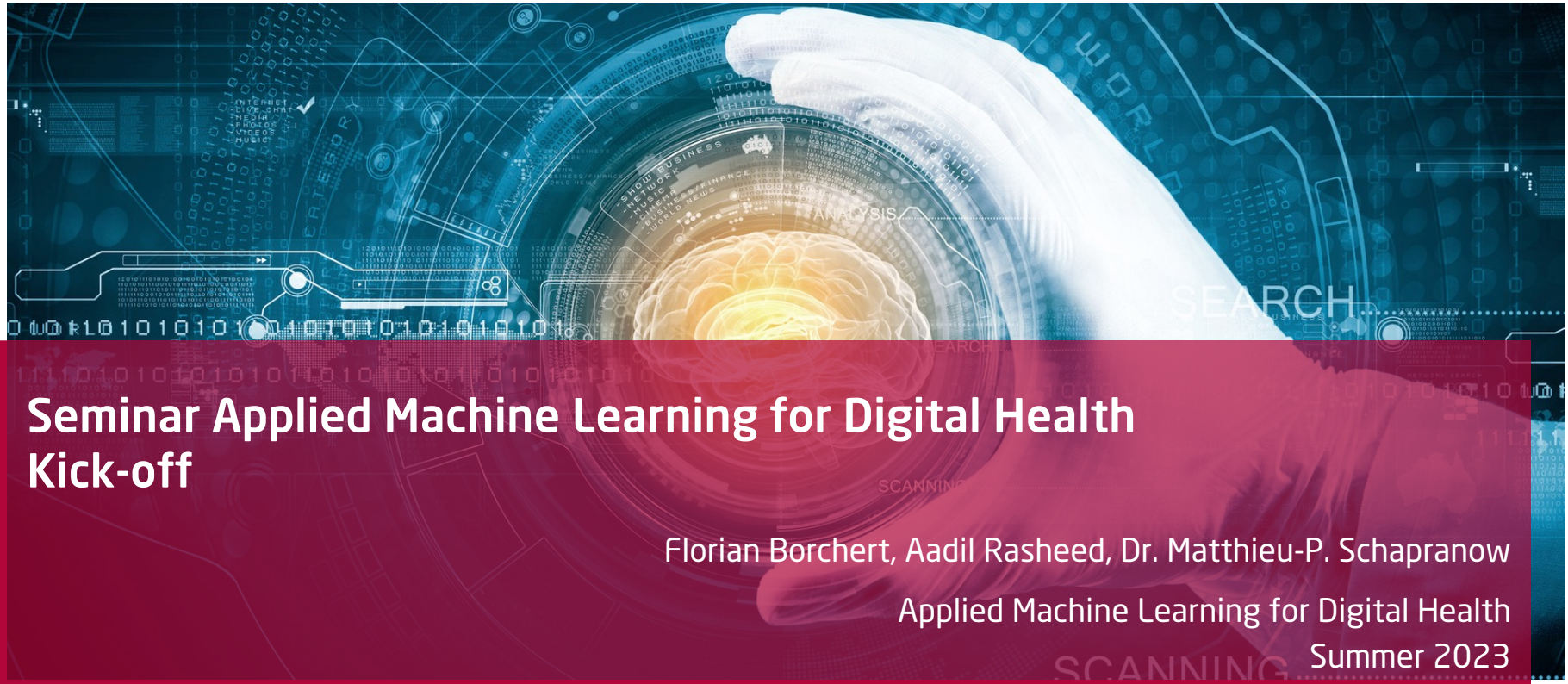
Hasso Plattner Institut
Digital Engineering · Universität Potsdam



Seminar Applied Machine Learning for Digital Health
Kick-off

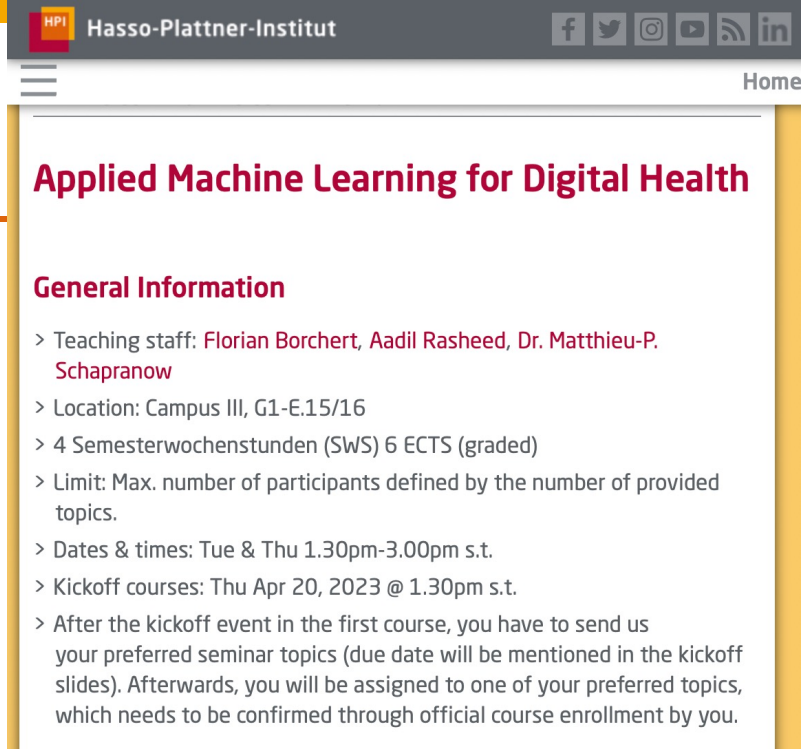
Florian Borchert, Aadil Rasheed, Dr. Matthieu-P. Schapranow

Applied Machine Learning for Digital Health

Summer 2023

Seminar Organization
Administrative Details Time / Dates

- Format: Seminar
- Scope: 4 SWS (6 graded ECTS)
- Dates and time:
  - Tuesdays + Thursdays 01.30pm – 03.00pm and
  - Individual appointments with your personal supervisor.
- Further details are available on the seminar website: https://hpi.de/digital-health-cluster/teaching/summer-term-2023/applied-machine-learning-for-digital-health.html



Seminar Organization
What You Can Expect from Us

- Broaden your horizons in the fields of
  - Digital Health,
  - Life sciences, as well as
  - Data challenges and opportunities
- Work with real-world data, real-world use cases
- Hands-on experiments of selected tools
- Experience in scientific writing and presentation skills

https://www.haselden.com/wp-content/uploads/2019/01/65298106_s.jpg

Seminar Organization
What We Expect from You

- Commitment to your seminar topic
- Regular participation in all presentations and update meetings
- Active participation in group discussions
- Perform autonomous research to dig deeper into the topics
- Contribute with your expertise also to your colleagues
- Update supervisors on any issues you might encounter

https://www.haselden.com/wp-content/uploads/2019/01/65298106_s.jpg

Seminar Organization
Grading

- The grading of the seminar works as follows (aka “Leistungserfassungsprozess”):
  - 40% Seminar results, i.e.
    - Intermediate & final presentation conducted during seminar slots
    - Research prototype
  - 40% Scientific research article about your individual contribution submitted by the end of the seminar
  - 20% Individual commitment throughout the seminar

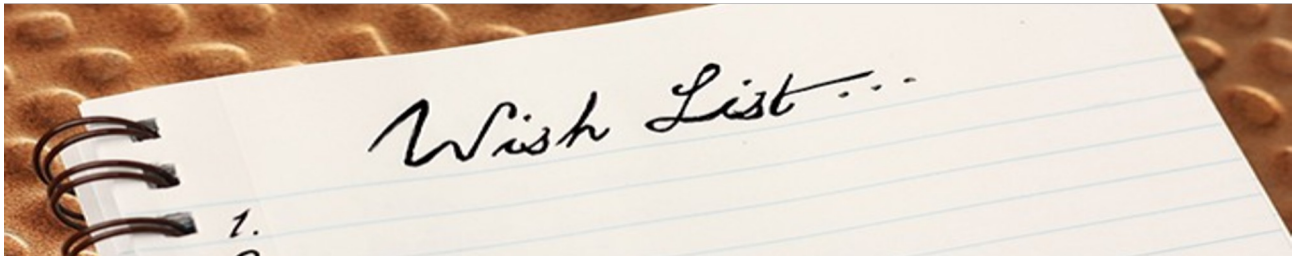
- **All individual parts have to be passed to pass the complete seminar**

https://hpi.de/fileadmin/user_upload/hpi/bilder/galerien/2022/Eröffnung_Haus_L/KayH20220401-1M7A3644.jpg

Seminar Kickoff, Apr 20, 2023

Next Steps
Enrollment Process: How to apply for a topic?

- Send prioritized list of top three topics to Aadil Rasheed (Aadil.Rasheed@hpi.de) by **Wed Apr 26, 2023 9am (sharp)**
  - 1st choice: ...
  - 2nd choice: ...
  - 3rd choice: ...
- Assignment of seminar topics: **Wed Apr 26, 2023 by noon**
- Enrollment deadline: **Fri Apr 28, 2023 end of day (via Studienreferat)**



Seminar Schedule: Presentations

- **May 23rd (+ May 25th)** Intermediate presentations
  - 10 minutes presentation
  - Introduce your topic, problem/motivation, how you want to solve it
  - Slides due at day of presentation, 9am

- **July 18th + July 20th** Final presentations
  - 20 minutes presentation
  - Slides due at day of presentation, 9am
  - Present your approach and results achieved

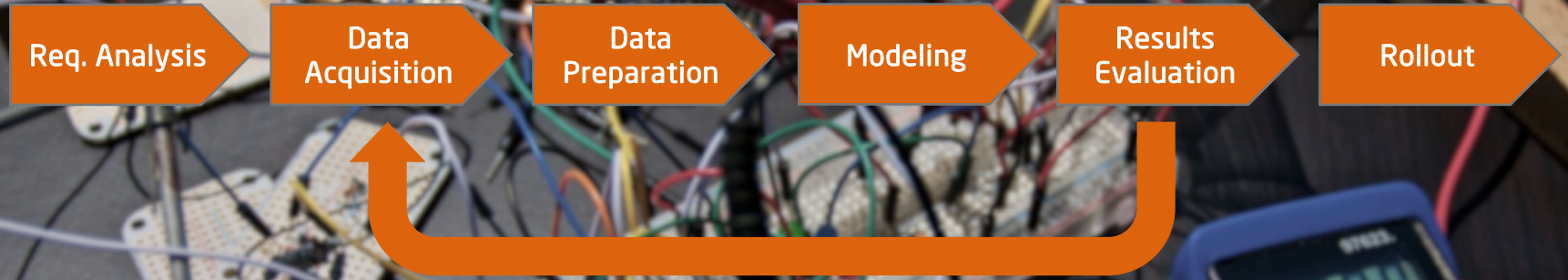
Seminar Schedule: Paper Writing

Hasso Plattner Institut

- **July 20th**: Introduction to scientific writing

- **Aug 20th (end of day):** Project results submission
  - One paper per topic
  - Max. 6 pages excluding appendix
  - Iterate regularly with your supervisor prior to submission
  - Source code for project and paper (LaTeX) including documentation how to build it

Machine Learning for Digital Health Process:



While designing the following topics, we had in mind, that each of them should cover selected steps of the ML process to allow you to broaden your competency.

Photo by Nicolas Thomas

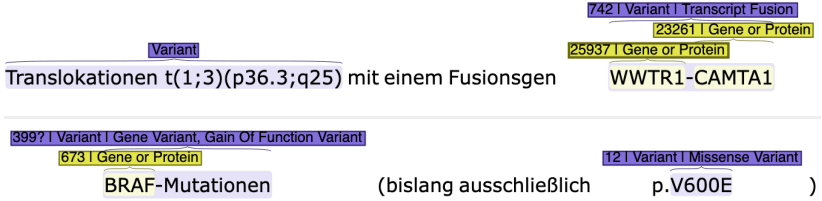
Overview of Seminar Topics

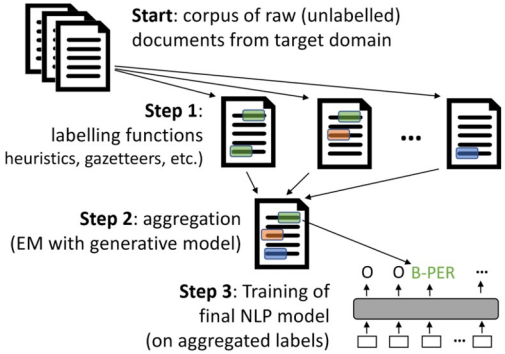
A. Weak Supervision for Detecting Mentions of Genetic Variants in Medical Text
B. MedNLP-SC Shared Task: Detecting Adverse Drug Events on Social Media
C. Generating Multilingual Interface Terminologies with Large Language Models
D. Effect of Feature Drift on Model Quality using MLOps
E. De-identified Medical Data and Its Impact on Model Performance Metric
F. Comparison of Automated and Manual Feature Engineering for Training of CPMs

A: Weak Supervision for Detecting Mentions of Genetic Variants in Medical Text

Hasso Plattner Institut

- As expert labels for supervised ML are expensive to obtain, we can use „weak" supervision to obtain cheaper, but noisier labels
- **Your tasks:**
  - Use the skweak framework [1] to generate weakly labeled training data
  - Extend our GGTWEAK [2] pipeline to handle variants (building on last year's seminar results)
- **Data**: up to 1k manual annotations of variants + much more unlabeled data from GGPONC 2.0
- **Requirements**: Good Python skills, basic ML knowledge, German language might be helpful





Seminar Kickoff, Apr 20, 2023

Applied Machine Learning for Digital Health, Summer 2023

[1] https://spacy.io/universe/project/skweak
[2] https://www.dropbox.com/s/j901c7h0onntvsl/AIME_2023_paper_24.pdf?dl=0

B: MedNLP-SC Shared Task: Detecting Adverse Drug Events on Social Media

Hasso Plattner Institut

- The goal of the MedNLP-SC shared task is to detect Adverse Drug Events (ADE) from tweets in 4 languages: https://sociocom.naist.jp/mednlp-sc/
- **Your tasks:**
  - Participate in the challenge
  - Win!
- **Data:** 10k tweets in Japanese, English, German, and French
- **Requirements**: Python, Basic ML knowledge, any of the languages besides English might be helpful

JA アザチオプリンを服用して2ヶ月経ちました。1週間くらいで全身の発疹はなくなり、かゆみもほぼ無くなっていたのですが、麻疹が少し残ってて怖かったなぁと思います。

EN I've been on Azathioprine for 2 months now, and after about a week the rash all over my body was gone and the itching was almost gone, but I still had a bit of measles and I think it was scary.

DE Ich nehme jetzt seit zwei Monaten Azathioprin, und nach etwa einer Woche war der Ausschlag am ganzen Körper verschwunden und der Juckreiz fast weg, aber ich hatte immer noch ein bisschen Masern, und ich glaube, das war beängstigend.

FR Je prends de l'azathioprine depuis deux mois maintenant, et après environ une semaine, l'éruption cutanée sur tout mon corps avait disparu et les démangeaisons avaient presque disparu, mais j'avais encore un peu de rougeole et je pense que c'était effrayant.

Positive for "Rash" and "Other"

Multi-label classification

Schedule

- March 2023: Dataset release
- (March-June 2023: Dry run)
- June 1, 2023: Registration deadline
- June 24, 2023: Training data (final version) release
- July 10, 2023: Test data release
- July 17, 2023: Result submission
- August 1, 2023: Evaluation result release
- August 1, 2023: Task overview paper release (draft)
- September 1, 2023: Submission due of participant papers (draft)
- November 1, 2023: Camera-ready participant paper due
- December 12-15, 2023: NTCIR-17 Conference in NII, Tokyo (Online presentation will be available)

If you choose the topic, we will register as a team to get access to the full dataset asap.

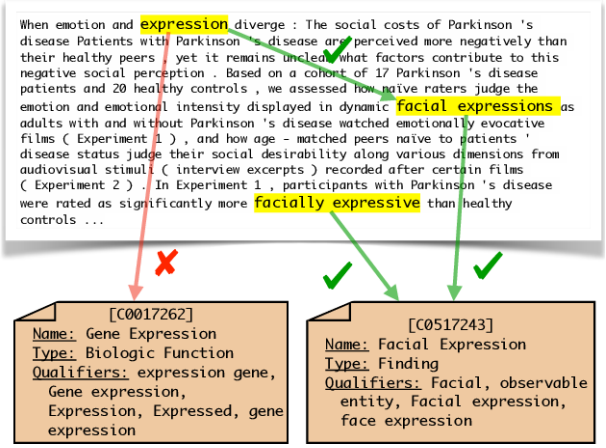
Seminar Kickoff, Apr 20, 2023

Applied Machine Learning for Digital Health, Summer 2023

C: Generating Multilingual Interface Terminologies with Large Language Models

Hasso Plattner Institut

- Linking entities to IDs in knowledge bases (UMLS, SNOMED CT) is essential for most downstream tasks
- But most terms in medical terminologies are available in English only!
- **Your tasks:**
  - Use modern large language models like GPT-*, BLOOMZ, et al. to generate high-quality aliases in different languages [1]
  - Use these aliases for entity linking and improve over monolingual / cross-lingual baseline
- **Data:** UMLS, annotated Non–English corpora (e.g., Quaero, Mantra GSC)
- **Requirements:** Solid ML + NLP background, Basic understanding of medical ontologies



Source: https://aclanthology.org/2021.naacl-main.205/

Name Count by Language:

Language	Name Count	% of Metathesaurus
ENG	11855838	70.33%
SPA	1806743	10.72%
FRE	443827	2.63%
POR	440312	2.61%
JPN	338265	2.01%
RUS	302797	1.8%
DUT	299344	1.78%
ITA	258724	1.53%
GER	255542	1.52%

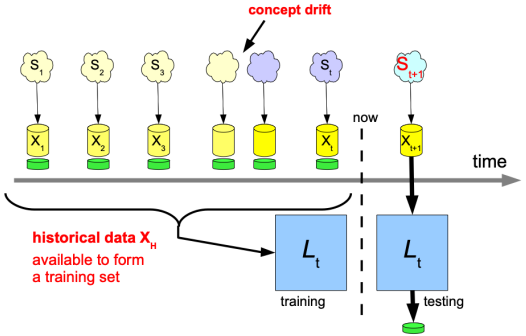
Seminar Kickoff, Apr 20, 2023

Applied Machine Learning for Digital Health, Summer 2023

[1] https://aclanthology.org/2020.multilingualbio-1.3/

D: Effect of Feature Drift on Model Quality using MLOps

- Changes in data generation process leads to concept drift[1], leading to model retraining.
- Modern MLOps technique makes retraining, maintainable and reproducible.
- **Your tasks:**
  - Train different models on drifted datasets
  - Use MLOps tools i.e. wandb to version models, analyse performance as the features drift demonstrating goals like maintainability etc.
- **Data:** Scientific Registry of Transplant Recipients(SRTR) dataset [2]
- **Requirements:** Solid ML understanding, good knowledge of Python, SSH, proficiency in working on linux VMs remotely



Seminar Kickoff, Apr 20, 2023

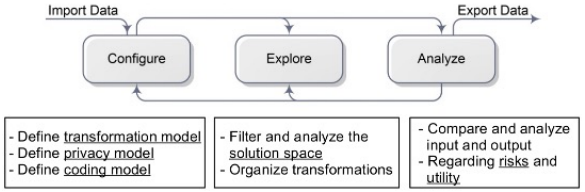
Applied Machine Learning for Digital Health, Summer 2023

[1] Žliobaitė, Indrė. "Learning under concept drift: an overview." arXiv preprint arXiv:1010.4784 (2010).
[2] https://www.srtr.org/requesting-srtr-data/saf-data-dictionary/

E: De-identified Medical Data and Its Impact on Model Performance Metric

Hasso Plattner Institut

- Sharing of data helps reproducibility in ML but privacy is main challenge
- De-identification mitigates privacy concern but lead to information loss
- **Your tasks:**
  - Use modern ARX tool[1] to create de-identifed data using different privacy measures
  - Compare the model performance on transformed datasets vs original dataset
- **Data:** NephroCAGE[2] dataset. Tabular data set with information about transplanted patients
- **Requirements:** ML skills, SSH, proficiency in working on linux VMs remotely

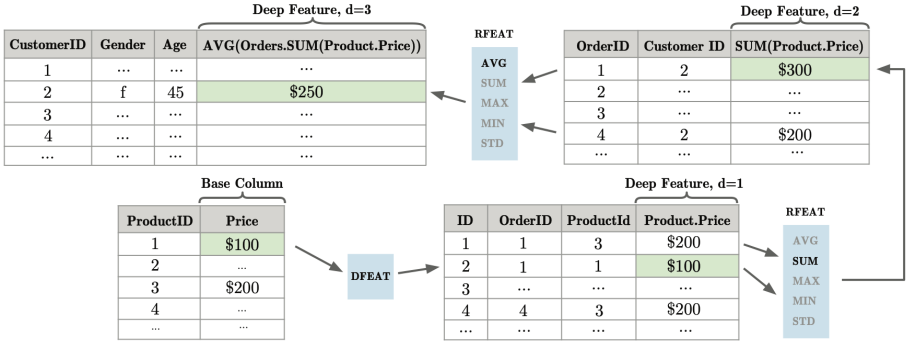


Seminar Kickoff, Apr 20, 2023

[1] https://arx.deidentifier.org
[2] https://nephrocage.org

F: Comparison of Automated and Manual Feature Engineering for Training of CPMs

- Manual feature engineering requires time and expertise
- Deep feature synthesis (DFS) can automate it
- **Your tasks:**
  - Generate new features using featuretools[2]
  - Compare ML model performance between handpicked and DFS generated feature .
  - **Data:** SRTR dataset [3]
- **Requirements:** Solid ML skills, SSH, proficiency in working on linux VMs remotely



Featuretools

Seminar Kickoff, Apr 20, 2023

Applied Machine Learning for Digital Health, Summer 2023

[1] Kanter, James Max, and Kalyan Veeramachaneni. "Deep feature synthesis: Towards automating data science endeavors." 2015 IEEE international conference on data science and advanced analytics (DSAA). IEEE, 2015.
[2] https://www.featuretools.com
[3] https://www.srtr.org/requesting-srtr-data/saf-data-dictionary/

Do Not Forget to Enroll for the Lecture!

We want you!

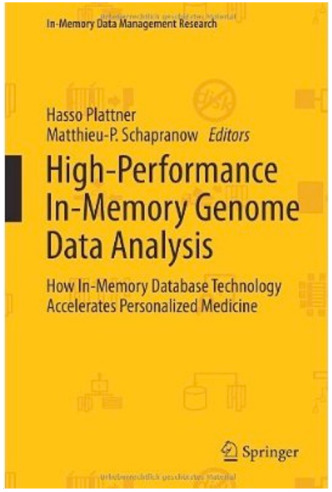
Contacts

- Florian Borchert
- Aadil Rasheed
- Dr. Matthieu-P. Schapranow

✉ <First Name>.<Last Name>@hpi.de

Digital Health Cluster
Hasso Plattner Institute Campus III
Rudolf-Breitscheid-Str. 187
14482 Potsdam, Germany

we.analyzegenomes.com
@AnalyzeGenomes



Seminar Kickoff, Apr 20, 2023

Applied Machine Learning for Digital Health, Summer 2023