

# Model experimentation screenshots

Screenshot of the main page during experimentation:

The screenshot shows the mlflow Experiments page for an experiment named 'Lead\_scoring\_mlflow\_experimentation'. The interface includes a search bar, a list of experiments, and a table of runs. The table columns are Start Time, Duration, Run Name, User, Source, Version, Models, Metrics (AUC, Accuracy, F1), Parameters (C, CPU Jobs), and Tags. The table shows 101 matching runs, with the first few rows highlighted. A 'Load more' button is visible at the bottom of the table.

Start Time	Duration	Run Name	User	Source	Version	Models	AUC	Accuracy	F1	C	CPU Jobs	Tags
23 minutes ago		Session Init...	root	ipykernel...	-	-	-	-	-	-	-1	1 setup
4 days ago		Session Init...	root	ipykernel...	-	-	-	-	-	-	-1	1 setup
4 days ago		Session Init...	root	ipykernel...	-	-	-	-	-	-	-1	1 setup
7 days ago		Random For...	root	ipykernel...	-	sklearn	0.818	0.737	0.759	-	-	compare_m...

Model experimentation screenshot

This screenshot provides a detailed view of the mlflow Experiments table, with annotations highlighting specific rows and columns. The table columns are Start Time, Duration, Run Name, User, Source, Version, Models, Metrics (AUC, Accuracy, F1), Parameters (C, CPU Jobs), and Tags. The table shows 101 matching runs, with the first few rows highlighted. A 'Load more' button is visible at the bottom of the table.

Start Time	Duration	Run Name	User	Source	Version	Models	AUC	Accuracy	F1	C	CPU Jobs	Tags
10 minutes ago		Session Init...	root	ipykernel...	-	-	-	-	-	-	-1	1 setup
6 seconds ago		Light Gradie...	root	ipykernel...	-	sklearn	0.821	0.739	0.761	-	-	-
3 minutes ago		Light Gradie...	root	ipykernel...	-	sklearn	0.821	0.738	0.762	-	-	-
4 minutes ago		Naive Bayes	root	ipykernel...	-	sklearn	0.734	0.672	0.725	-	-	-
4 minutes ago		Linear Discr...	root	ipykernel...	-	sklearn	0.773	0.7	0.727	-	-	-
4 minutes ago		Ridge Classif...	root	ipykernel...	-	sklearn	0	0.7	0.727	-	-	-
4 minutes ago		Logistic Reg...	root	ipykernel...	-	sklearn	0.784	0.71	0.74	1.0	-	-
4 minutes ago		Decision Tre...	root	ipykernel...	-	sklearn	0.817	0.736	0.758	-	-	-
4 minutes ago		Extra Trees C...	root	ipykernel...	-	sklearn	0.817	0.737	0.758	-	-	-
4 minutes ago		Random For...	root	ipykernel...	-	sklearn	0.818	0.737	0.759	-	-	-
4 minutes ago		Light Gradie...	root	ipykernel...	-	sklearn	0.821	0.738	0.762	-	-	-
4 minutes ago		Extreme Gra...	root	ipykernel...	-	-	-	-	-	-	-	-
6 minutes ago		Session Init...	root	ipykernel...	-	-	-	-	-	-	-1	1 setup
7 minutes ago		Light Gradie...	root	ipykernel...	-	sklearn	0.821	0.739	0.762	-	-	-
8 minutes ago		Naive Bayes	root	ipykernel...	-	sklearn	0.734	0.662	0.727	-	-	-
8 minutes ago		Linear Discr...	root	ipykernel...	-	sklearn	0.774	0.7	0.728	-	-	-
8 minutes ago		Ridge Classif...	root	ipykernel...	-	sklearn	0	0.7	0.728	-	-	-
8 minutes ago		Logistic Reg...	root	ipykernel...	-	sklearn	0.784	0.71	0.74	1.0	-	-
8 minutes ago		Decision Tre...	root	ipykernel...	-	sklearn	0.817	0.736	0.758	-	-	-
8 minutes ago		Extra Trees C...	root	ipykernel...	-	sklearn	0.818	0.737	0.758	-	-	-
8 minutes ago		Random For...	root	ipykernel...	-	sklearn	0.819	0.737	0.759	-	-	-
8 minutes ago		Light Gradie...	root	ipykernel...	-	sklearn	0.821	0.739	0.762	-	-	-
8 minutes ago		Extreme Gra...	root	ipykernel...	-	-	-	-	-	-	-	-


Annotations:

- Tune model - record
- After dropping feature create models
- After dropping feature compare models
- Before dropping feature create models
- Before dropping feature compare models

Before dropping features – experiment details:

```
[21]: # setup pycaret
Baseline_model_exp01 = setup(data = encoded_df, target = 'app_complete_flag',
                             session_id = 42,fix_imbalance=False,
                             n_jobs=-1,use_gpu=False,
                             log_experiment=True,experiment_name='Lead_scoring_mflow_experimentation',
                             log_plots=True, log_data=True,
                             silent=True, verbose=True,
                             log_profile=False)
```

	Description	Value
0	session_id	42
1	Target	app_complete_flag
2	Target Type	Binary
3	Label Encoded	None
4	Original Data	(238964, 46)
5	Missing Values	False
6	Numeric Features	44
7	Categorical Features	1
8	Ordinal Features	False
9	High Cardinality Features	False
10	High Cardinality Method	None
11	Transformed Train Set	(167274, 45)
12	Transformed Test Set	(71690, 45)
13	Shuffle Train-Test	True
14	Stratify Train-Test	False

 1.26.1


ExperimentsModels

Lead\_scoring\_mflow\_experimentation > Light Gradient Boosting Machine

Light Gradient Boosting Machine

Date: 2023-01-14 16:58:42

Status: UNFINISHED

Source:  ipykernel\_launcher.py

Lifecycle Stage: active

User: root

Parent Run: 8a8b5d516c7b49fb86cd6f20c2da9e46

► DescriptionEdit

▼ Parameters (20)

Name	Value
boosting_type	gbdt
class_weight	None
colsample_bytree	1.0
importance_type	split
learning_rate	0.1
max_depth	-1
min_child_samples	20
min_child_weight	0.001
min_split_gain	0.0
n_estimators	100

n_jobs	-1
num_leaves	31
objective	None
random_state	42
reg_alpha	0.0
reg_lambda	0.0
silent	warn
subsample	1.0
subsample_for_bin	200000
subsample_freq	0

▼ Metrics (8)

Name	Value
AUC <a href="#">🔗</a>	0.821
Accuracy <a href="#">🔗</a>	0.739
F1 <a href="#">🔗</a>	0.762
Kappa <a href="#">🔗</a>	0.477
MCC <a href="#">🔗</a>	0.485
Prec. <a href="#">🔗</a>	0.703
Recall <a href="#">🔗</a>	0.833
TT <a href="#">🔗</a>	1.58

▼ Tags (5)

Name	Value	Actions
Run ID	4e8f10243b784d89bad3911f34f15a8c	<a href="#">🔗</a> <a href="#">🗑️</a>
Run Time	8.63	<a href="#">🔗</a> <a href="#">🗑️</a>
Source	create_model	<a href="#">🔗</a> <a href="#">🗑️</a>
URI	95dd81a8	<a href="#">🔗</a> <a href="#">🗑️</a>

▼ Artifacts

## After dropping features experiment details:

```
Baseline_model_exp02 = setup(data = encoded_df_sig_features, target = 'app_complete_flag',
                             session_id = 42, fix_imbalance=False,
                             n_jobs=-1, use_gpu=False,
                             log_experiment=True, experiment_name='Lead_scoring_mlflow_experimentation',
                             log_plots=True, log_data=True,
                             silent=True, verbose=True,
                             log_profile=False, normalize=False,
                             transformation=False)
```

	Description	Value
0	session_id	42
1	Target	app_complete_flag
2	Target Type	Binary
3	Label Encoded	None
4	Original Data	(238964, 41)
5	Missing Values	False
6	Numeric Features	39
7	Categorical Features	1
8	Ordinal Features	False
9	High Cardinality Features	False
10	High Cardinality Method	None
11	Transformed Train Set	(167274, 40)
12	Transformed Test Set	(71690, 40)
13	Shuffle Train-Test	True
14	Stratify Train-Test	False
15	Fold Generator	StratifiedKFold

```
User: root
```

Parent Run: 6d0e0cffdefc43eab9efad59d32bbeb0

Edit

n_jobs	-1
num_leaves	31
objective	None
random_state	42
reg_alpha	0.0
reg_lambda	0.0
silent	warn
subsample	1.0
subsample_for_bin	200000
subsample_freq	0

tags (5)▼ Artifacts

Tuned model experimentation details:

mlflow

L261

ExperimentsModels

GitHubDocs

Lead\_scoring\_mlflow\_experimentation > Light Gradient Boosting Machine

Light Gradient Boosting Machine

Date: 2023-01-14 17:06:31

Source: ipykernel\_launcher.py

User: root

Status: UNFINISHED

Lifecycle Stage: active

Parent Run: 9f164b6b2cc94142800186ee2ffc21ea

DescriptionEdit

Parameters (23)

Name	Value
bagging_fraction	0.8575226483040845
bagging_freq	6
boosting_type	gdbt
class_weight	None
colsample_bytree	1.0
feature_fraction	0.9899478911514554
importance_type	split
learning_rate	0.15532136620191594
max_depth	-1
min_child_samples	89
min_child_weight	0.001
min_split_gain	0.07659568344438661
n_estimators	91
n_jobs	-1
num_leaves	96
objective	None
random_state	42
reg_alpha	3.746393596839106e-08
reg_lambda	0.8095609624177388
silent	warn
subsample	1.0
subsample_for_bin	200000
subsample_freq	0

Metrics (8)

Name	Value
AUC	0.821
Accuracy	0.739
F1	0.761
Kappa	0.477
MCC	0.484
Prec.	0.704
Recall	0.829
TT	1.87

Tags (5)

Name	Value	Actions
Run ID	3703486648ea4d0d9043fe5cbe39f15a	
Run Time	180.04	
Source	tune_model	
URI	c9b6214a	

One of the model details:

Registered Models > LightGBM > Version 18

Version 18



Registered At: 2023-01-10 15:16:02

Stage: None

Last Modified: 2023-01-10 15:16:02

Source Run: LGBM\_Bayes\_Search\_1673343959

Description Edit

Tags

Schema

Name	Type
------	------

No schema. See MLflow docs for how to include input and output schema with your model.

# Model training screenshots

## Run pipeline multiple times

The screenshot shows the mlflow Experiments page for the experiment 'Lead\_scoring\_mlflow\_production'. The page displays a table of runs with columns for Start Time, Duration, Run Name, User, Source, Version, Models, and Metrics. The table shows 6 runs, all using the 'airflow' source and 'LightGBM' models. The metrics for each run are: False Negative, Precision, Precision\_0, boosting\_type, and categorical\_fe.

Start Time	Duration	Run Name	User	Source	Version	Models	False Negative	Precision	Precision_0	boosting_type	categorical_fe
3 days ago	7.3s	Lead_scoring...	root	airflow	-	LightGBM/6	3899	0.739	0.797	gbdt	[]
3 days ago	7.5s	Lead_scoring...	root	airflow	-	LightGBM/5	3899	0.739	0.797	gbdt	[]
3 days ago	8.1s	Lead_scoring...	root	airflow	-	LightGBM/4	3899	0.739	0.797	gbdt	[]
6 days ago	4.7s	Lead_scoring...	root	airflow	-	LightGBM/3	4066	0.739	0.791	gbdt	[]
6 days ago	5.0s	Lead_scoring...	root	airflow	-	LightGBM/2	4066	0.739	0.791	gbdt	[]
6 days ago	4.7s	Lead_scoring...	root	airflow	-	LightGBM/1	4066	0.739	0.791	gbdt	[]

## Following 5 screenshot highlight the details of the LightGBM/6 model from above screenshot:

The screenshot shows the mlflow Run page for the specific run 'Lead\_scoring\_mlflow\_production\_run\_10\_01\_2023\_00\_00\_00'. The page displays the run's metadata, including Date, Duration, Source, User, Status, and Lifecycle Stage. The Parameters section shows the following values:

Name	Value
boosting_type	gbdt
categorical_feature	[]
class_weight	None
colsample_bytree	1.0
force_row_wise	True
importance_type	split
learning_rate	0.1

max_bin	255
max_depth	-1
metric	roc_auc
min_child_samples	20
min_child_weight	0.001
min_split_gain	0.0
n_estimators	100
n_jobs	-1
num_boost_round	200
num_leaves	31
objective	binary
random_state	42
reg_alpha	0.0
reg_lambda	0.0

reg_lambda	0.0
silent	warn
subsample	1.0
subsample_for_bin	200000
subsample_freq	0
verbose	-1

▼ Metrics (13)

Name	Value
False Negative <a href="#">🔗</a>	3899
Precision <a href="#">🔗</a>	0.739
Precision_0 <a href="#">🔗</a>	0.797
Precision_1 <a href="#">🔗</a>	0.701
Recall <a href="#">🔗</a>	0.749
Recall_0 <a href="#">🔗</a>	0.641
Recall_1 <a href="#">🔗</a>	0.837
True Negative <a href="#">🔗</a>	15286
f1 score <a href="#">🔗</a>	0.737
f1_0 <a href="#">🔗</a>	0.711
f1_1 <a href="#">🔗</a>	0.763
roc_auc <a href="#">🔗</a>	0.749
test_accuracy <a href="#">🔗</a>	0.739



▼ Artifacts

models

MLmodel  
conda.yaml  
model.pkl  
python\_env.yaml  
requirements.txt

Full Path:mlruns/1/7fe7ee66470b4a3e806352a48fd1ac4d/artifacts/models

LightGBM, v6  
Registered on 2023/01/10

### MLflow Model

The code snippets below demonstrate how to make predictions using the logged model. This model is also registered to the model registry.

#### Model schema

Input and output schema for your model. [Learn more](#)

Name	Type
No schema. See <a href="#">MLflow docs</a> for how to include input and output schema with your model.	

#### Make Predictions

Predict on a Spark DataFrame:

```
import mlflow
logged_model = 'runs:/7fe7ee66470b4a3e806352a48fd1ac4d/models'

# Load model as a Spark UDF. Override result_type if the model does not return double values.
loaded_model = mlflow.pyfunc.spark_udf(spark, model_uri=logged_model, result_type='double')

# Predict on a Spark DataFrame.
columns = list(df.columns)
df.withColumn('predictions', loaded_model(*columns)).collect()
```

Predict on a Pandas DataFrame:

```
import mlflow
logged_model = 'runs:/7fe7ee66470b4a3e806352a48fd1ac4d/models'

# Load model as a PyFuncModel.
loaded_model = mlflow.pyfunc.load_model(logged_model)

# Predict on a Pandas DataFrame.
import pandas as pd
loaded_model.predict(pd.DataFrame(data))
```

## Model moved to Production stage

mlflow1.26.1ExperimentsModels

GitHubDocs

Registered Models > LightGBM > Version 6

### Version 6

Registered At: 2023-01-10 16:40:53

Source Run: [Lead\\_scoring\\_mlflow\\_production\\_run\\_10\\_01\\_2023\\_00\\_00\\_00](#)

► Description [Edit](#)

► Tags

▼ Schema

Name	Type
No schema. See <a href="#">MLflow docs</a> for how to include input and output schema with your model.	

Stage: **Production** ▼

Last Modified: 2023-01-13 20:29:07

# Airflow Screenshots

Airflow main page:

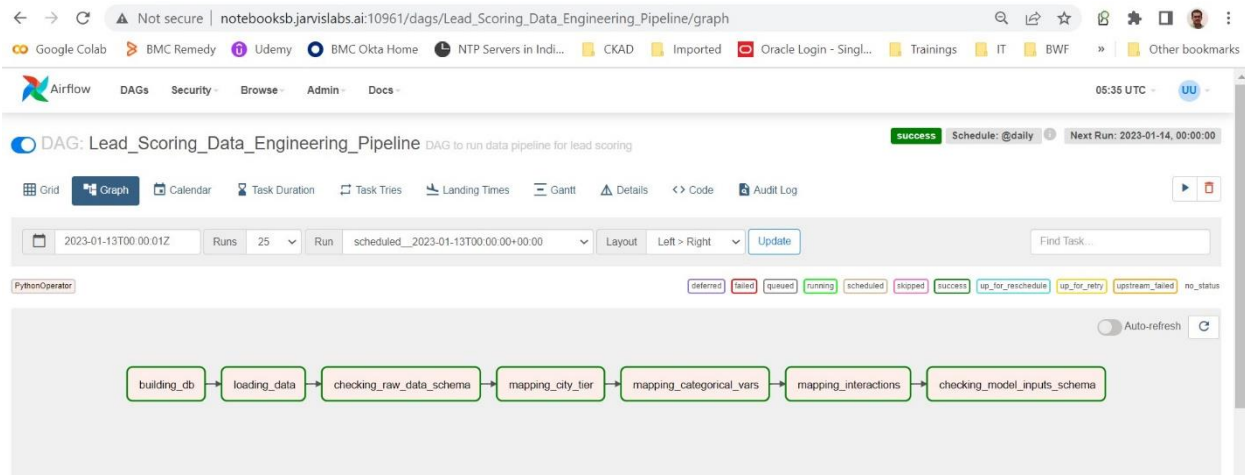
The screenshot shows the Airflow web interface. At the top, there's a navigation bar with links to DAGs, Security, Browse, Admin, and Docs. A warning message states: "The scheduler does not appear to be running. Last heartbeat was received 47 seconds ago. The DAGs list may not update, and new tasks will not be scheduled." Below this, another warning says: "Do not use SQLite as metadata DB in production - it should only be used for dev/testing. We recommend using Postgres or MySQL. Click here for more information." A third warning mentions: "Do not use SequentialExecutor in production. Click here for more information." The main section is titled "DAGs" and shows a table of DAGs with columns for DAG name, Owner, Runs, Schedule, Last Run, Next Run, Recent Tasks, Actions, and Links. The table lists several DAGs, including Heart\_Disease\_ML\_dag, Lead\_Scoring\_Data\_Engineering\_Pipeline, Lead\_scoring\_inference\_pipeline, Lead\_scoring\_training\_pipeline, and example\_bash\_operator.

DAG	Owner	Runs	Schedule	Last Run	Next Run	Recent Tasks	Actions	Links
Heart_Disease_ML_dag	airflow	100	@hourly	2022-12-21, 08:00:00	2022-12-21, 09:00:00	3	▶	...
Lead_Scoring_Data_Engineering_Pipeline	airflow	10	@daily	2023-01-13, 00:00:00	2023-01-14, 00:00:00	4	▶	...
Lead_scoring_inference_pipeline	airflow	10	@hourly	2023-01-14, 04:00:00	2023-01-14, 05:00:00	1	▶	...
Lead_scoring_training_pipeline	airflow	5	@monthly	2023-01-10, 11:10:26	2023-01-01, 00:00:00	2	▶	...
example_bash_operator	airflow	0	00 * * * *		2023-01-09, 00:00:00		▶	...

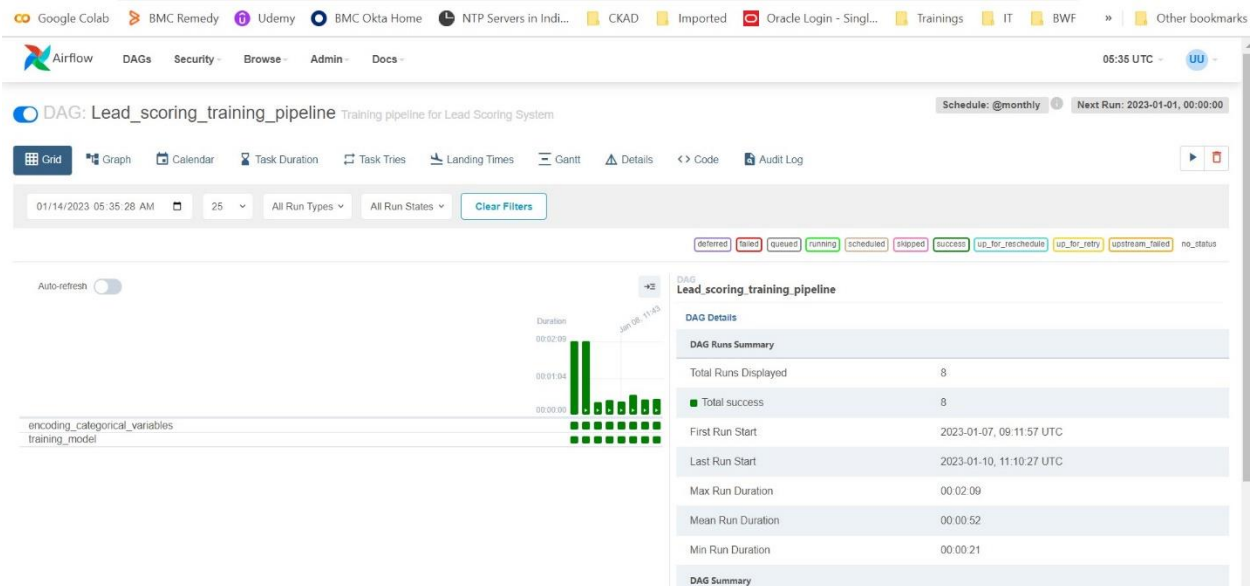
Data engineering pipeline

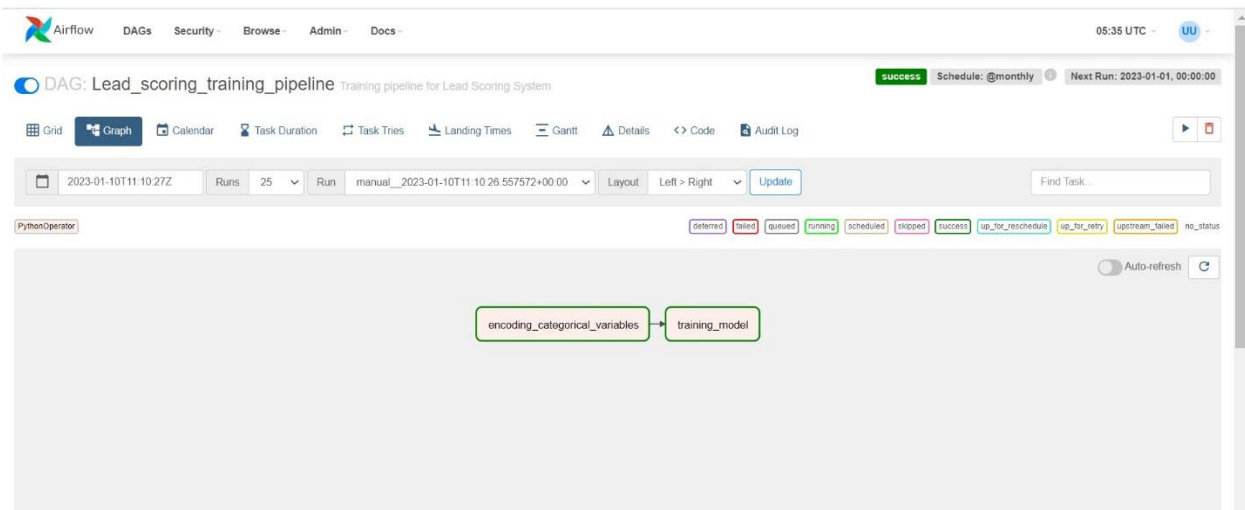
The screenshot shows the Airflow web interface for the DAG "Lead\_Scoring\_Data\_Engineering\_Pipeline". The top bar indicates the schedule is "@daily" and the next run is "2023-01-14, 00:00:00". Below the bar, there's a navigation menu with options like Grid, Graph, Calendar, Task Duration, Task Tries, Landing Times, Gantt, Details, Code, and Audit Log. The main section displays a DAG run summary with a bar chart showing the duration of runs over time. The summary table shows the following data:

DAG Run Summary	
Total Runs Displayed	17
Total success	15
Total failed	2
First Run Start	2022-12-29, 11:39:39 UTC
Last Run Start	2023-01-14, 05:27:03 UTC
Max Run Duration	00:04:06
Mean Run Duration	00:02:08
Min Run Duration	00:00:18

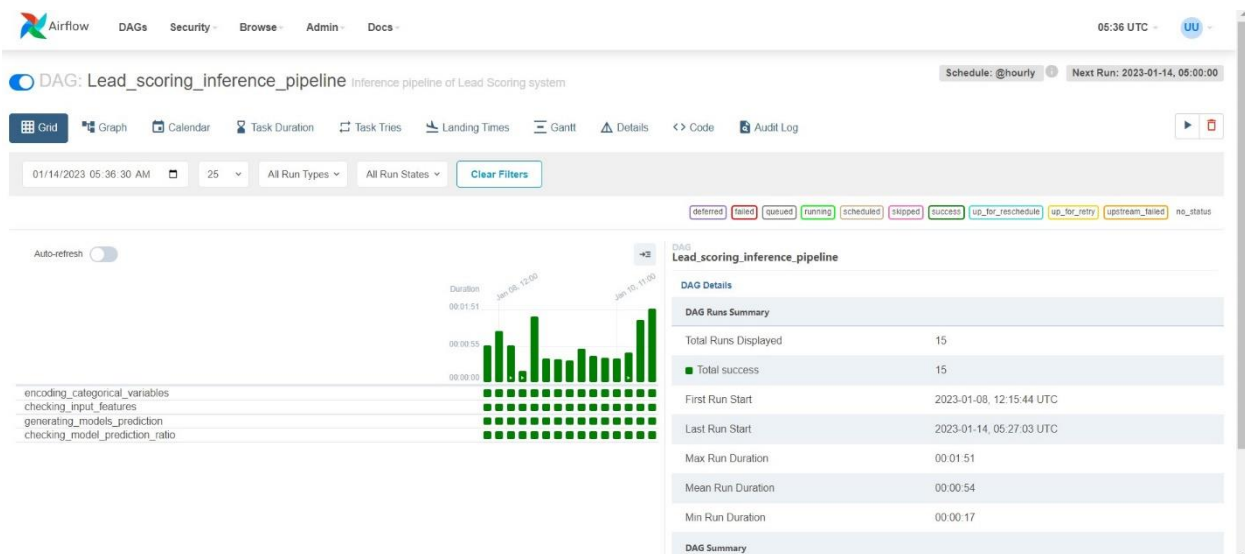


## Model training pipeline





## Inference pipeline





## DAG: Lead\_scoring\_inference\_pipeline Inference pipeline of Lead Scoring system

**success** Schedule: @hourly Next Run: 2023-01-14, 05:00:00

Grid **Graph** Calendar Task Duration Task Tries Landing Times Gantt Details <> Code Audit Log

2023-01-14T04:00:01Z Runs 25 Run scheduled\_\_2023-01-14T04:00:00+00:00 Layout Left > Right Update Find Task...

PythonOperator

deferred failed queued **running** scheduled shipped success up\_for\_reschedule up\_for\_retry upstream\_failed no\_status

Auto-refresh

