

2025-10-20 Meeting Agenda

Date

20 Oct 2025

Participants

- RAIL PG-2 project team
 - Tao Xu a1937511
 - Sheng Wang a1903948
 - Jinchao Yuan a1936476
 - Zilun Ma a1915860
 - Di Zhu a1919727
 - Xin Wei a1912958
 - Yifan Gu a1909803
 - Tianhua Zhang a1915934
 - Zihan Luo a1916700
- Murtaza (Proxy Client)

Goals

- Github backlog overview
- Report progress
- Submission results
- Next steps
- QA

Discussion topics

1. GitHub backlog overview

The screenshot shows a GitHub backlog board for the project 'RAIL PG-2'. The board is organized into four columns: 'Sprint Backlog (User Stories)', 'In progress (Tasks or Spikes)', 'Done (Tasks or Spikes)', and 'To Do (Tasks or Spikes)'. Each column contains several items with detailed descriptions and status indicators.

- Sprint Backlog (User Stories):** Contains 6 items.
 - RAIL-PG-2 #35: User Story 5: As a software engineer, I want to identify the key features driving rail breaks within the training data as well as to improve the AUCPR score on the test set to exceed 60%.
 - RAIL-PG-2 #17: User Story 4.1
 - RAIL-PG-2 #18: User Story 4.2
 - RAIL-PG-2 #1: US1: As a software engineer, I want to research modelling on an imbalanced temporal dataset
 - RAIL-PG-2 #7: US2: As a software engineer, I want to try out, 1) feature engineering methods, 2) feature selection methods and 3) Machine Learning (ML) techniques
- In progress (Tasks or Spikes):** Contains 4 items.
 - RAIL-PG-2 #36: Model tuning, improve the AUCPR score
 - RAIL-PG-2 #37: Reporting: 1. Identify important features
 - RAIL-PG-2 #38: Reporting: 2. Determine thresholds or value ranges linked to higher rail failure risk
 - RAIL-PG-2 #39: Reporting: 3. Combination of techniques, model and explainability method worked so far.
- Done (Tasks or Spikes):** Contains 23 items.
 - RAIL-PG-2 #32: Implement model explainability techniques
 - RAIL-PG-2 #15: Implement different ML models with hyperparameters tuning
 - RAIL-PG-2 #22: Research Model Explainability Techniques: LRP (US4.1)
 - RAIL-PG-2 #26: Research Model Explainability Techniques: PDP & ICE (US4.1)
 - RAIL-PG-2 #24: Research Model Explainability Techniques: Permutation Feature Importance (US4.1)
- To Do (Tasks or Spikes):** Contains 0 items.

2. Report progress

2.1 XAI technique Research:

Each team member is assigned to research one XAI technique and share the result with the team. The research outcomes are added to the wiki page on GitHub.

Related tasks:

1. Research Model Explainability Techniques: EBM
2. Research Model Explainability Techniques: PDP & ICE
3. Research Model Explainability Techniques: Visualizing Attention
4. Research Model Explainability Techniques: Permutation Feature Importance
5. Research Model Explainability Techniques: LIME
6. Research Model Explainability Techniques: LRP
7. Research Model Explainability Techniques: Integrated Gradients
8. Research Model Explainability Techniques: Counterfactual Explanations (DICE)
9. Research Model Explainability Techniques: SHAP

The screenshot shows a GitHub repository page for 'Research reports'. The main content area lists several topics:

- Data ingestion
- Feature Engineering
- Features Selection
- Research Machine Learning Techniques(DNN)
- Research svm and rf
- Research Transformer
- Group Lasso Transformer_Design and Implementation
- Group Lasso Transformer_Fine-tuning and Optimization Experiments
- Filter method
- Traning Table Design
- REF+LightGBM
- XAI technique: Visualization Attention
- XAI technique: Layer-wise Relevance Propagation
- XAI technique: Shapley Additive Explanations(SHAP)

The sidebar on the right contains a 'Pages' section with a search bar and a list of pages:

- Home
- Assignments
- Iterations
- Research reports

Under 'Research reports', there is a detailed list of the same topics as in the main content area.

2.2 XAI technique Implement:

XAI technique candidates:

- LIME
- SHAP
- DICE

ML model candidates:

- Group Lasso Transformer
- Transformer
- DNN
- SVM
- LightGBM

After the internal meeting of the team, **LIME, SHAP, and DICE** are chosen to be applied to the machine learning models.

Each team member chose a combination of model and XAI technique and implemented them. Shared the visual chart screenshot in github task comments.[#32](#)

2.3 Maintain the production line

2.4 Model tuning

3. Submission results

The best combination for AUC_PR is:

- Model: SVM
- XAI: SHAP
- Rebalanced technique: Class weighting
- Tuning Hyperparameters: Manual C selection
- Accuracy: 43.37%, ACC_PR: 61.49%, F1_score: 51.88%

d9ea01b5	RAIL-PG-2	Completed	22 days ago	68d5f68e5900.csv	Competition 3 - The Defibrillator	★ Accuracy: 43.37%, AUC_PR: 61.49%, F1_Score: 51.88%
----------	-----------	-----------	-------------	------------------	-----------------------------------	--

The best combination for F1 is:

- Model: Group Lasso Transformer
- Rebalance technique: Stratified batch resampling (75% positive samples per batch) combined with weighted loss function (pos_weight = neg_count/pos_count)
- XAI: SHAP

The best score of using SHAP explanation is to select top 10 features:

Accuracy: 64.98%, ACC_PR: 46.00%, F1_score: 52.42%

f389b93c	RAIL-PG-2	Completed	a minute ago	68f3292e3463.csv	Competition 3 - The Defibrillator	Accuracy: 64.98%, AUC_PR: 46.00%, F1_Score: 52.42%
----------	-----------	-----------	--------------	------------------	-----------------------------------	--

- The best score for F1 is using gating technique to select top8 features:

Accuracy: 64.32%, ACC_PR: 46.57%, F1_score: 57.68%

be55df2e	RAIL-PG-2	Completed	20 days ago	68d781805425.csv	Competition 2 - Senna	★ Accuracy: 64.32%, AUC_PR: 46.57%, F1_Score: 57.68%
----------	-----------	-----------	-------------	------------------	-----------------------	--

4. Next steps

Goal: In Sprint 5, our goal is to continue optimizing the model, maintain the **AUCPR** above 60, organize the experimental data, identify key features and risk ranges, and finally sort out the best model combination at present.

- Model tuning, improve the AUCPR score
- Identify important features
- Determine thresholds or value ranges linked to higher rail failure risk
- Sort out combination of techniques, model and explainability method worked so far

5. QA

Q: Details related to the final report and final presentation