Machine Learning for Truck Aerodynamic Performance Evaluation and Optimization

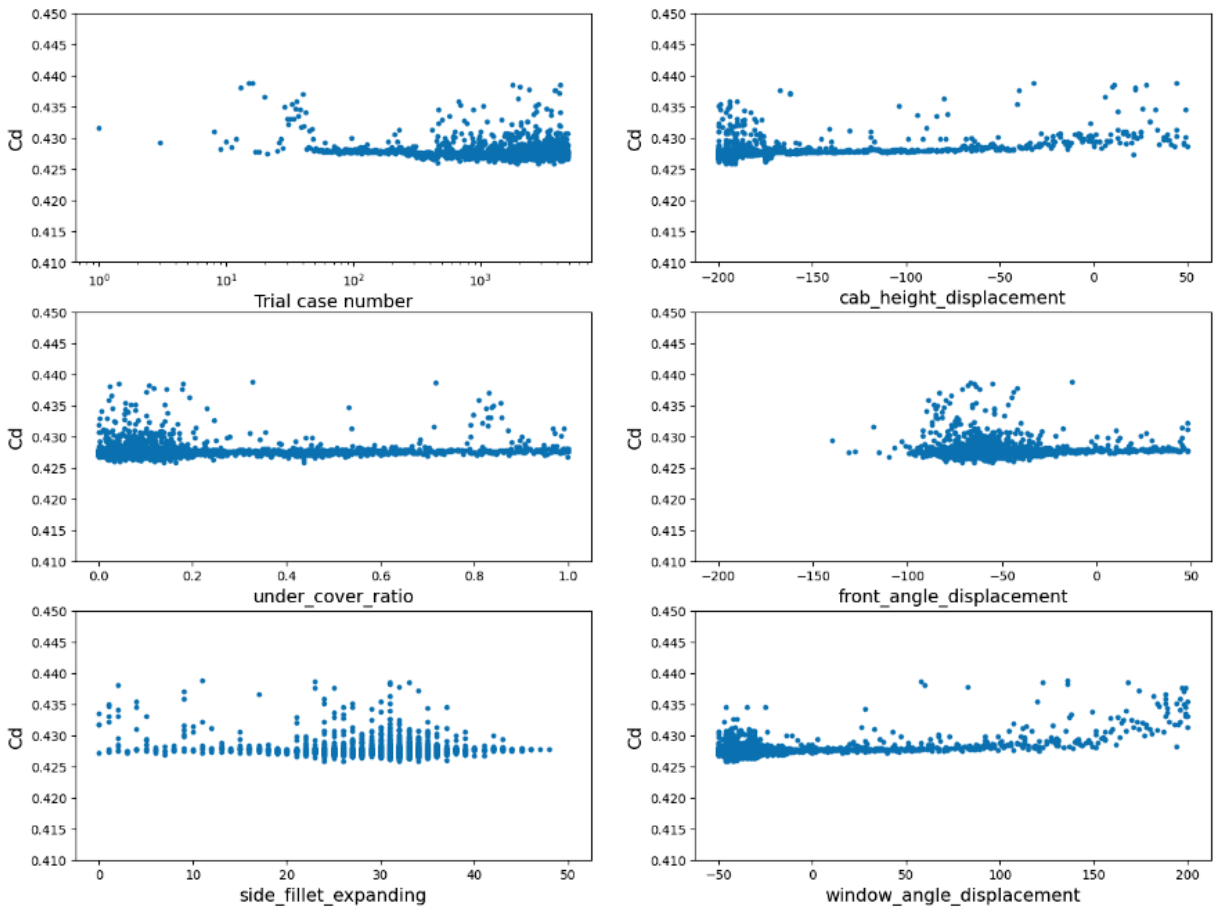
RICOS Co. Ltd.
21st Jan. 2025

Agenda

- Updates on generative CAE
- Discussion of project status
- Demonstration of Gen-CAE

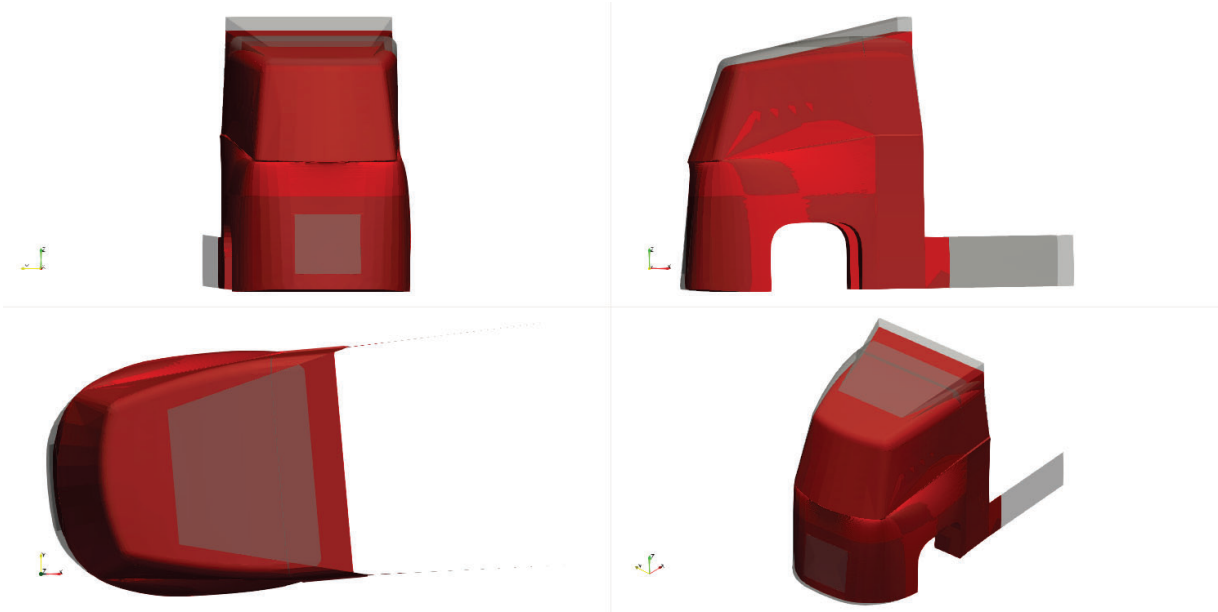
Updates on generative CAE

- Overview
  - Generative CAE model is updated to satisfy constraints for all the designs created during optimization
- Result of trial optimization on updated model
  - Trial optimization study is performed with the updated model



Optimization study results

parameter	Trial00	Trial3783
"cab_height_displacement"	0.0	-171
"window_angle_displacement"	0.0	-27
"front_angle_displacement"	0.0	-200
"side_fillet_expanding"	0.0	47
"under_cover_ratio"	1.0	0.549
Predicted Cd	0.4289	0.4258



Best design Trial3783 (red) and base design Trial00 (gray, semi-transparent)

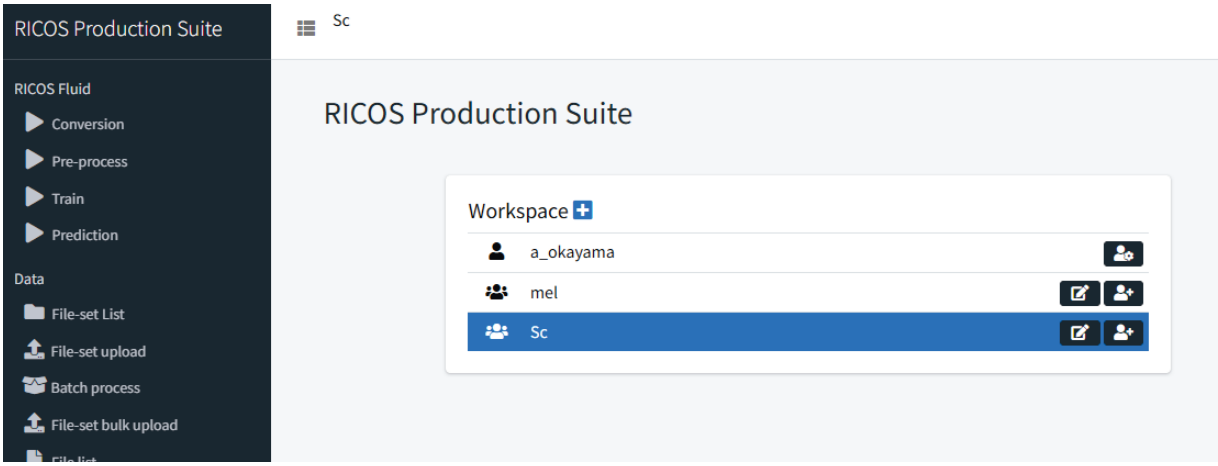
Discussion of project status

- Summary of 1st step(June-Dec)
  - We approached your problem with both Lightning and Generative CAE using your data
  - Both tools operated properly, and produced expected results
- Next Actions
  - We will open the Gen-CAE access to both of you(or your group members) after today's call, and provide a quick manual(as below)
  - You can freely use that until end-of February

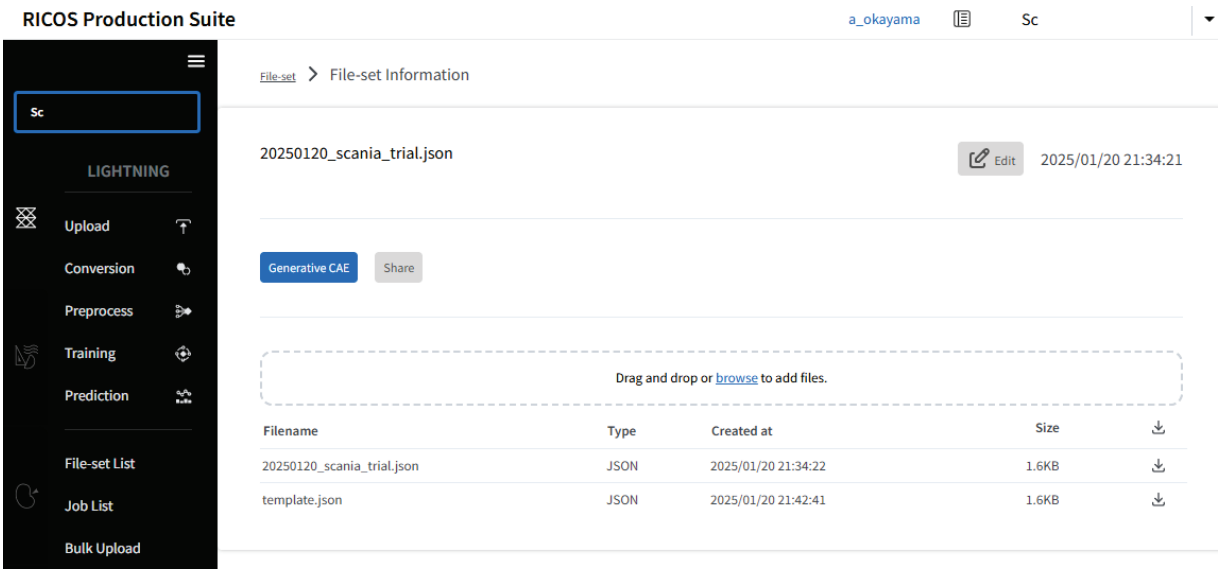
    - We want to collect your feedback to refine the system for a potential full introduction
- Feedback & improvements
    - During the test period, please evaluate tool usability, output accuracy, and any other aspects important to you
    - Let us know if you have any specific feature requests or improvements
- Next February discussion
    - We will collect your feedback and discuss about next step

Demonstration of Gen-CAE

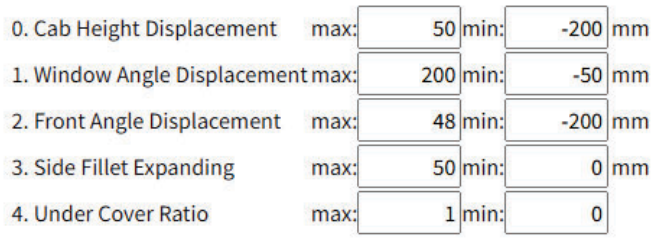
- Preparation
    - Login to RICOS Production Suite
        - Cloud based tool. Nothing to install to your PC.
    - Please choose the Scania group from “Workspace”
        - When selecting the group, all of the team members will access the same data

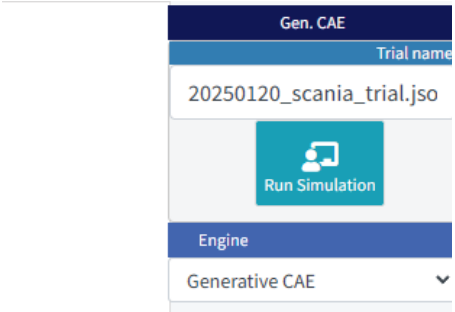


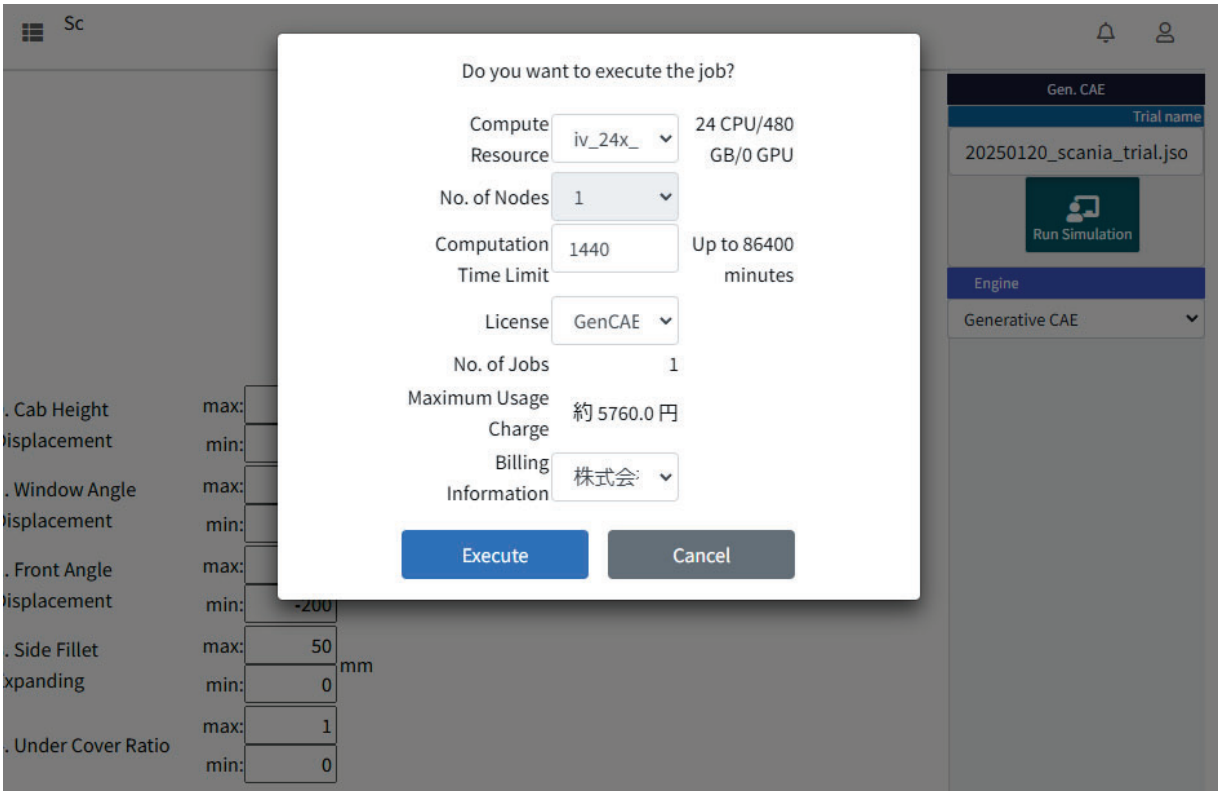
    - Go to File-set List and find Generative CAE Template
    - You will see “Generative CAE” from “File-set information”



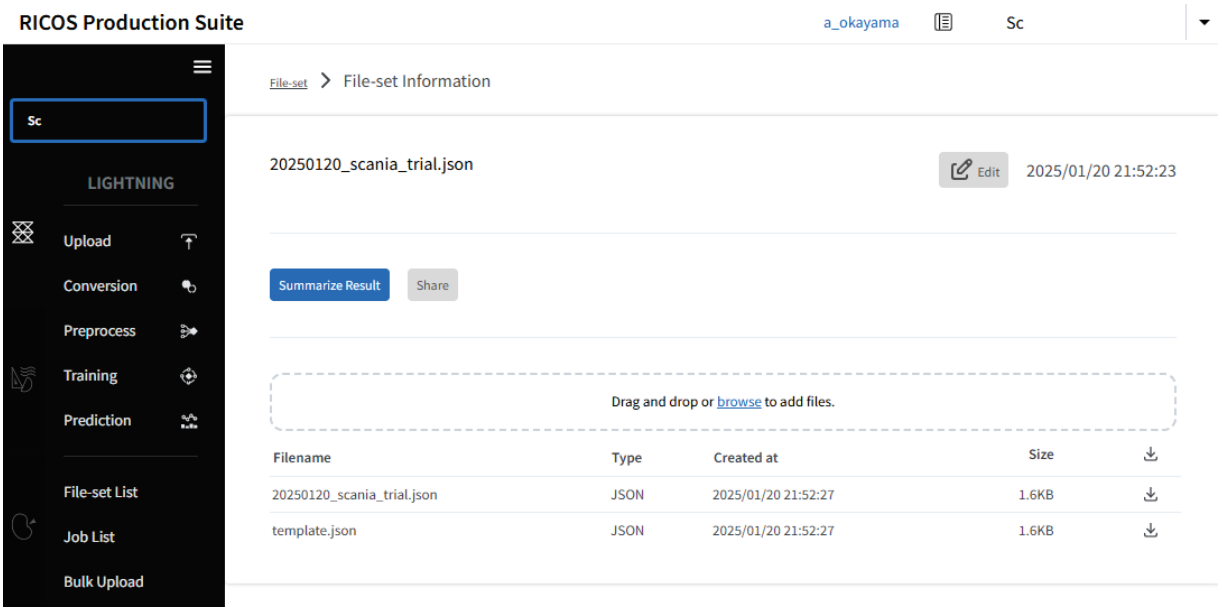
- Execution
  - Click “Generative CAE” to proceed to modify optimization settings
    - Enter min and max values for each parameter
    - Enter arbitrary “Trial name”
    - Choose Generative CAE “Engine”
  - Click “Run Simulation” to proceed to execute settings
  - Execute settings
    - Computation Time Limit : Up to 86,400 minutes (60 days)







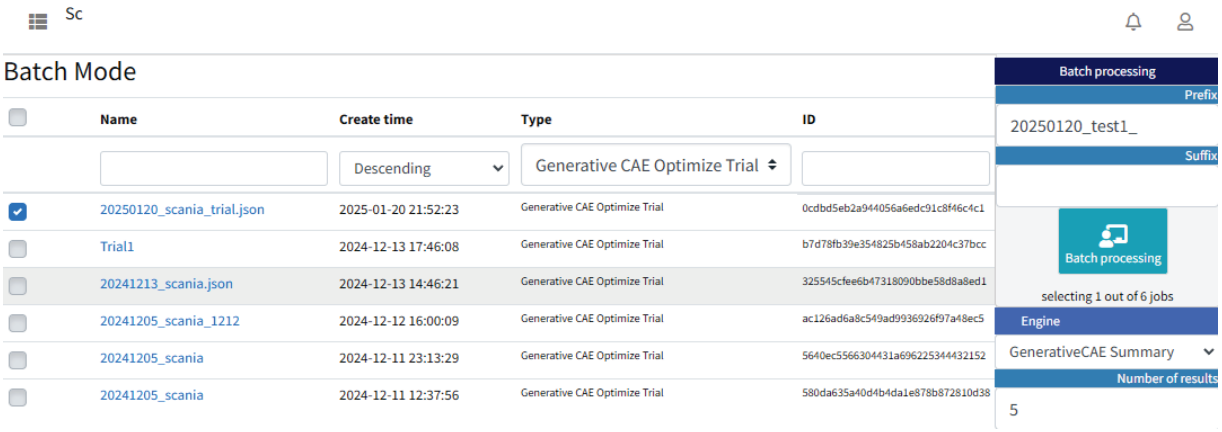
- After running optimization, you will see “Summarize Result” for your File-set
  - This feature enables you to visualize the best designs of your optimization study



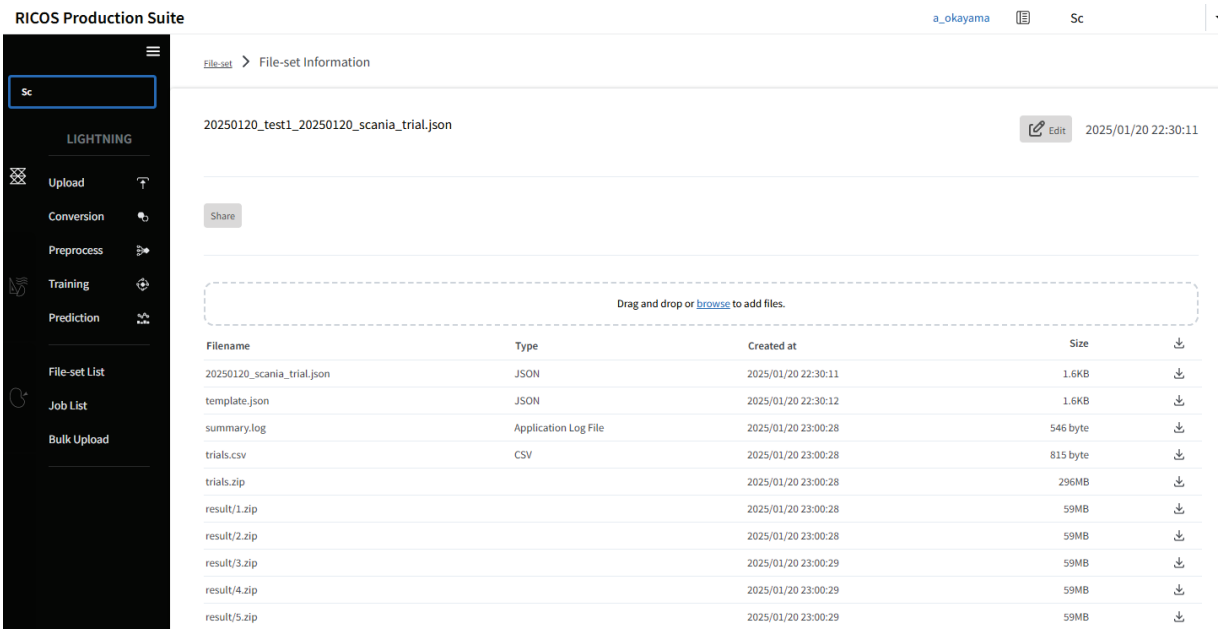
- PostProcess
  - When you click “Summarize Result”, you will see the list of optimization jobs

- Choose the optimization job that you want to summarize the result
- Choose GenerativeCAE Summary from “Engine”
- Enter arbitrary “prefix” and “suffix” to identify the postprocess results
- Enter the number of results that you want to visualize

- Click “Batch processing” to start visualization of the result



- Once the job is done (you will receive email from the system), you can download the followings:
  - Summary.log
    - Summary of Trial number and Cd value
  - trials.csv
    - Details of trials including result and each parameter
  - result/*.zip
    - Visualized result of the specific trial
    - The number means the order of Cd value (1 means the best)
    - It contains the followings:
      - result/features.txt : cda and cd value
      - result/mesh.vtu : mesh file including pressure and velocity field predicted by RICOS Lightning
      - shape : STL files of the specific trial
  - trials.zip
    - Combined zip file of the results
  - template.json
    - Template file used in the optimization study


RICOS Production Suite
a_okayama
Sc
Sc
LIGHTNING
Upload
Conversion
Preprocess
Training
Prediction
File-set List
Job List
Bulk Upload
File-set
File-set Information
20250120_test1_20250120_scania_trial.json
Edit
2025/01/20 22:30:11
Share
Drag and drop or browse to add files.
Filename
Type
Created at
Size
20250120_scania_trial.json
JSON
2025/01/20 22:30:11
1.6KB
template.json
JSON
2025/01/20 22:30:12
1.6KB
summary.log
Application Log File
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trials.csv
CSV
2025/01/20 23:00:28
815 byte
trials.zip
2025/01/20 23:00:28
296MB
result/1.zip
2025/01/20 23:00:28
59MB
result/2.zip
2025/01/20 23:00:28
59MB
result/3.zip
2025/01/20 23:00:29
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result/4.zip
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result/5.zip
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