

2025-10-20 Meeting Notes

Date

20 Oct 2025

Participants

- RAIL PG-2 project team
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Discussion topics

1. Github backlog

- Introduced completed tasks in sprint 4, including the research of XAI technique and implementation of 3 XAI techniques with our model, which is LIME, SHAP, DICE.
- Divided tasks for sprint 5 based on the user story 5, including multiple model tuning to improve ACC_PR score and do summarize feature importance, determine the ranges or thresholds of these features and report which combination of techniques, model, and explainability method has worked best so far.

2. Project 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 Wiki page titled "Research reports". The page content lists various research topics under the heading "Research reports". To the right of the content is a sidebar with a navigation menu. The menu includes sections for "Pages" (with a count of 5), "Find a page...", "Home", "Assignments", "Iterations", and "Research reports". Under "Research reports", there is a detailed list of the same 9 items listed in the main content area. At the bottom of the page, there is a footer with the text "CopyRight@Rail_P0_2" and a "Snooze" button.

- 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)

Pages 5 Find a page...
Home Assignments Iterations
Research reports
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)

CopyRight@Rail_P0_2 Snooze

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. Sprint 3 results

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

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%

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%
- The best score for F1 is using gating technique to select top8 features:
Accuracy: 64.32%, ACC_PR: 46.57%, F1_score: 57.68%

4. Blockers

Multiple XAI techniques are tried out in sprint 4, we tested different XAI-model combinations and found that performance varied by metric — for example, SVM had the best F1 score, Group Lasso Transformer achieved higher AUCPR, and feature selection also affected the results, as using the top 8 or top 10 features led to different outcomes.

5. Next plan

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

6. QA

Q: Details related to the final report and final presentation?

A: Please keep an eye on the information on MyUni, as the details are still being adjusted. Make sure to stay updated with the course announcements.

Q : In the final presentation, do we only need to show the best-performing model, or should we also present the model performance under different evaluation metrics or parameter settings?

A: Since the presentation time is limited, it's best to focus on the top-performing model, you can include the top one or two. There's no need to show all of them..

7. Suggestions

- Keep an eye on the leaderboard, if our ranking stays high, we could win the competition, so let's get ready for the in-person presentation and client demo
- Let's start working on the final report early.