Kaggle Playground

Problem Statement / Real World Implementations

1. Importing Libraries

In [1]:
```
# Core Data Science Libraries
import numpy as np
import pandas as pd
import warnings

# Visualization Libraries
import plotly.express as px
import matplotlib.pyplot as plt
import seaborn as sns
import plotly.graph_objects as go
from plotly.subplots import make_subplots

# Scikit-learn for Preprocessing and Modeling
from sklearn.model_selection import KFold, train_test_split
from sklearn.preprocessing import OrdinalEncoder, StandardScaler
from sklearn.metrics import mean_squared_error, mean_absolute_error, r2_score

# Machine Learning Models
from xgboost import XGBRegressor
from lightgbm import LGBMRegressor

# Hyperparameter Tuning
import optuna

# Notebook settings
warnings.filterwarnings('ignore')
pd.set_option('display.max_columns', None)
```

2. Loading Dataset

In [2]:
```
# Define file paths
TRAIN_PATH = "/kaggle/input/playground-series-s5e11/train.csv"
TEST_PATH = "/kaggle/input/playground-series-s5e11/test.csv"
SUBMISSION_PATH = "/kaggle/input/playground-series-s5e11/sample_submission.csv"

# Load the datasets into pandas DataFrames
train_df = pd.read_csv(TRAIN_PATH)
test_df = pd.read_csv(TEST_PATH)
submission_df = pd.read_csv(SUBMISSION_PATH)
```

3. Normalization of data

In [3]:
```
# Save the test IDs now, before we drop the 'id' column
test_ids = test_df['id']

# Drop 'id' from both, as it's not a feature
train_df = train_df.drop('id', axis=1)
test_df = test_df.drop('id', axis=1)
```

In [4]:
```
# --- 3. Feature Engineering (Financial Ratios) ---
def create_financial_features(df):
    df['monthly_income'] = df['annual_income'] / 12
```

```
    df['total_monthly_debt'] = df['debt_to_income_ratio'] * df['monthly_income']
    df['available_income'] = df['monthly_income'] - df['total_monthly_debt']
    df['loan_to_income_ratio'] = df['loan_amount'] / df['annual_income']
    df['loan_to_available_income'] = df['loan_amount'] / df['available_income']
    df.replace([np.inf, -np.inf], np.nan, inplace=True)
    cols_to_drop = ['annual_income', 'debt_to_income_ratio']
    df = df.drop(columns=cols_to_drop)
    return df

print("Creating financial features for train_df...")
train_df = create_financial_features(train_df)
print("Creating financial features for test_df...")
test_df = create_financial_features(test_df)


# --- 4. Smart Encoding & Processing ---
def process_and_encode_features(df_train, df_test):
    train_target = df_train['loan_paid_back']
    df_train = df_train.drop('loan_paid_back', axis=1)

    df_train['source'] = 'train'
    df_test['source'] = 'test'
    combined_df = pd.concat([df_train, df_test], ignore_index=True)

    # Bin Credit Score
    score_bins = [300, 579, 669, 739, 799, 850]
    score_labels = ['Poor', 'Fair', 'Good', 'Very Good', 'Excellent']
    combined_df['credit_score_bin'] = pd.cut(combined_df['credit_score'],
                                             bins=score_bins,
                                             labels=score_labels,
                                             include_lowest=True)

    # Logical Ordinal Mapping
    education_map = {'Other': 0, 'High School': 1, 'Bachelor\'s': 2, 'Master\'s'
    grades = ['A', 'B', 'C', 'D', 'E', 'F', 'G']
    subgrades = ['1', '2', '3', '4', '5']
    grade_map = {g + s: i for i, (g, s) in enumerate((g, s) for g in grades for
    combined_df['education_level_ordinal'] = combined_df['education_level'].map(
    combined_df['grade_subgrade_ordinal'] = combined_df['grade_subgrade'].map(gr

    # Ordinal Encode Remaining Categoricals
    categorical_cols = ['gender', 'marital_status', 'employment_status', 'loan_p
    encoder = OrdinalEncoder(handle_unknown='use_encoded_value', unknown_value=-
    combined_df['credit_score_bin'] = combined_df['credit_score_bin'].astype(str
    combined_df[categorical_cols] = encoder.fit_transform(combined_df[categorica

    # Handle NaNs (Only for education, let trees handle the rest)
    if combined_df['education_level_ordinal'].isnull().any():
        mode_val = combined_df['education_level_ordinal'].mode()[0]
        combined_df['education_level_ordinal'] = combined_df['education_level_or

    # Drop old columns and split back
    cols_to_drop = ['credit_score', 'education_level', 'grade_subgrade']
    combined_df = combined_df.drop(columns=cols_to_drop)

    train_processed = combined_df[combined_df['source'] == 'train'].drop('source
    test_processed = combined_df[combined_df['source'] == 'test'].drop('source',

    train_processed['loan_paid_back'] = train_target
    return train_processed, test_processed
```

```
print("Processing and encoding all features (letting trees handle NaNs)...")
train_processed, test_processed = process_and_encode_features(train_df, test_df)
print("Processing complete.")
```

```
Creating financial features for train_df...
Creating financial features for test_df...
Processing and encoding all features (letting trees handle NaNs)...
Processing complete.
```

Train test split

In [5]:
```
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import MinMaxScaler, StandardScaler, RobustScaler, Pc
import numpy as np

# --- 5. Train-Test Split (for Validation) ---
X = train_processed.drop("loan_paid_back", axis=1)
y = train_processed["loan_paid_back"]
X = X.select_dtypes(include=[np.number])

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_

# --- 6. --- REMOVED SCALING --- ---
# Tree models (XGB/LGBM) do not require feature scaling.
# We will feed the unscaled data directly to the models.
print("Skipping scaling, tree models will handle unscaled data and NaNs.")
X_train_scaled = X_train
X_test_scaled = X_test
```

```
Skipping scaling, tree models will handle unscaled data and NaNs.
```

In [6]:
```
import optuna
from sklearn.metrics import mean_squared_error, mean_absolute_error, r2_score
from xgboost import XGBRegressor
from lightgbm import LGBMRegressor

# ✅ Enable GPU for both XGBoost and LightGBM

# --- 7. Hyperparameter Tuning (Optuna) ---
# --- Hyperparameter tuning for XGBRegressor ---
def objective_xgb(trial):
    param = {
        'tree_method': 'gpu_hist', 'predictor': 'gpu_predictor', 'gpu_id': 0,
        'lambda': trial.suggest_loguniform('lambda', 1e-3, 10.0),
        'alpha': trial.suggest_loguniform('alpha', 1e-3, 10.0),
        'colsample_bytree': trial.suggest_categorical('colsample_bytree', [0.3,
        'subsample': trial.suggest_categorical('subsample', [0.5, 0.6, 0.7, 0.8,
        'learning_rate': trial.suggest_float('learning_rate', 0.005, 0.05, log=T
        'n_estimators': trial.suggest_int('n_estimators', 200, 1000, step=100),
        'max_depth': trial.suggest_int('max_depth', 3, 12),
        'min_child_weight': trial.suggest_int('min_child_weight', 1, 300),
        'random_state': 42
    }
    model = XGBRegressor(**param, verbosity=0)
    model.fit(X_train_scaled, y_train) # Uses unscaled data
    y_pred = model.predict(X_test_scaled) # Uses unscaled data
    mse = mean_squared_error(y_test, y_pred)
    return mse

# --- Hyperparameter tuning for LGBMRegressor ---
```

```python
def objective_lgbm(trial):
    param = {
        'device': 'gpu', 'gpu_platform_id': 0, 'gpu_device_id': 0,
        'boosting_type': 'gbdt', 'objective': 'regression', 'metric': 'mse',
        'lambda_l1': trial.suggest_float('lambda_l1', 1e-5, 1.0, log=True),
        'lambda_l2': trial.suggest_float('lambda_l2', 1e-5, 1.0, log=True),
        'num_leaves': trial.suggest_int('num_leaves', 16, 256),
        'feature_fraction': trial.suggest_float('feature_fraction', 0.5, 1.0),
        'bagging_fraction': trial.suggest_float('bagging_fraction', 0.5, 1.0),
        'bagging_freq': trial.suggest_int('bagging_freq', 1, 7),
        'min_child_samples': trial.suggest_int('min_child_samples', 10, 100),
        'learning_rate': trial.suggest_float('learning_rate', 0.005, 0.3, log=Tr
        'n_estimators': trial.suggest_int('n_estimators', 200, 1000, step=100),
        'max_depth': trial.suggest_int('max_depth', 3, 12),
        'random_state': 42, 'verbosity': -1
    }
    model = LGBMRegressor(**param)
    model.fit(X_train_scaled, y_train) # Uses unscaled data
    y_pred = model.predict(X_test_scaled) # Uses unscaled data
    mse = mean_squared_error(y_test, y_pred)
    return mse

# --- Run GPU-accelerated Optuna optimization ---
print("🚀 Tuning XGBRegressor (GPU)...")
study_xgb = optuna.create_study(direction='minimize')
study_xgb.optimize(objective_xgb, n_trials=150, timeout=7200)
best_params_xgb = study_xgb.best_params
print(f"✅ Best XGBRegressor parameters: {best_params_xgb}")

print("\n🚀 Tuning LGBMRegressor (GPU)...")
study_lgbm = optuna.create_study(direction='minimize')
study_lgbm.optimize(objective_lgbm, n_trials=150, timeout=7200)
best_params_lgbm = study_lgbm.best_params
print(f"✅ Best LGBMRegressor parameters: {best_params_lgbm}")

# --- 8. Initialize and Evaluate Tuned Models ---
xgb_model = XGBRegressor(**best_params_xgb, tree_method='gpu_hist', predictor='g
lgbm_model = LGBMRegressor(**best_params_lgbm, device='gpu')
models = [("XGBRegressor (GPU)", xgb_model), ("LGBMRegressor (GPU)", lgbm_model)

print("\n⚡ Evaluating Tuned Models on GPU...\n")
mse_scores = []
model_names = []
for name, model in models:
    model.fit(X_train_scaled, y_train) # Uses unscaled data
    y_pred = model.predict(X_test_scaled) # Uses unscaled data
    mse = mean_squared_error(y_test, y_pred)
    mae = mean_absolute_error(y_test, y_pred)
    r2 = r2_score(y_test, y_pred)
    mse_scores.append(mse)
    model_names.append(name)
    print(f"{name:<30} | MSE: {mse:.5f} | MAE: {mae:.5f} | R²: {r2:.5f}")
```

```
[I 2025-11-03 14:01:19,876] A new study created in memory with name: no-name-48dc906
e818-4acb-bbbe-5e70ce0d0232
🚀 Tuning XGBRegressor (GPU)...
```

```
[I 2025-11-03 14:01:23,548] Trial 0 finished with value: 0.07875003870408565 and
parameters: {'lambda': 0.003297652232646508, 'alpha': 2.601489400516726,
'colsample_bytree': 0.5, 'subsample': 0.6, 'learning_rate': 0.008713428997546704,
'n_estimators': 400, 'max_depth': 7, 'min_child_weight': 284}. Best is trial 0 with v
0.07875003870408565.
[I 2025-11-03 14:01:28,184] Trial 1 finished with value: 0.07766447193398597 and
parameters: {'lambda': 0.0071102438462940926, 'alpha': 5.241108941333859,
'colsample_bytree': 0.3, 'subsample': 0.5, 'learning_rate': 0.011294072507615549,
'n_estimators': 1000, 'max_depth': 4, 'min_child_weight': 104}. Best is trial 1 with
0.07766447193398597.
[I 2025-11-03 14:01:35,952] Trial 2 finished with value: 0.07622454768277283 and
parameters: {'lambda': 0.035913647456981515, 'alpha': 0.0023817838099940243,
'colsample_bytree': 0.3, 'subsample': 0.7, 'learning_rate': 0.04867465810687974,
'n_estimators': 700, 'max_depth': 10, 'min_child_weight': 211}. Best is trial 2 with
0.07622454768277283.
[I 2025-11-03 14:01:41,071] Trial 3 finished with value: 0.08220565565280527 and
parameters: {'lambda': 0.05243070871341083, 'alpha': 0.023966524165772943,
'colsample_bytree': 0.3, 'subsample': 1.0, 'learning_rate': 0.010746490094550722,
'n_estimators': 400, 'max_depth': 9, 'min_child_weight': 196}. Best is trial 2 with v
0.07622454768277283.
[I 2025-11-03 14:01:52,406] Trial 4 finished with value: 0.07574148372816845 and
parameters: {'lambda': 9.127059779688588, 'alpha': 0.004302374091871779,
'colsample_bytree': 0.5, 'subsample': 1.0, 'learning_rate': 0.01233815143036957,
'n_estimators': 600, 'max_depth': 12, 'min_child_weight': 268}. Best is trial 4 with
0.07574148372816845.
[I 2025-11-03 14:01:57,519] Trial 5 finished with value: 0.07646840070453696 and
parameters: {'lambda': 0.0645766390546978, 'alpha': 0.0038315936054791207,
'colsample_bytree': 0.3, 'subsample': 0.5, 'learning_rate': 0.038284091093147815,
'n_estimators': 1000, 'max_depth': 5, 'min_child_weight': 172}. Best is trial 4 with
0.07574148372816845.
[I 2025-11-03 14:02:00,563] Trial 6 finished with value: 0.07747701399468453 and
parameters: {'lambda': 0.07050306216352999, 'alpha': 0.06281531649426564,
'colsample_bytree': 0.9, 'subsample': 0.7, 'learning_rate': 0.012259713027216878,
'n_estimators': 700, 'max_depth': 3, 'min_child_weight': 289}. Best is trial 4 with v
0.07574148372816845.
[I 2025-11-03 14:02:05,822] Trial 7 finished with value: 0.0759542214271198 and paran
{'lambda': 0.004645927139993122, 'alpha': 0.036324288106090896, 'colsample_bytree': 1
'subsample': 1.0, 'learning_rate': 0.01994492373917006, 'n_estimators': 200, 'max_dep
12, 'min_child_weight': 119}. Best is trial 4 with value: 0.07574148372816845.
[I 2025-11-03 14:02:09,665] Trial 8 finished with value: 0.07822932559352651 and
parameters: {'lambda': 0.006518270439468023, 'alpha': 0.0019455546354740462,
'colsample_bytree': 0.7, 'subsample': 0.7, 'learning_rate': 0.005711796775142837,
'n_estimators': 1000, 'max_depth': 3, 'min_child_weight': 11}. Best is trial 4 with v
0.07574148372816845.
[I 2025-11-03 14:02:14,582] Trial 9 finished with value: 0.07580450083457975 and
parameters: {'lambda': 0.06293493090039119, 'alpha': 0.05153087220131624,
'colsample_bytree': 1.0, 'subsample': 0.5, 'learning_rate': 0.01050838179351169,
'n_estimators': 1000, 'max_depth': 5, 'min_child_weight': 146}. Best is trial 4 with
0.07574148372816845.
[I 2025-11-03 14:02:21,371] Trial 10 finished with value: 0.07557864562252449 and
parameters: {'lambda': 8.860474981753747, 'alpha': 0.33812062344833343, 'colsample_by
0.5, 'subsample': 0.8, 'learning_rate': 0.02974491923412626, 'n_estimators': 500,
'max_depth': 11, 'min_child_weight': 248}. Best is trial 10 with value:
0.07557864562252449.
[I 2025-11-03 14:02:29,690] Trial 11 finished with value: 0.07560806866999221 and
parameters: {'lambda': 7.557703152693831, 'alpha': 0.4980486859647253, 'colsample_byt
0.5, 'subsample': 0.8, 'learning_rate': 0.02184409560129343, 'n_estimators': 500,
'max_depth': 12, 'min_child_weight': 235}. Best is trial 10 with value:
0.07557864562252449.
[I 2025-11-03 14:02:35,682] Trial 12 finished with value: 0.07555396914449022 and
```

```
parameters: {'lambda': 9.76432269950859, 'alpha': 0.7084524071352525, 'colsample_bytr
0.5, 'subsample': 0.8, 'learning_rate': 0.024898043598513223, 'n_estimators': 500,
'max_depth': 10, 'min_child_weight': 235}. Best is trial 12 with value:
0.07555396914449022.
[I 2025-11-03 14:02:38,724] Trial 13 finished with value: 0.07598777335250134 and
parameters: {'lambda': 1.0706012221759351, 'alpha': 0.519325829412131, 'colsample_byt
0.5, 'subsample': 0.8, 'learning_rate': 0.02893963877766818, 'n_estimators': 200,
'max_depth': 10, 'min_child_weight': 245}. Best is trial 12 with value:
0.07555396914449022.
[I 2025-11-03 14:02:42,428] Trial 14 finished with value: 0.07556120681815821 and
parameters: {'lambda': 1.0811670286021038, 'alpha': 0.4551142902276409, 'colsample_by
0.5, 'subsample': 0.8, 'learning_rate': 0.029126370263828298, 'n_estimators': 400,
'max_depth': 8, 'min_child_weight': 53}. Best is trial 12 with value: 0.0755539691444
[I 2025-11-03 14:02:45,452] Trial 15 finished with value: 0.0756940238350157 and
parameters: {'lambda': 1.0981927560679077, 'alpha': 1.6923472020355106, 'colsample_by
0.7, 'subsample': 0.8, 'learning_rate': 0.0193667542174954, 'n_estimators': 300,
'max_depth': 8, 'min_child_weight': 33}. Best is trial 12 with value: 0.0755539691444
[I 2025-11-03 14:02:50,847] Trial 16 finished with value: 0.07542609517465954 and
parameters: {'lambda': 1.2790367703021088, 'alpha': 0.1901735374686738, 'colsample_by
0.9, 'subsample': 0.8, 'learning_rate': 0.027968672345326365, 'n_estimators': 800,
'max_depth': 7, 'min_child_weight': 65}. Best is trial 16 with value: 0.0754260951746
[I 2025-11-03 14:02:55,475] Trial 17 finished with value: 0.07554762544081604 and
parameters: {'lambda': 0.39254918815246853, 'alpha': 0.1549807324867035,
'colsample_bytree': 0.9, 'subsample': 0.6, 'learning_rate': 0.01647003953553393,
'n_estimators': 800, 'max_depth': 6, 'min_child_weight': 67}. Best is trial 16 with v
0.07542609517465954.
[I 2025-11-03 14:03:00,184] Trial 18 finished with value: 0.07554039344331963 and
parameters: {'lambda': 0.2995711403137907, 'alpha': 0.012667946467138173,
'colsample_bytree': 0.9, 'subsample': 0.6, 'learning_rate': 0.017053745259566645,
'n_estimators': 800, 'max_depth': 6, 'min_child_weight': 76}. Best is trial 16 with v
0.07542609517465954.
[I 2025-11-03 14:03:05,519] Trial 19 finished with value: 0.07553950241258849 and
parameters: {'lambda': 0.228792168488244, 'alpha': 0.012854353519636385,
'colsample_bytree': 0.9, 'subsample': 0.6, 'learning_rate': 0.03754080246128926,
'n_estimators': 800, 'max_depth': 7, 'min_child_weight': 89}. Best is trial 16 with v
0.07542609517465954.
[I 2025-11-03 14:03:10,790] Trial 20 finished with value: 0.07565083477224865 and
parameters: {'lambda': 0.0011726476347617687, 'alpha': 0.010770222484929232,
'colsample_bytree': 0.9, 'subsample': 0.6, 'learning_rate': 0.04987826171267524,
'n_estimators': 800, 'max_depth': 7, 'min_child_weight': 111}. Best is trial 16 with
0.07542609517465954.
[I 2025-11-03 14:03:15,323] Trial 21 finished with value: 0.07551522275766538 and
parameters: {'lambda': 0.2721972409975076, 'alpha': 0.013422915721080397,
'colsample_bytree': 0.9, 'subsample': 0.6, 'learning_rate': 0.03794868735773748,
'n_estimators': 800, 'max_depth': 6, 'min_child_weight': 76}. Best is trial 16 with v
0.07542609517465954.
[I 2025-11-03 14:03:20,356] Trial 22 finished with value: 0.07553368597313262 and
parameters: {'lambda': 0.190207273427318, 'alpha': 0.011974781586228242,
'colsample_bytree': 0.9, 'subsample': 0.6, 'learning_rate': 0.03628006430679591,
'n_estimators': 900, 'max_depth': 6, 'min_child_weight': 92}. Best is trial 16 with v
0.07542609517465954.
[I 2025-11-03 14:03:25,411] Trial 23 finished with value: 0.07561553556865871 and
parameters: {'lambda': 2.0772116030448933, 'alpha': 0.18512401630030248,
'colsample_bytree': 0.9, 'subsample': 0.6, 'learning_rate': 0.03916521335119824,
'n_estimators': 900, 'max_depth': 6, 'min_child_weight': 30}. Best is trial 16 with v
0.07542609517465954.
[I 2025-11-03 14:03:29,840] Trial 24 finished with value: 0.07557703214123841 and
parameters: {'lambda': 0.022146008647902792, 'alpha': 0.001147864820478351,
'colsample_bytree': 0.9, 'subsample': 0.6, 'learning_rate': 0.03560267697084742,
'n_estimators': 900, 'max_depth': 5, 'min_child_weight': 138}. Best is trial 16 with
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0.07542609517465954.
[I 2025-11-03 14:03:36,985] Trial 25 finished with value: 0.07552389694664556 and
parameters: {'lambda': 0.17691164883094487, 'alpha': 0.09651651775193869,
'colsample_bytree': 0.9, 'subsample': 0.6, 'learning_rate': 0.02639577034808086,
'n_estimators': 900, 'max_depth': 8, 'min_child_weight': 53}. Best is trial 16 with v
0.07542609517465954.
[I 2025-11-03 14:03:44,803] Trial 26 finished with value: 0.07567902588779701 and
parameters: {'lambda': 0.5219457442660052, 'alpha': 0.11386877601214132,
'colsample_bytree': 0.9, 'subsample': 0.6, 'learning_rate': 0.023771598510126005,
'n_estimators': 700, 'max_depth': 9, 'min_child_weight': 6}. Best is trial 16 with va
0.07542609517465954.
[I 2025-11-03 14:03:51,958] Trial 27 finished with value: 0.07553884513917687 and
parameters: {'lambda': 0.14593577577030198, 'alpha': 0.08055711003201131,
'colsample_bytree': 0.9, 'subsample': 0.6, 'learning_rate': 0.02646752134329262,
'n_estimators': 900, 'max_depth': 8, 'min_child_weight': 56}. Best is trial 16 with v
0.07542609517465954.
[I 2025-11-03 14:03:58,016] Trial 28 finished with value: 0.07560104671972985 and
parameters: {'lambda': 0.01665351919090768, 'alpha': 0.02601280640898517,
'colsample_bytree': 0.9, 'subsample': 0.8, 'learning_rate': 0.031943325349573684,
'n_estimators': 600, 'max_depth': 9, 'min_child_weight': 40}. Best is trial 16 with v
0.07542609517465954.
[I 2025-11-03 14:04:02,825] Trial 29 finished with value: 0.07558679462288097 and
parameters: {'lambda': 2.6207222325730144, 'alpha': 1.556981141673275, 'colsample_byt
0.7, 'subsample': 0.6, 'learning_rate': 0.044674420844852 42, 'n_estimators': 700,
'max_depth': 7, 'min_child_weight': 78}. Best is trial 16 with value: 0.0754260951746
[I 2025-11-03 14:04:06,352] Trial 30 finished with value: 0.07616806698294372 and
parameters: {'lambda': 0.6727031307058916, 'alpha': 0.18476912008194588,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.015331364721894105,
'n_estimators': 800, 'max_depth': 4, 'min_child_weight': 125}. Best is trial 16 with
0.07542609517465954.
[I 2025-11-03 14:04:11,407] Trial 31 finished with value: 0.0755170253980872 and
parameters: {'lambda': 0.15026624195895158, 'alpha': 0.006874831570336399,
'colsample_bytree': 0.9, 'subsample': 0.6, 'learning_rate': 0.03440465214402685,
'n_estimators': 900, 'max_depth': 6, 'min_child_weight': 93}. Best is trial 16 with v
0.07542609517465954.
[I 2025-11-03 14:04:17,306] Trial 32 finished with value: 0.07550766323127527 and
parameters: {'lambda': 0.14312132736152072, 'alpha': 0.006621741841624189,
'colsample_bytree': 0.9, 'subsample': 0.6, 'learning_rate': 0.0326114326802327,
'n_estimators': 900, 'max_depth': 7, 'min_child_weight': 96}. Best is trial 16 with v
0.07542609517465954.
[I 2025-11-03 14:04:23,176] Trial 33 finished with value: 0.07564886349316242 and
parameters: {'lambda': 0.11066434866238396, 'alpha': 0.005059944985688859,
'colsample_bytree': 0.9, 'subsample': 0.6, 'learning_rate': 0.04416441931341393,
'n_estimators': 900, 'max_depth': 7, 'min_child_weight': 99}. Best is trial 16 with v
0.07542609517465954.
[I 2025-11-03 14:04:28,042] Trial 34 finished with value: 0.0756170798127529 and
parameters: {'lambda': 0.0241074568277038, 'alpha': 0.006527861727536949,
'colsample_bytree': 0.9, 'subsample': 0.5, 'learning_rate': 0.033242759149389095,
'n_estimators': 1000, 'max_depth': 5, 'min_child_weight': 155}. Best is trial 16 with
value: 0.07542609517465954.
[I 2025-11-03 14:04:31,171] Trial 35 finished with value: 0.07696545463169072 and
parameters: {'lambda': 3.9755540134980434, 'alpha': 6.35505632795663, 'colsample_bytr
0.3, 'subsample': 1.0, 'learning_rate': 0.041198175610577634, 'n_estimators': 700,
'max_depth': 4, 'min_child_weight': 176}. Best is trial 16 with value: 0.075426095174
[I 2025-11-03 14:04:35,975] Trial 36 finished with value: 0.0758376057864645 and
parameters: {'lambda': 0.5500341603160435, 'alpha': 0.0022779038818118275,
'colsample_bytree': 0.9, 'subsample': 0.6, 'learning_rate': 0.0071722277066700695,
'n_estimators': 800, 'max_depth': 6, 'min_child_weight': 126}. Best is trial 16 with
0.07542609517465954.
[I 2025-11-03 14:04:42,476] Trial 37 finished with value: 0.07563148976906582 and
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parameters: {'lambda': 0.03810150934875958, 'alpha': 0.023743342310879177,
'colsample_bytree': 0.9, 'subsample': 0.5, 'learning_rate': 0.034231137038988696,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 84}. Best is trial 16 with
0.07542609517465954.
[I 2025-11-03 14:04:45,971] Trial 38 finished with value: 0.0766995411198521 and
parameters: {'lambda': 0.09874019401444259, 'alpha': 0.007512204312610851,
'colsample_bytree': 0.3, 'subsample': 1.0, 'learning_rate': 0.031017691432116783,
'n_estimators': 700, 'max_depth': 5, 'min_child_weight': 105}. Best is trial 16 with
0.07542609517465954.
[I 2025-11-03 14:04:55,069] Trial 39 finished with value: 0.07548252220956851 and
parameters: {'lambda': 0.012098316171881007, 'alpha': 0.0033324262504932927,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.014216654416361645,
'n_estimators': 900, 'max_depth': 9, 'min_child_weight': 66}. Best is trial 16 with v
0.07542609517465954.
[I 2025-11-03 14:05:03,775] Trial 40 finished with value: 0.07549406284035001 and
parameters: {'lambda': 0.0016554287118645593, 'alpha': 0.0033963891405318298,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.013570025553723837,
'n_estimators': 800, 'max_depth': 9, 'min_child_weight': 25}. Best is trial 16 with v
0.07542609517465954.
[I 2025-11-03 14:05:13,048] Trial 41 finished with value: 0.07550776674154702 and
parameters: {'lambda': 0.002120791229345657, 'alpha': 0.0034948324907981315,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.009266091479005896,
'n_estimators': 800, 'max_depth': 9, 'min_child_weight': 20}. Best is trial 16 with v
0.07542609517465954.
[I 2025-11-03 14:05:21,274] Trial 42 finished with value: 0.07552313931678813 and
parameters: {'lambda': 0.0019331657921991506, 'alpha': 0.0010283102538100187,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.009420257594625113,
'n_estimators': 700, 'max_depth': 9, 'min_child_weight': 23}. Best is trial 16 with v
0.07542609517465954.
[I 2025-11-03 14:05:37,873] Trial 43 finished with value: 0.0758565816646822 and
parameters: {'lambda': 0.010801021129900524, 'alpha': 0.0032130721618502285,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.013888303274859067,
'n_estimators': 900, 'max_depth': 11, 'min_child_weight': 16}. Best is trial 16 with
0.07542609517465954.
[I 2025-11-03 14:05:54,793] Trial 44 finished with value: 0.07584379012953534 and
parameters: {'lambda': 0.0031618939019876563, 'alpha': 0.001607680621361931,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.011918151692303505,
'n_estimators': 1000, 'max_depth': 10, 'min_child_weight': 1}. Best is trial 16 with
0.07542609517465954.
[I 2025-11-03 14:06:02,144] Trial 45 finished with value: 0.07559726906888674 and
parameters: {'lambda': 0.001011904854584613, 'alpha': 0.0030669295814146663,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.007744996809300555,
'n_estimators': 600, 'max_depth': 9, 'min_child_weight': 40}. Best is trial 16 with v
0.07542609517465954.
[I 2025-11-03 14:06:14,996] Trial 46 finished with value: 0.07570332956951886 and
parameters: {'lambda': 0.004558625657562193, 'alpha': 0.001559079829963994,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.014008007679002898,
'n_estimators': 800, 'max_depth': 11, 'min_child_weight': 60}. Best is trial 16 with
0.07542609517465954.
[I 2025-11-03 14:06:25,394] Trial 47 finished with value: 0.07552033368393357 and
parameters: {'lambda': 0.002177427656245049, 'alpha': 0.004559100020736969,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.006300118053360871,
'n_estimators': 900, 'max_depth': 9, 'min_child_weight': 44}. Best is trial 16 with v
0.07542609517465954.
[I 2025-11-03 14:06:31,001] Trial 48 finished with value: 0.0755451272311388 and
parameters: {'lambda': 0.006247722113635747, 'alpha': 0.04516847955894279,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.009882566615652386,
'n_estimators': 600, 'max_depth': 8, 'min_child_weight': 27}. Best is trial 16 with v
0.07542609517465954.
[I 2025-11-03 14:06:45,784] Trial 49 finished with value: 0.0755962499754099 and
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parameters: {'lambda': 0.012138618640437143, 'alpha': 0.0027294845077659997,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.008599673094132874,
'n_estimators': 1000, 'max_depth': 10, 'min_child_weight': 17}. Best is trial 16 with
value: 0.07542609517465954.
[I 2025-11-03 14:06:52,308] Trial 50 finished with value: 0.0754359681210447 and
parameters: {'lambda': 0.0018292352688461446, 'alpha': 0.023067587305736804,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.01959263928889497,
'n_estimators': 800, 'max_depth': 8, 'min_child_weight': 65}. Best is trial 16 with
0.07542609517465954.
[I 2025-11-03 14:06:58,903] Trial 51 finished with value: 0.07544469006737216 and
parameters: {'lambda': 0.002292039970507844, 'alpha': 0.02897812751416121,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.01947339631257692,
'n_estimators': 800, 'max_depth': 8, 'min_child_weight': 48}. Best is trial 16 with
0.07542609517465954.
[I 2025-11-03 14:07:05,474] Trial 52 finished with value: 0.07543760698483601 and
parameters: {'lambda': 0.0014562193945354223, 'alpha': 0.01985268444293466,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.018916534514526705,
'n_estimators': 800, 'max_depth': 8, 'min_child_weight': 71}. Best is trial 16 with
0.07542609517465954.
[I 2025-11-03 14:07:11,292] Trial 53 finished with value: 0.07545887328736632 and
parameters: {'lambda': 0.0014359426065689994, 'alpha': 0.029599383262571617,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.0187045420088111,
'n_estimators': 700, 'max_depth': 8, 'min_child_weight': 66}. Best is trial 16 with
0.07542609517465954.
[I 2025-11-03 14:07:17,096] Trial 54 finished with value: 0.07546583968247512 and
parameters: {'lambda': 0.0037238444494370874, 'alpha': 0.031236385548363152,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.018761258990456452,
'n_estimators': 700, 'max_depth': 8, 'min_child_weight': 67}. Best is trial 16 with
0.07542609517465954.
[I 2025-11-03 14:07:22,952] Trial 55 finished with value: 0.07544082935722571 and
parameters: {'lambda': 0.003292365654980314, 'alpha': 0.028971580454626625,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.018552018008446084,
'n_estimators': 700, 'max_depth': 8, 'min_child_weight': 70}. Best is trial 16 with
0.07542609517465954.
[I 2025-11-03 14:07:28,790] Trial 56 finished with value: 0.0754498123696208 and
parameters: {'lambda': 0.0027613307009872845, 'alpha': 0.017557338074790565,
'colsample_bytree': 1.0, 'subsample': 0.8, 'learning_rate': 0.02196761179773598,
'n_estimators': 700, 'max_depth': 8, 'min_child_weight': 44}. Best is trial 16 with
0.07542609517465954.
[I 2025-11-03 14:07:34,582] Trial 57 finished with value: 0.0754517560427672 and
parameters: {'lambda': 0.002749618029573415, 'alpha': 0.017549370271284864,
'colsample_bytree': 0.7, 'subsample': 0.8, 'learning_rate': 0.02242552307164655,
'n_estimators': 700, 'max_depth': 8, 'min_child_weight': 112}. Best is trial 16 with
0.07542609517465954.
[I 2025-11-03 14:07:38,241] Trial 58 finished with value: 0.07550088234335713 and
parameters: {'lambda': 0.006206622984460002, 'alpha': 0.059035513397248,
'colsample_bytree': 1.0, 'subsample': 0.8, 'learning_rate': 0.020100296750485205,
'n_estimators': 500, 'max_depth': 7, 'min_child_weight': 48}. Best is trial 16 with
0.07542609517465954.
[I 2025-11-03 14:07:44,808] Trial 59 finished with value: 0.07541294463523736 and
parameters: {'lambda': 0.0013109272834073485, 'alpha': 0.019631049552571674,
'colsample_bytree': 1.0, 'subsample': 0.8, 'learning_rate': 0.01732772830012188,
'n_estimators': 800, 'max_depth': 8, 'min_child_weight': 78}. Best is trial 59 with
0.07541294463523736.
[I 2025-11-03 14:07:49,103] Trial 60 finished with value: 0.07573037734903422 and
parameters: {'lambda': 0.0014514251863619 77, 'alpha': 0.039862476602533684,
'colsample_bytree': 0.5, 'subsample': 0.8, 'learning_rate': 0.017444388231291394,
'n_estimators': 600, 'max_depth': 7, 'min_child_weight': 209}. Best is trial 59 with
0.07541294463523736.
[I 2025-11-03 14:07:55,526] Trial 61 finished with value: 0.07547037374524936 and
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parameters: {'lambda': 0.002747832667329412, 'alpha': 0.0183759946870894,
'colsample_bytree': 1.0, 'subsample': 0.8, 'learning_rate': 0.023910781665306906,
'n_estimators': 800, 'max_depth': 8, 'min_child_weight': 74}. Best is trial 59 with v
0.07541294463523736.
[I 2025-11-03 14:08:02,093] Trial 62 finished with value: 0.07544562819759017 and
parameters: {'lambda': 0.004433352508954619, 'alpha': 0.018202311370523763,
'colsample_bytree': 1.0, 'subsample': 0.8, 'learning_rate': 0.021768687413333848,
'n_estimators': 800, 'max_depth': 8, 'min_child_weight': 40}. Best is trial 59 with v
0.07541294463523736.
[I 2025-11-03 14:08:08,654] Trial 63 finished with value: 0.07546095510469739 and
parameters: {'lambda': 0.004544729150283165, 'alpha': 0.06693579243680488,
'colsample_bytree': 1.0, 'subsample': 0.8, 'learning_rate': 0.02085741288233286,
'n_estimators': 800, 'max_depth': 8, 'min_child_weight': 36}. Best is trial 59 with v
0.07541294463523736.
[I 2025-11-03 14:08:14,185] Trial 64 finished with value: 0.0754498437168982 and
parameters: {'lambda': 0.0011753930934079772, 'alpha': 0.009159237501761768,
'colsample_bytree': 1.0, 'subsample': 0.8, 'learning_rate': 0.015675299233737266,
'n_estimators': 800, 'max_depth': 7, 'min_child_weight': 86}. Best is trial 59 with v
0.07541294463523736.
[I 2025-11-03 14:08:21,093] Trial 65 finished with value: 0.07648849852066987 and
parameters: {'lambda': 0.004108606744219177, 'alpha': 0.12100696033526938,
'colsample_bytree': 0.3, 'subsample': 0.8, 'learning_rate': 0.017008296218911936,
'n_estimators': 800, 'max_depth': 8, 'min_child_weight': 50}. Best is trial 59 with v
0.07541294463523736.
[I 2025-11-03 14:08:27,360] Trial 66 finished with value: 0.07554690416987533 and
parameters: {'lambda': 0.008410646069993198, 'alpha': 0.020027123998500797,
'colsample_bytree': 1.0, 'subsample': 1.0, 'learning_rate': 0.027041398098825397,
'n_estimators': 800, 'max_depth': 8, 'min_child_weight': 60}. Best is trial 59 with v
0.07541294463523736.
[I 2025-11-03 14:08:32,239] Trial 67 finished with value: 0.07555562535591707 and
parameters: {'lambda': 0.001971768060249615, 'alpha': 0.03717888823324215,
'colsample_bytree': 0.7, 'subsample': 0.5, 'learning_rate': 0.017489327242368187,
'n_estimators': 700, 'max_depth': 7, 'min_child_weight': 78}. Best is trial 59 with v
0.07541294463523736.
[I 2025-11-03 14:08:40,953] Trial 68 finished with value: 0.07550105881515455 and
parameters: {'lambda': 0.0010365557404379657, 'alpha': 0.3661449879529504,
'colsample_bytree': 1.0, 'subsample': 0.8, 'learning_rate': 0.018531294483007454,
'n_estimators': 800, 'max_depth': 10, 'min_child_weight': 266}. Best is trial 59 with
value: 0.07541294463523736.
[I 2025-11-03 14:08:47,446] Trial 69 finished with value: 0.07544176681793646 and
parameters: {'lambda': 0.0015264011912179266, 'alpha': 0.05590174460559645,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.020484752273246584,
'n_estimators': 800, 'max_depth': 8, 'min_child_weight': 56}. Best is trial 59 with v
0.07541294463523736.
[I 2025-11-03 14:08:54,930] Trial 70 finished with value: 0.07550694593240585 and
parameters: {'lambda': 0.0014502420809456764, 'alpha': 0.2466050847550272,
'colsample_bytree': 0.5, 'subsample': 0.7, 'learning_rate': 0.015126032909493351,
'n_estimators': 700, 'max_depth': 9, 'min_child_weight': 83}. Best is trial 59 with v
0.07541294463523736.
[I 2025-11-03 14:09:01,395] Trial 71 finished with value: 0.07543902897929282 and
parameters: {'lambda': 0.002346030557095459, 'alpha': 0.08167708278789734,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.02112396504665261,
'n_estimators': 800, 'max_depth': 8, 'min_child_weight': 70}. Best is trial 59 with v
0.07541294463523736.
[I 2025-11-03 14:09:06,729] Trial 72 finished with value: 0.07540451517227897 and
parameters: {'lambda': 0.0023713729330604367, 'alpha': 0.07839278895530936,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.025065032726683856,
'n_estimators': 800, 'max_depth': 7, 'min_child_weight': 56}. Best is trial 72 with v
0.07540451517227897.
[I 2025-11-03 14:09:12,650] Trial 73 finished with value: 0.07540016771172552 and
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parameters: {'lambda': 0.0016018790723392926, 'alpha': 0.08128982392863832,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.02440775643924439,
'n_estimators': 900, 'max_depth': 7, 'min_child_weight': 71}. Best is trial 73 with v
0.07540016771172552.
[I 2025-11-03 14:09:18,550] Trial 74 finished with value: 0.07543167897555465 and
parameters: {'lambda': 0.0034457048188405804, 'alpha': 0.07806937152915251,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.025597424944334878,
'n_estimators': 900, 'max_depth': 7, 'min_child_weight': 71}. Best is trial 73 with v
0.07540016771172552.
[I 2025-11-03 14:09:23,571] Trial 75 finished with value: 0.0754722204645772 and
parameters: {'lambda': 0.0012422800852335504, 'alpha': 0.152129790194954,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.027705414914035248,
'n_estimators': 900, 'max_depth': 6, 'min_child_weight': 300}. Best is trial 73 with
0.07540016771172552.
[I 2025-11-03 14:09:29,477] Trial 76 finished with value: 0.07542995066455023 and
parameters: {'lambda': 0.0057362936824894946, 'alpha': 0.08191598013618205,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.025380403519439727,
'n_estimators': 900, 'max_depth': 7, 'min_child_weight': 100}. Best is trial 73 with
0.07540016771172552.
[I 2025-11-03 14:09:35,524] Trial 77 finished with value: 0.07638175945505758 and
parameters: {'lambda': 0.008037623626482575, 'alpha': 0.24971318424369607,
'colsample_bytree': 0.3, 'subsample': 0.7, 'learning_rate': 0.023390110730392034,
'n_estimators': 900, 'max_depth': 7, 'min_child_weight': 108}. Best is trial 73 with
0.07540016771172552.
[I 2025-11-03 14:09:37,580] Trial 78 finished with value: 0.07571361997594916 and
parameters: {'lambda': 0.005300143958241613, 'alpha': 0.09289939069572672,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.025326427407584836,
'n_estimators': 300, 'max_depth': 6, 'min_child_weight': 85}. Best is trial 73 with v
0.07540016771172552.
[I 2025-11-03 14:09:44,059] Trial 79 finished with value: 0.07549180970616046 and
parameters: {'lambda': 0.0017972685675839383, 'alpha': 0.06859265170759471,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.029167400452976427,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 99}. Best is trial 73 with
0.07540016771172552.
[I 2025-11-03 14:09:50,067] Trial 80 finished with value: 0.07554587614862913 and
parameters: {'lambda': 5.63540667517276, 'alpha': 0.12320839966848325, 'colsample_byt
0.7, 'subsample': 0.5, 'learning_rate': 0.023316830830459222, 'n_estimators': 900,
'max_depth': 7, 'min_child_weight': 122}. Best is trial 73 with value: 0.075400167711
[I 2025-11-03 14:09:56,021] Trial 81 finished with value: 0.07542966406541984 and
parameters: {'lambda': 0.0025026233436879017, 'alpha': 0.08009623237286721,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.025254696417621413,
'n_estimators': 900, 'max_depth': 7, 'min_child_weight': 60}. Best is trial 73 with v
0.07540016771172552.
[I 2025-11-03 14:10:01,164] Trial 82 finished with value: 0.07546262399950623 and
parameters: {'lambda': 0.0034192058874611 65, 'alpha': 0.8845393552268374,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.02550551081020159,
'n_estimators': 900, 'max_depth': 6, 'min_child_weight': 91}. Best is trial 73 with v
0.07540016771172552.
[I 2025-11-03 14:10:07,696] Trial 83 finished with value: 0.07547065062378108 and
parameters: {'lambda': 0.0025865138005800154, 'alpha': 0.16355732572295592,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.02838106378781463,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 63}. Best is trial 73 with
0.07540016771172552.
[I 2025-11-03 14:10:13,566] Trial 84 finished with value: 0.07544356487873824 and
parameters: {'lambda': 0.0012845625239617548, 'alpha': 0.04547805653562448,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.03107072339580046,
'n_estimators': 900, 'max_depth': 7, 'min_child_weight': 136}. Best is trial 73 with
0.07540016771172552.
[I 2025-11-03 14:10:18,573] Trial 85 finished with value: 0.07549556133167204 and
parameters: {'lambda': 0.0017244716333015243, 'alpha': 0.226073085878928,
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'colsample_bytree': 1.0, 'subsample': 1.0, 'learning_rate': 0.0249659564990988,
'n_estimators': 900, 'max_depth': 6, 'min_child_weight': 76}. Best is trial 73 with v
0.07540016771172552.
[I 2025-11-03 14:10:24,548] Trial 86 finished with value: 0.0754451976410619 and
parameters: {'lambda': 1.4327046326765795, 'alpha': 0.09886989370234443,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.030061011188840674,
'n_estimators': 900, 'max_depth': 7, 'min_child_weight': 56}. Best is trial 73 with v
0.07540016771172552.
[I 2025-11-03 14:10:30,508] Trial 87 finished with value: 0.07557582426467632 and
parameters: {'lambda': 0.00338309056216571, 'alpha': 0.0809078325698997,
'colsample_bytree': 0.5, 'subsample': 0.7, 'learning_rate': 0.026458503193261446,
'n_estimators': 900, 'max_depth': 7, 'min_child_weight': 98}. Best is trial 73 with v
0.07540016771172552.
[I 2025-11-03 14:10:36,092] Trial 88 finished with value: 0.07545818381788955 and
parameters: {'lambda': 0.0018525409745788757, 'alpha': 0.12668763961738863,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.023923809260586074,
'n_estimators': 1000, 'max_depth': 6, 'min_child_weight': 32}. Best is trial 73 with
0.07540016771172552.
[I 2025-11-03 14:10:42,068] Trial 89 finished with value: 0.07541577330122654 and
parameters: {'lambda': 0.0010710300360706328, 'alpha': 0.04803327558457278,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.02254886382218954,
'n_estimators': 900, 'max_depth': 7, 'min_child_weight': 80}. Best is trial 73 with v
0.07540016771172552.
[I 2025-11-03 14:10:48,664] Trial 90 finished with value: 0.0762307790903281 and
parameters: {'lambda': 0.0010465669799944476, 'alpha': 0.05429066067408198,
'colsample_bytree': 0.3, 'subsample': 0.7, 'learning_rate': 0.02780844947998951,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 83}. Best is trial 73 with
0.07540016771172552.
[I 2025-11-03 14:10:54,639] Trial 91 finished with value: 0.07542722614023338 and
parameters: {'lambda': 0.04893945494686981, 'alpha': 0.02250078935269581,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.02272129689446929,
'n_estimators': 900, 'max_depth': 7, 'min_child_weight': 73}. Best is trial 73 with v
0.07540016771172552.
[I 2025-11-03 14:11:00,630] Trial 92 finished with value: 0.07540608332025388 and
parameters: {'lambda': 0.03363642336118703, 'alpha': 0.04313254251454678,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.022669038685757904,
'n_estimators': 900, 'max_depth': 7, 'min_child_weight': 61}. Best is trial 73 with v
0.07540016771172552.
[I 2025-11-03 14:11:06,593] Trial 93 finished with value: 0.0753811419598585 and
parameters: {'lambda': 0.03793493921768352, 'alpha': 0.04748837204206898,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.02245363654812717,
'n_estimators': 900, 'max_depth': 7, 'min_child_weight': 56}. Best is trial 93 with v
0.0753811419598585.
[I 2025-11-03 14:11:11,668] Trial 94 finished with value: 0.0754646748217295 and
parameters: {'lambda': 0.05156201655711931, 'alpha': 0.048379774449620376,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.022549769907923033,
'n_estimators': 900, 'max_depth': 6, 'min_child_weight': 116}. Best is trial 93 with
0.0753811419598585.
[I 2025-11-03 14:11:18,169] Trial 95 finished with value: 0.07540215241238085 and
parameters: {'lambda': 0.028892901781203503, 'alpha': 0.03478771104287462,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.024735805240902308,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 55}. Best is trial 93 with
0.0753811419598585.
[I 2025-11-03 14:11:23,743] Trial 96 finished with value: 0.07544900893578686 and
parameters: {'lambda': 0.02920353210444274, 'alpha': 0.036090292544218035,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.021454965181178 62,
'n_estimators': 1000, 'max_depth': 6, 'min_child_weight': 55}. Best is trial 93 with
0.0753811419598585.
[I 2025-11-03 14:11:30,258] Trial 97 finished with value: 0.07543847848728634 and
parameters: {'lambda': 0.04792422287250325, 'alpha': 0.03949809354070451,
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'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.024251360223670252,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 79}. Best is trial 93 with
0.0753811419598585.
[I 2025-11-03 14:11:36,819] Trial 98 finished with value: 0.07549665568889108 and
parameters: {'lambda': 0.06570688497754384, 'alpha': 0.013901274722156768,
'colsample_bytree': 1.0, 'subsample': 0.5, 'learning_rate': 0.02231183175268956,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 60}. Best is trial 93 with
0.0753811419598585.
[I 2025-11-03 14:11:41,806] Trial 99 finished with value: 0.07551813303380081 and
parameters: {'lambda': 0.07998906505869978, 'alpha': 0.024009423514317375,
'colsample_bytree': 0.9, 'subsample': 1.0, 'learning_rate': 0.02965857800140048,
'n_estimators': 900, 'max_depth': 6, 'min_child_weight': 46}. Best is trial 93 with v
0.0753811419598585.
[I 2025-11-03 14:11:47,770] Trial 100 finished with value: 0.07546409124971971 and
parameters: {'lambda': 0.017338574939310004, 'alpha': 0.061447053105016435,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.026780656354183745,
'n_estimators': 900, 'max_depth': 7, 'min_child_weight': 34}. Best is trial 93 with v
0.0753811419598585.
[I 2025-11-03 14:11:53,782] Trial 101 finished with value: 0.07540488327796162 and
parameters: {'lambda': 0.03881012475398673, 'alpha': 0.033519922441000854,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.022844614575756064,
'n_estimators': 900, 'max_depth': 7, 'min_child_weight': 51}. Best is trial 93 with v
0.0753811419598585.
[I 2025-11-03 14:11:59,786] Trial 102 finished with value: 0.07542869183483225 and
parameters: {'lambda': 0.0379475933846823, 'alpha': 0.03282097433678446,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.023214505163458004,
'n_estimators': 900, 'max_depth': 7, 'min_child_weight': 40}. Best is trial 93 with v
0.0753811419598585.
[I 2025-11-03 14:12:05,639] Trial 103 finished with value: 0.0758996239310986 and
parameters: {'lambda': 0.03828360518576261, 'alpha': 0.014294374401273291,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.005014764943245795,
'n_estimators': 1000, 'max_depth': 6, 'min_child_weight': 51}. Best is trial 93 with
0.0753811419598585.
[I 2025-11-03 14:12:11,591] Trial 104 finished with value: 0.0754190213705173 and
parameters: {'lambda': 0.02529887688237377, 'alpha': 0.0322808720432997,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.023043712924643325,
'n_estimators': 900, 'max_depth': 7, 'min_child_weight': 41}. Best is trial 93 with v
0.0753811419598585.
[I 2025-11-03 14:12:17,632] Trial 105 finished with value: 0.07549563337756394 and
parameters: {'lambda': 0.02847943455894881, 'alpha': 0.04488239216610852,
'colsample_bytree': 0.7, 'subsample': 0.8, 'learning_rate': 0.019826531313659204,
'n_estimators': 900, 'max_depth': 7, 'min_child_weight': 28}. Best is trial 93 with v
0.0753811419598585.
[I 2025-11-03 14:12:23,542] Trial 106 finished with value: 0.07540676266331399 and
parameters: {'lambda': 0.018372819249356822, 'alpha': 0.010023055095671063,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.02089787399443959,
'n_estimators': 900, 'max_depth': 7, 'min_child_weight': 179}. Best is trial 93 with
0.0753811419598585.
[I 2025-11-03 14:12:30,026] Trial 107 finished with value: 0.07542686898659993 and
parameters: {'lambda': 0.015528971698394557, 'alpha': 0.010208602985929465,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.020702021519254852,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 170}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:12:35,037] Trial 108 finished with value: 0.07546190950253358 and
parameters: {'lambda': 0.01990878230773404, 'alpha': 0.005474880228731995,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.02454352848461389,
'n_estimators': 900, 'max_depth': 6, 'min_child_weight': 172}. Best is trial 93 with
0.0753811419598585.
[I 2025-11-03 14:12:41,573] Trial 109 finished with value: 0.07558259504018691 and
parameters: {'lambda': 0.029267270256939436, 'alpha': 0.03388997958440845,
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'colsample_bytree': 0.5, 'subsample': 0.8, 'learning_rate': 0.02155693154974629,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 188}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:12:46,981] Trial 110 finished with value: 0.07543813626920275 and
parameters: {'lambda': 0.02074834157923165, 'alpha': 0.015886513368951343,
'colsample_bytree': 0.9, 'subsample': 0.7, 'learning_rate': 0.016328500844264262,
'n_estimators': 800, 'max_depth': 7, 'min_child_weight': 147}. Best is trial 93 with
0.0753811419598585.
[I 2025-11-03 14:12:53,525] Trial 111 finished with value: 0.07542207823216868 and
parameters: {'lambda': 0.013826738475625024, 'alpha': 0.01046596211133163,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.01783574108213057,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 161}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:13:00,063] Trial 112 finished with value: 0.07541495313352992 and
parameters: {'lambda': 0.01110655569562235, 'alpha': 0.00951413658244826,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.020145433408401636,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 185}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:13:07,747] Trial 113 finished with value: 0.07546680887945012 and
parameters: {'lambda': 0.014614948290474187, 'alpha': 0.008834934119671928,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.020335925943543134,
'n_estimators': 1000, 'max_depth': 8, 'min_child_weight': 158}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:13:14,271] Trial 114 finished with value: 0.07541859997976776 and
parameters: {'lambda': 0.024035050556680395, 'alpha': 0.025270151684573673,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.019495499635507577,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 188}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:13:20,803] Trial 115 finished with value: 0.07540940131977478 and
parameters: {'lambda': 0.02536464508622469, 'alpha': 0.026573766709701966,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.019413971757905237,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 165}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:13:27,317] Trial 116 finished with value: 0.07540501405758794 and
parameters: {'lambda': 0.009356848753667478, 'alpha': 0.026601939693059132,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.019445395921013506,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 196}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:13:32,905] Trial 117 finished with value: 0.07547753356493322 and
parameters: {'lambda': 0.010858865676768822, 'alpha': 0.026760628236622643,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.01828109852622926,
'n_estimators': 1000, 'max_depth': 6, 'min_child_weight': 220}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:13:40,687] Trial 118 finished with value: 0.07543105614038124 and
parameters: {'lambda': 0.009531267412573114, 'alpha': 0.05040870070461672,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.01642819586526674,
'n_estimators': 1000, 'max_depth': 8, 'min_child_weight': 190}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:13:47,168] Trial 119 finished with value: 0.07540751291570172 and
parameters: {'lambda': 0.08056490224684773, 'alpha': 0.02101040580496886,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.02117352198702362,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 166}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:13:52,770] Trial 120 finished with value: 0.07547125550987761 and
parameters: {'lambda': 0.0727957140449123, 'alpha': 0.008270159522806936,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.01941411137286328,
'n_estimators': 1000, 'max_depth': 6, 'min_child_weight': 202}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:13:59,604] Trial 121 finished with value: 0.07541114416390307 and
parameters: {'lambda': 0.040094659920718395, 'alpha': 9.317255550264946,
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'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.0210849912233225,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 194}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:14:06,119] Trial 122 finished with value: 0.07540780004164191 and
parameters: {'lambda': 0.08718421254012625, 'alpha': 0.01112071353172311,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.0203576655988277,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 165}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:14:12,986] Trial 123 finished with value: 0.0754116018794547 and
parameters: {'lambda': 0.11651210475911308, 'alpha': 9.943747423060843, 'colsample_by
1.0, 'subsample': 0.7, 'learning_rate': 0.02142570780256079, 'n_estimators': 1000,
'max_depth': 7, 'min_child_weight': 181}. Best is trial 93 with value: 0.075381141959
[I 2025-11-03 14:14:19,668] Trial 124 finished with value: 0.07540294268447842 and
parameters: {'lambda': 0.09514237151158049, 'alpha': 1.9477022669278314,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.021230130453751127,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 165}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:14:26,328] Trial 125 finished with value: 0.07540553927329932 and
parameters: {'lambda': 0.08412086928441846, 'alpha': 2.765516703422069, 'colsample_by
1.0, 'subsample': 0.7, 'learning_rate': 0.02086513390078669, 'n_estimators': 1000,
'max_depth': 7, 'min_child_weight': 199}. Best is trial 93 with value: 0.075381141959
[I 2025-11-03 14:14:33,058] Trial 126 finished with value: 0.07541174451790679 and
parameters: {'lambda': 0.060066619519720595, 'alpha': 3.4774239100311948,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.024066026223793575,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 164}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:14:36,898] Trial 127 finished with value: 0.07671640045198509 and
parameters: {'lambda': 0.10269881937157234, 'alpha': 2.405003798401028, 'colsample_by
1.0, 'subsample': 0.7, 'learning_rate': 0.021871571505785826, 'n_estimators': 1000,
'max_depth': 3, 'min_child_weight': 152}. Best is trial 93 with value: 0.075381141959
[I 2025-11-03 14:14:42,628] Trial 128 finished with value: 0.07658640411747773 and
parameters: {'lambda': 0.13713872077155465, 'alpha': 2.773925566443753, 'colsample_by
0.3, 'subsample': 0.7, 'learning_rate': 0.018294719656903876, 'n_estimators': 1000,
'max_depth': 6, 'min_child_weight': 168}. Best is trial 93 with value: 0.075381141959
[I 2025-11-03 14:14:49,119] Trial 129 finished with value: 0.07542397636348654 and
parameters: {'lambda': 0.20173107370927287, 'alpha': 0.012396760907721323,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.020646434023962722,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 178}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:14:55,737] Trial 130 finished with value: 0.07541089794825231 and
parameters: {'lambda': 0.09122685595293822, 'alpha': 1.4943991066446023,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.0190387744969432,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 220}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:15:02,355] Trial 131 finished with value: 0.07540527691347945 and
parameters: {'lambda': 0.03158548485188005, 'alpha': 1.0134820534344586,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.019206486910239545,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 215}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:15:08,912] Trial 132 finished with value: 0.07540699822590456 and
parameters: {'lambda': 0.03136825573912255, 'alpha': 2.0816190458196404,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.023365366562858633,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 211}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:15:15,512] Trial 133 finished with value: 0.07541293964429031 and
parameters: {'lambda': 0.03201439536221813, 'alpha': 1.2156816838479938,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.023410056169706733,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 203}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:15:22,214] Trial 134 finished with value: 0.07543784407439501 and
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parameters: {'lambda': 0.043768160194719234, 'alpha': 4.4153316235850175,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.02605200565687744,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 219}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:15:28,782] Trial 135 finished with value: 0.07541798122265107 and
parameters: {'lambda': 0.05948968916619176, 'alpha': 2.394787042453736, 'colsample_by
1.0, 'subsample': 0.7, 'learning_rate': 0.024414146278625117, 'n_estimators': 1000,
'max_depth': 7, 'min_child_weight': 235}. Best is trial 93 with value: 0.075381141959
[I 2025-11-03 14:15:34,427] Trial 136 finished with value: 0.07545736854922033 and
parameters: {'lambda': 0.08775448295877397, 'alpha': 2.0435686148788093,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.02185863977556249,
'n_estimators': 1000, 'max_depth': 6, 'min_child_weight': 214}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:15:40,982] Trial 137 finished with value: 0.07541897547486832 and
parameters: {'lambda': 0.05500402499637213, 'alpha': 0.9107202115853091,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.022600310304937813,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 200}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:15:49,078] Trial 138 finished with value: 0.07552161449456381 and
parameters: {'lambda': 0.03347353135181416, 'alpha': 3.1661361631633618,
'colsample_bytree': 0.7, 'subsample': 0.5, 'learning_rate': 0.02068195025883612,
'n_estimators': 1000, 'max_depth': 8, 'min_child_weight': 137}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:15:54,967] Trial 139 finished with value: 0.07548084506453359 and
parameters: {'lambda': 0.045256687379351394, 'alpha': 1.9197516929375058,
'colsample_bytree': 1.0, 'subsample': 1.0, 'learning_rate': 0.027046203080040035,
'n_estimators': 900, 'max_depth': 7, 'min_child_weight': 207}. Best is trial 93 with
0.0753811419598585.
[I 2025-11-03 14:16:01,639] Trial 140 finished with value: 0.07541171273726449 and
parameters: {'lambda': 0.018861023714737978, 'alpha': 3.616297657667327,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.024089290150537696,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 233}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:16:08,244] Trial 141 finished with value: 0.07542855856740432 and
parameters: {'lambda': 0.07142636531194721, 'alpha': 1.1869721222827418,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.01927424775938122,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 176}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:16:15,025] Trial 142 finished with value: 0.07542378396635299 and
parameters: {'lambda': 0.1222100378630307, 'alpha': 6.123590087336972, 'colsample_byt
1.0, 'subsample': 0.7, 'learning_rate': 0.020256492451577297, 'n_estimators': 1000,
'max_depth': 7, 'min_child_weight': 228}. Best is trial 93 with value: 0.075381141959
[I 2025-11-03 14:16:21,006] Trial 143 finished with value: 0.07543657321365449 and
parameters: {'lambda': 0.023753061066325135, 'alpha': 0.06352092746749405,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.01793794807310139,
'n_estimators': 900, 'max_depth': 7, 'min_child_weight': 195}. Best is trial 93 with
0.0753811419598585.
[I 2025-11-03 14:16:27,488] Trial 144 finished with value: 0.07541983587652035 and
parameters: {'lambda': 0.02573664924202041, 'alpha': 0.03941441077597092,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.02174359961694734,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 181}. Best is trial 93 with
value: 0.0753811419598585.
[I 2025-11-03 14:16:33,211] Trial 145 finished with value: 0.07548003945604273 and
parameters: {'lambda': 0.03457643427679107, 'alpha': 4.317868204447662, 'colsample_by
1.0, 'subsample': 0.7, 'learning_rate': 0.016918405188770545, 'n_estimators': 1000,
'max_depth': 6, 'min_child_weight': 153}. Best is trial 93 with value: 0.075381141959
[I 2025-11-03 14:16:39,807] Trial 146 finished with value: 0.07540114296970721 and
parameters: {'lambda': 0.08344637268647456, 'alpha': 1.4014929792786248,
'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate': 0.023185832572357436,
'n_estimators': 1000, 'max_depth': 7, 'min_child_weight': 165}. Best is trial 93 with
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value: 0.0753811419598585.
[I 2025-11-03 14:16:45,814] Trial 147 finished with value: 0.0754175940274703 and
parameters: {'lambda': 0.07314422229600574, 'alpha': 1.427715975505908, 'colsample_by
1.0, 'subsample': 0.7, 'learning_rate': 0.022947234279300347, 'n_estimators': 900,
'max_depth': 7, 'min_child_weight': 143}. Best is trial 93 with value: 0.075381141959
[I 2025-11-03 14:16:52,939] Trial 148 finished with value: 0.0755113299644388 and
parameters: {'lambda': 0.3008700884668602, 'alpha': 1.6899603479678675, 'colsample_by
0.5, 'subsample': 0.7, 'learning_rate': 0.0252637143192346, 'n_estimators': 900,
'max_depth': 8, 'min_child_weight': 174}. Best is trial 93 with value: 0.075381141959
[I 2025-11-03 14:16:59,491] Trial 149 finished with value: 0.07543055318428027 and
parameters: {'lambda': 0.08693088822084334, 'alpha': 1.133424388146693, 'colsample_by
1.0, 'subsample': 0.7, 'learning_rate': 0.02379058232396969, 'n_estimators': 1000,
'max_depth': 7, 'min_child_weight': 214}. Best is trial 93 with value: 0.075381141959
[I 2025-11-03 14:16:59,493] A new study created in memory with name: no-name-de5e5a29
e811-458d-a11a-4d50ff53536d
✅ Best XGBRegressor parameters: {'lambda': 0.03793493921768352, 'alpha':
0.04748837204206898, 'colsample_bytree': 1.0, 'subsample': 0.7, 'learning_rate':
0.02245363654812717, 'n_estimators': 900, 'max_depth': 7, 'min_child_weight': 56}

🚀 Tuning LGBMRegressor (GPU)...
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[I 2025-11-03 14:17:41,466] Trial 0 finished with value: 0.07621798541905134 and
parameters: {'lambda_l1': 0.0031852790371024392, 'lambda_l2': 0.0006735934991910609,
'num_leaves': 230, 'feature_fraction': 0.5084478298271974, 'bagging_fraction':
0.6275212971248738, 'bagging_freq': 6, 'min_child_samples': 80, 'learning_rate':
0.0076527349074864085, 'n_estimators': 700, 'max_depth': 8}. Best is trial 0 with val
0.07621798541905134.
[I 2025-11-03 14:17:55,082] Trial 1 finished with value: 0.07686122012383328 and
parameters: {'lambda_l1': 3.0767344844882927e-05, 'lambda_l2': 0.0008657264012403919,
'num_leaves': 209, 'feature_fraction': 0.7911830831560916, 'bagging_fraction':
0.8545487268658825, 'bagging_freq': 1, 'min_child_samples': 41, 'learning_rate':
0.018507048702397114, 'n_estimators': 1000, 'max_depth': 3}. Best is trial 0 with val
0.07621798541905134.
[I 2025-11-03 14:18:10,511] Trial 2 finished with value: 0.07585886499317256 and
parameters: {'lambda_l1': 0.0006857888117312407, 'lambda_l2': 2.5299408678230633e-05,
'num_leaves': 122, 'feature_fraction': 0.8875131972860095, 'bagging_fraction':
0.9799239513737882, 'bagging_freq': 5, 'min_child_samples': 71, 'learning_rate':
0.14847559941180 88, 'n_estimators': 500, 'max_depth': 6}. Best is trial 2 with value:
0.07585886499317256.
[I 2025-11-03 14:18:39,598] Trial 3 finished with value: 0.07661783619179892 and
parameters: {'lambda_l1': 0.0006579338344336676, 'lambda_l2': 0.010135946087705593,
'num_leaves': 63, 'feature_fraction': 0.7049668821963317, 'bagging_fraction':
0.9407016201767466, 'bagging_freq': 2, 'min_child_samples': 18, 'learning_rate':
0.01038351189937391, 'n_estimators': 900, 'max_depth': 4}. Best is trial 2 with value
0.07585886499317256.
[I 2025-11-03 14:19:14,132] Trial 4 finished with value: 0.07642143794980255 and
parameters: {'lambda_l1': 0.0002853100901055872, 'lambda_l2': 0.04486580505293356,
'num_leaves': 163, 'feature_fraction': 0.8594065445304252, 'bagging_fraction':
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0.7816144919208265, 'bagging_freq': 2, 'min_child_samples': 59, 'learning_rate':
0.08804884920507994, 'n_estimators': 600, 'max_depth': 9}. Best is trial 2 with value
0.07585886499317256.
[I 2025-11-03 14:19:18,437] Trial 5 finished with value: 0.07695585538336029 and
parameters: {'lambda_l1': 0.0008290668319135787, 'lambda_l2': 0.025823372307541927,
'num_leaves': 161, 'feature_fraction': 0.7783160954731354, 'bagging_fraction':
0.8180120947505938, 'bagging_freq': 5, 'min_child_samples': 70, 'learning_rate':
0.07665403959863595, 'n_estimators': 200, 'max_depth': 3}. Best is trial 2 with value
0.07585886499317256.
[I 2025-11-03 14:19:46,032] Trial 6 finished with value: 0.07647436358492785 and
parameters: {'lambda_l1': 0.0051363040332083445, 'lambda_l2': 4.722068364774514e-05,
'num_leaves': 156, 'feature_fraction': 0.5011835663089881, 'bagging_fraction':
0.9736899590671579, 'bagging_freq': 2, 'min_child_samples': 71, 'learning_rate':
0.00987993697968522, 'n_estimators': 600, 'max_depth': 6}. Best is trial 2 with value
0.07585886499317256.
[I 2025-11-03 14:20:07,609] Trial 7 finished with value: 0.07681132554636969 and
parameters: {'lambda_l1': 0.0015150660457274308, 'lambda_l2': 1.0505076406415542e-05,
'num_leaves': 246, 'feature_fraction': 0.5271272313670127, 'bagging_fraction':
0.7642523346787943, 'bagging_freq': 3, 'min_child_samples': 46, 'learning_rate':
0.03370418834795406, 'n_estimators': 1000, 'max_depth': 3}. Best is trial 2 with valu
0.07585886499317256.
[I 2025-11-03 14:20:42,887] Trial 8 finished with value: 0.07580924756815714 and
parameters: {'lambda_l1': 3.6472295591830024e-05, 'lambda_l2': 0.0014512516301627579,
'num_leaves': 168, 'feature_fraction': 0.6077822060665994, 'bagging_fraction':
0.5138083634592763, 'bagging_freq': 6, 'min_child_samples': 41, 'learning_rate':
0.03242280297455001, 'n_estimators': 700, 'max_depth': 10}. Best is trial 8 with valu
0.07580924756815714.
[I 2025-11-03 14:20:53,038] Trial 9 finished with value: 0.0760787469488552 and param
{'lambda_l1': 0.00013629593360212658, 'lambda_l2': 0.04299563174460295, 'num_leaves':
'feature_fraction': 0.5457326079923552, 'bagging_fraction': 0.7907438603125261,
'bagging_freq': 7, 'min_child_samples': 59, 'learning_rate': 0.2122878727741685,
'n_estimators': 400, 'max_depth': 5}. Best is trial 8 with value: 0.07580924756815714.
[I 2025-11-03 14:21:01,614] Trial 10 finished with value: 0.07578544437519034 and
parameters: {'lambda_l1': 0.16225832062669981, 'lambda_l2': 0.9964617974008846,
'num_leaves': 40, 'feature_fraction': 0.6345512118340194, 'bagging_fraction':
0.5139909180502111, 'bagging_freq': 7, 'min_child_samples': 97, 'learning_rate':
0.031721172635880014, 'n_estimators': 300, 'max_depth': 12}. Best is trial 10 with val
0.07578544437519034.
[I 2025-11-03 14:21:07,000] Trial 11 finished with value: 0.07619483793058349 and
parameters: {'lambda_l1': 0.20088599735873386, 'lambda_l2': 0.2750798860557251,
'num_leaves': 25, 'feature_fraction': 0.6473523749457419, 'bagging_fraction':
0.5002988650205772, 'bagging_freq': 7, 'min_child_samples': 94, 'learning_rate':
0.03422035626219757, 'n_estimators': 200, 'max_depth': 12}. Best is trial 10 with val
0.07578544437519034.
[I 2025-11-03 14:21:36,727] Trial 12 finished with value: 0.0755741666960191 and
parameters: {'lambda_l1': 0.9000365158215693, 'lambda_l2': 0.44710978173238225,
'num_leaves': 95, 'feature_fraction': 0.6315994467643882, 'bagging_fraction':
0.5026485080615584, 'bagging_freq': 6, 'min_child_samples': 25, 'learning_rate':
0.0210720113469378, 'n_estimators': 800, 'max_depth': 12}. Best is trial 12 with valu
0.0755741666960191.
[I 2025-11-03 14:22:01,717] Trial 13 finished with value: 0.07593153473967576 and
parameters: {'lambda_l1': 0.854289946392252, 'lambda_l2': 0.9509311064639837, 'num_le
87, 'feature_fraction': 0.6677320535168554, 'bagging_fraction': 0.6358369300228036,
'bagging_freq': 5, 'min_child_samples': 15, 'learning_rate': 0.05842534072754088,
'n_estimators': 800, 'max_depth': 12}. Best is trial 12 with value: 0.075574166696019.
[I 2025-11-03 14:22:09,244] Trial 14 finished with value: 0.07725543731698778 and
parameters: {'lambda_l1': 0.03341456874416444, 'lambda_l2': 0.29773886772751595,
'num_leaves': 17, 'feature_fraction': 0.5993413734343793, 'bagging_fraction':
0.5990806764279547, 'bagging_freq': 7, 'min_child_samples': 29, 'learning_rate':
0.016286767308969677, 'n_estimators': 300, 'max_depth': 11}. Best is trial 12 with val
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0.0755741666960191.
[I 2025-11-03 14:22:24,371] Trial 15 finished with value: 0.07561272528701005 and
parameters: {'lambda_l1': 0.0631393532366899, 'lambda_l2': 0.6375491579044212,
'num_leaves': 68, 'feature_fraction': 0.7208109548545302, 'bagging_fraction':
0.6896186957287692, 'bagging_freq': 6, 'min_child_samples': 88, 'learning_rate':
0.018807551276747058, 'n_estimators': 400, 'max_depth': 10}. Best is trial 12 with va
0.0755741666960191.
[I 2025-11-03 14:22:45,957] Trial 16 finished with value: 0.07555371905329547 and
parameters: {'lambda_l1': 0.021267367017715564, 'lambda_l2': 0.19756890876103916,
'num_leaves': 103, 'feature_fraction': 0.7383602503674762, 'bagging_fraction':
0.6754508958164173, 'bagging_freq': 4, 'min_child_samples': 27, 'learning_rate':
0.01781476322506573, 'n_estimators': 500, 'max_depth': 10}. Best is trial 16 with val
0.07555371905329547.
[I 2025-11-03 14:23:24,606] Trial 17 finished with value: 0.07564149382045238 and
parameters: {'lambda_l1': 0.01041808521546437, 'lambda_l2': 0.1295509658425784,
'num_leaves': 110, 'feature_fraction': 0.9778454187646408, 'bagging_fraction':
0.7064093755519232, 'bagging_freq': 4, 'min_child_samples': 27, 'learning_rate':
0.005412361438752618, 'n_estimators': 800, 'max_depth': 10}. Best is trial 16 with va
0.07555371905329547.
[I 2025-11-03 14:23:45,853] Trial 18 finished with value: 0.0755382422599206 and
parameters: {'lambda_l1': 0.37585240724754015, 'lambda_l2': 0.005884781209648058,
'num_leaves': 98, 'feature_fraction': 0.8289162981161651, 'bagging_fraction':
0.5764854532303604, 'bagging_freq': 4, 'min_child_samples': 28, 'learning_rate':
0.01420624104178774, 'n_estimators': 500, 'max_depth': 8}. Best is trial 18 with valu
0.0755382422599206.
[I 2025-11-03 14:24:08,582] Trial 19 finished with value: 0.07556916659466563 and
parameters: {'lambda_l1': 0.017304580421039793, 'lambda_l2': 0.00665637926793028,
'num_leaves': 124, 'feature_fraction': 0.8466084658191032, 'bagging_fraction':
0.5744802967877986, 'bagging_freq': 4, 'min_child_samples': 10, 'learning_rate':
0.011976939964327579, 'n_estimators': 500, 'max_depth': 8}. Best is trial 18 with val
0.0755382422599206.
[I 2025-11-03 14:24:32,347] Trial 20 finished with value: 0.07633279682010229 and
parameters: {'lambda_l1': 0.18704400157051088, 'lambda_l2': 0.00014896036333516058,
'num_leaves': 188, 'feature_fraction': 0.9610139655806721, 'bagging_fraction':
0.6911110268196767, 'bagging_freq': 3, 'min_child_samples': 36, 'learning_rate':
0.0059240581512232035, 'n_estimators': 500, 'max_depth': 7}. Best is trial 18 with va
0.0755382422599206.
[I 2025-11-03 14:24:55,394] Trial 21 finished with value: 0.0755691880658071 and
parameters: {'lambda_l1': 0.017130489173939546, 'lambda_l2': 0.00389011051402908,
'num_leaves': 131, 'feature_fraction': 0.8271577788689037, 'bagging_fraction':
0.5789515541251105, 'bagging_freq': 4, 'min_child_samples': 12, 'learning_rate':
0.012664149589619545, 'n_estimators': 500, 'max_depth': 8}. Best is trial 18 with val
0.0755382422599206.
[I 2025-11-03 14:25:17,079] Trial 22 finished with value: 0.07553728455564511 and
parameters: {'lambda_l1': 0.06827629491787042, 'lambda_l2': 0.007323790673910319,
'num_leaves': 95, 'feature_fraction': 0.9079362118608041, 'bagging_fraction':
0.5695588258808731, 'bagging_freq': 3, 'min_child_samples': 21, 'learning_rate':
0.012930322768955142, 'n_estimators': 500, 'max_depth': 9}. Best is trial 22 with val
0.07553728455564511.
[I 2025-11-03 14:25:32,922] Trial 23 finished with value: 0.07548845367070063 and
parameters: {'lambda_l1': 0.0713447084312684, 'lambda_l2': 0.0002833657742383887,
'num_leaves': 82, 'feature_fraction': 0.9134857795953437, 'bagging_fraction':
0.6442060944025301, 'bagging_freq': 3, 'min_child_samples': 20, 'learning_rate':
0.024422882802537224, 'n_estimators': 400, 'max_depth': 9}. Best is trial 23 with val
0.07548845367070063.
[I 2025-11-03 14:25:47,293] Trial 24 finished with value: 0.07553120491712871 and
parameters: {'lambda_l1': 0.07762423024949835, 'lambda_l2': 0.00018838814248123162,
'num_leaves': 69, 'feature_fraction': 0.9219866238335399, 'bagging_fraction':
0.5463419070235521, 'bagging_freq': 3, 'min_child_samples': 22, 'learning_rate':
0.025391870399869777, 'n_estimators': 400, 'max_depth': 9}. Best is trial 23 with val
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0.07548845367070063.
[I 2025-11-03 14:26:00,754] Trial 25 finished with value: 0.07560043062269446 and
parameters: {'lambda_l1': 0.06271266660569096, 'lambda_l2': 0.0001518066648731648,
'num_leaves': 69, 'feature_fraction': 0.9175324174113995, 'bagging_fraction':
0.5492108013450249, 'bagging_freq': 3, 'min_child_samples': 50, 'learning_rate':
0.05068455412233885, 'n_estimators': 400, 'max_depth': 9}. Best is trial 23 with valu
0.07548845367070063.
[I 2025-11-03 14:26:09,130] Trial 26 finished with value: 0.07560055058908456 and
parameters: {'lambda_l1': 0.05898881691769674, 'lambda_l2': 0.0002459972612218413,
'num_leaves': 49, 'feature_fraction': 0.9237371361759247, 'bagging_fraction':
0.6336792554388061, 'bagging_freq': 1, 'min_child_samples': 18, 'learning_rate':
0.024845254537060883, 'n_estimators': 300, 'max_depth': 9}. Best is trial 23 with val
0.07548845367070063.
[I 2025-11-03 14:26:23,891] Trial 27 finished with value: 0.07552056991834256 and
parameters: {'lambda_l1': 0.006725745318555629, 'lambda_l2': 0.00043168640666537415,
'num_leaves': 82, 'feature_fraction': 0.996357695984734, 'bagging_fraction':
0.5462070556096397, 'bagging_freq': 3, 'min_child_samples': 35, 'learning_rate':
0.04755792190777531, 'n_estimators': 400, 'max_depth': 7}. Best is trial 23 with valu
0.07548845367070063.
[I 2025-11-03 14:26:34,214] Trial 28 finished with value: 0.07563850141209352 and
parameters: {'lambda_l1': 0.006505115090075227, 'lambda_l2': 0.000352585427421322,
'num_leaves': 46, 'feature_fraction': 0.9870802717072146, 'bagging_fraction':
0.5445505811729985, 'bagging_freq': 2, 'min_child_samples': 36, 'learning_rate':
0.052868320022819285, 'n_estimators': 300, 'max_depth': 6}. Best is trial 23 with val
0.07548845367070063.
[I 2025-11-03 14:26:48,767] Trial 29 finished with value: 0.07607484815517654 and
parameters: {'lambda_l1': 0.00271295685271292, 'lambda_l2': 0.0016928964175469945,
'num_leaves': 79, 'feature_fraction': 0.9993720068881209, 'bagging_fraction':
0.6132503049984988, 'bagging_freq': 3, 'min_child_samples': 34, 'learning_rate':
0.10429075424074713, 'n_estimators': 400, 'max_depth': 7}. Best is trial 23 with valu
0.07548845367070063.
[I 2025-11-03 14:27:15,616] Trial 30 finished with value: 0.0755468432247069 and
parameters: {'lambda_l1': 0.4157899219950686, 'lambda_l2': 7.811974957265644e-05,
'num_leaves': 145, 'feature_fraction': 0.9430775095102187, 'bagging_fraction':
0.6480171345044423, 'bagging_freq': 2, 'min_child_samples': 22, 'learning_rate':
0.04199121037997762, 'n_estimators': 600, 'max_depth': 7}. Best is trial 23 with valu
0.07548845367070063.
[I 2025-11-03 14:27:30,501] Trial 31 finished with value: 0.07549282477508983 and
parameters: {'lambda_l1': 0.09943902492326746, 'lambda_l2': 0.0004272819948207794,
'num_leaves': 76, 'feature_fraction': 0.8926326374599188, 'bagging_fraction':
0.544563337348706, 'bagging_freq': 3, 'min_child_samples': 22, 'learning_rate':
0.025866089320567207, 'n_estimators': 400, 'max_depth': 9}. Best is trial 23 with val
0.07548845367070063.
[I 2025-11-03 14:27:46,408] Trial 32 finished with value: 0.07550210557136214 and
parameters: {'lambda_l1': 0.09779024135717748, 'lambda_l2': 0.0007333607418499584,
'num_leaves': 77, 'feature_fraction': 0.8789992615217163, 'bagging_fraction':
0.7211344163280717, 'bagging_freq': 3, 'min_child_samples': 33, 'learning_rate':
0.025297917946868597, 'n_estimators': 400, 'max_depth': 11}. Best is trial 23 with va
0.07548845367070063.
[I 2025-11-03 14:27:56,473] Trial 33 finished with value: 0.07560011163986573 and
parameters: {'lambda_l1': 0.03052360335097049, 'lambda_l2': 0.0006411179223458755,
'num_leaves': 117, 'feature_fraction': 0.8898568715143971, 'bagging_fraction':
0.7413999621285952, 'bagging_freq': 3, 'min_child_samples': 42, 'learning_rate':
0.026064469793400147, 'n_estimators': 200, 'max_depth': 11}. Best is trial 23 with va
0.07548845367070063.
[I 2025-11-03 14:28:03,884] Trial 34 finished with value: 0.07550558875996075 and
parameters: {'lambda_l1': 0.3737572671283038, 'lambda_l2': 0.0005847776352377563,
'num_leaves': 54, 'feature_fraction': 0.8740469301877994, 'bagging_fraction':
0.8610982249989142, 'bagging_freq': 1, 'min_child_samples': 33, 'learning_rate':
0.04203635545036391, 'n_estimators': 300, 'max_depth': 11}. Best is trial 23 with val
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0.07548845367070063.
[I 2025-11-03 14:28:10,629] Trial 35 finished with value: 0.07556757196393694 and
parameters: {'lambda_l1': 0.3836668544363003, 'lambda_l2': 0.0011213671814387335,
'num_leaves': 54, 'feature_fraction': 0.7904399328189664, 'bagging_fraction':
0.8561201910248879, 'bagging_freq': 1, 'min_child_samples': 49, 'learning_rate':
0.06600566352447507, 'n_estimators': 300, 'max_depth': 11}. Best is trial 23 with val
0.07548845367070063.
[I 2025-11-03 14:28:14,667] Trial 36 finished with value: 0.07565274044742236 and
parameters: {'lambda_l1': 0.13467873883286732, 'lambda_l2': 0.002530811060994402,
'num_leaves': 41, 'feature_fraction': 0.8833752692554707, 'bagging_fraction':
0.8562080384833151, 'bagging_freq': 1, 'min_child_samples': 32, 'learning_rate':
0.1174120803027837, 'n_estimators': 200, 'max_depth': 11}. Best is trial 23 with valu
0.07548845367070063.
[I 2025-11-03 14:28:39,342] Trial 37 finished with value: 0.07605102704674171 and
parameters: {'lambda_l1': 0.40771204437663533, 'lambda_l2': 7.117707280157995e-05,
'num_leaves': 31, 'feature_fraction': 0.8566567721727218, 'bagging_fraction':
0.9087939488040785, 'bagging_freq': 2, 'min_child_samples': 15, 'learning_rate':
0.007905406327403644, 'n_estimators': 600, 'max_depth': 10}. Best is trial 23 with va
0.07548845367070063.
[I 2025-11-03 14:28:48,196] Trial 38 finished with value: 0.07554888746717293 and
parameters: {'lambda_l1': 0.12834720959889234, 'lambda_l2': 0.0006062933669540828,
'num_leaves': 62, 'feature_fraction': 0.9529295235924757, 'bagging_fraction':
0.742269253395319, 'bagging_freq': 1, 'min_child_samples': 41, 'learning_rate':
0.02396014916151713, 'n_estimators': 300, 'max_depth': 11}. Best is trial 23 with val
0.07548845367070063.
[I 2025-11-03 14:29:14,421] Trial 39 finished with value: 0.07554076387530032 and
parameters: {'lambda_l1': 0.6375742168965346, 'lambda_l2': 0.013797963758563623,
'num_leaves': 79, 'feature_fraction': 0.8149109361636308, 'bagging_fraction':
0.827647258894759, 'bagging_freq': 5, 'min_child_samples': 65, 'learning_rate':
0.039211091406691385, 'n_estimators': 700, 'max_depth': 9}. Best is trial 23 with val
0.07548845367070063.
[I 2025-11-03 14:29:27,829] Trial 40 finished with value: 0.07560400942673944 and
parameters: {'lambda_l1': 0.035792067599535515, 'lambda_l2': 1.8170538261766346e-05,
'num_leaves': 58, 'feature_fraction': 0.8933560808144438, 'bagging_fraction':
0.7273491687325385, 'bagging_freq': 2, 'min_child_samples': 56, 'learning_rate':
0.08091551021410229, 'n_estimators': 400, 'max_depth': 10}. Best is trial 23 with val
0.07548845367070063.
[I 2025-11-03 14:29:41,375] Trial 41 finished with value: 0.07559124134247674 and
parameters: {'lambda_l1': 0.0029016959432785912, 'lambda_l2': 0.00048411874327286086,
'num_leaves': 81, 'feature_fraction': 0.769285247840745, 'bagging_fraction':
0.6617141383094863, 'bagging_freq': 3, 'min_child_samples': 32, 'learning_rate':
0.04786703143928269, 'n_estimators': 400, 'max_depth': 6}. Best is trial 23 with valu
0.07548845367070063.
[I 2025-11-03 14:29:52,655] Trial 42 finished with value: 0.07594349104783273 and
parameters: {'lambda_l1': 1.1709743168348864e-05, 'lambda_l2': 0.00034528842577974975
'num_leaves': 113, 'feature_fraction': 0.8746535054002714, 'bagging_fraction':
0.8931497035096367, 'bagging_freq': 2, 'min_child_samples': 38, 'learning_rate':
0.030346479655384763, 'n_estimators': 300, 'max_depth': 5}. Best is trial 23 with val
0.07548845367070063.
[I 2025-11-03 14:30:09,488] Trial 43 finished with value: 0.07545386340332606 and
parameters: {'lambda_l1': 0.009382640776547848, 'lambda_l2': 0.0009080044570701241,
'num_leaves': 89, 'feature_fraction': 0.9438776835510316, 'bagging_fraction':
0.781215020524987, 'bagging_freq': 3, 'min_child_samples': 44, 'learning_rate':
0.04261030767054911, 'n_estimators': 400, 'max_depth': 8}. Best is trial 43 with valu
0.07545386340332606.
[I 2025-11-03 14:30:15,906] Trial 44 finished with value: 0.0756284738251196 and
parameters: {'lambda_l1': 0.01207505251535478, 'lambda_l2': 0.0023365075561008353,
'num_leaves': 35, 'feature_fraction': 0.9438730711334968, 'bagging_fraction':
0.7987050534564352, 'bagging_freq': 4, 'min_child_samples': 45, 'learning_rate':
0.06486007757796187, 'n_estimators': 200, 'max_depth': 8}. Best is trial 43 with valu
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0.07545386340332606.
[I 2025-11-03 14:30:28,452] Trial 45 finished with value: 0.07548003188658775 and
parameters: {'lambda_l1': 0.2592397037215248, 'lambda_l2': 0.0008822414560678014,
'num_leaves': 91, 'feature_fraction': 0.8631204364601485, 'bagging_fraction':
0.8333008055477219, 'bagging_freq': 5, 'min_child_samples': 51, 'learning_rate':
0.03802326000191307, 'n_estimators': 300, 'max_depth': 9}. Best is trial 43 with valu
0.07545386340332606.
[I 2025-11-03 14:30:48,253] Trial 46 finished with value: 0.07548570608727541 and
parameters: {'lambda_l1': 0.0003603593145827118, 'lambda_l2': 0.000986179260728049,
'num_leaves': 137, 'feature_fraction': 0.8105338239737314, 'bagging_fraction':
0.7576703756552731, 'bagging_freq': 5, 'min_child_samples': 51, 'learning_rate':
0.021931046397219055, 'n_estimators': 400, 'max_depth': 9}. Best is trial 43 with val
0.07545386340332606.
[I 2025-11-03 14:31:19,576] Trial 47 finished with value: 0.07543250199738716 and
parameters: {'lambda_l1': 0.00015016316024129208, 'lambda_l2': 0.0012584773748234575,
'num_leaves': 143, 'feature_fraction': 0.8068263185126854, 'bagging_fraction':
0.7673499061083993, 'bagging_freq': 5, 'min_child_samples': 77, 'learning_rate':
0.020656940661433514, 'n_estimators': 600, 'max_depth': 9}. Best is trial 47 with val
0.07543250199738716.
[I 2025-11-03 14:31:53,539] Trial 48 finished with value: 0.07541936418307367 and
parameters: {'lambda_l1': 0.00021899920084396992, 'lambda_l2': 0.0011764345552694678,
'num_leaves': 145, 'feature_fraction': 0.7968252487484175, 'bagging_fraction':
0.7714890453920968, 'bagging_freq': 5, 'min_child_samples': 74, 'learning_rate':
0.019727718064723083, 'n_estimators': 700, 'max_depth': 8}. Best is trial 48 with val
0.07541936418307367.
[I 2025-11-03 14:32:38,083] Trial 49 finished with value: 0.075413002852022 and paran
{'lambda_l1': 0.00022250820834684464, 'lambda_l2': 0.0014066796133645368, 'num_leaves
182, 'feature_fraction': 0.7572308258411609, 'bagging_fraction': 0.7673719688244668,
'bagging_freq': 5, 'min_child_samples': 76, 'learning_rate': 0.016676973779995108,
'n_estimators': 900, 'max_depth': 8}. Best is trial 49 with value: 0.075413002852022.
[I 2025-11-03 14:33:25,603] Trial 50 finished with value: 0.07547480587409261 and
parameters: {'lambda_l1': 0.00022123757850480257, 'lambda_l2': 0.018103339223926037,
'num_leaves': 175, 'feature_fraction': 0.7460816830399768, 'bagging_fraction':
0.7752183228086947, 'bagging_freq': 6, 'min_child_samples': 79, 'learning_rate':
0.008721637194173043, 'n_estimators': 900, 'max_depth': 8}. Best is trial 49 with val
0.075413002852022.
[I 2025-11-03 14:34:17,086] Trial 51 finished with value: 0.075431689265512 and paran
{'lambda_l1': 0.00010348878997918527, 'lambda_l2': 0.0036995937844412356, 'num_leaves
178, 'feature_fraction': 0.7590037787826841, 'bagging_fraction': 0.7736466974867239,
'bagging_freq': 6, 'min_child_samples': 78, 'learning_rate': 0.009532223272349018,
'n_estimators': 1000, 'max_depth': 8}. Best is trial 49 with value: 0.075413002852022
[I 2025-11-03 14:35:04,202] Trial 52 finished with value: 0.07545381477278243 and
parameters: {'lambda_l1': 9.458363732747705e-05, 'lambda_l2': 0.01520275222432748,
'num_leaves': 179, 'feature_fraction': 0.7006874604068125, 'bagging_fraction':
0.7757212047341429, 'bagging_freq': 6, 'min_child_samples': 78, 'learning_rate':
0.009513841837407678, 'n_estimators': 900, 'max_depth': 8}. Best is trial 49 with val
0.075413002852022.
[I 2025-11-03 14:35:48,001] Trial 53 finished with value: 0.07550441299080698 and
parameters: {'lambda_l1': 9.020099759358747e-05, 'lambda_l2': 0.004101578979819361,
'num_leaves': 205, 'feature_fraction': 0.6906356342974662, 'bagging_fraction':
0.7865766071262896, 'bagging_freq': 6, 'min_child_samples': 78, 'learning_rate':
0.010197692740007636, 'n_estimators': 1000, 'max_depth': 7}. Best is trial 49 with va
0.075413002852022.
[I 2025-11-03 14:36:33,792] Trial 54 finished with value: 0.07540746412592288 and
parameters: {'lambda_l1': 4.789679014464514e-05, 'lambda_l2': 0.0435500702579506,
'num_leaves': 183, 'feature_fraction': 0.7223489275341595, 'bagging_fraction':
0.8054818952861873, 'bagging_freq': 5, 'min_child_samples': 85, 'learning_rate':
0.016086911077671535, 'n_estimators': 900, 'max_depth': 8}. Best is trial 54 with val
0.07540746412592288.
[I 2025-11-03 14:37:19,424] Trial 55 finished with value: 0.07540261103623838 and
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parameters: {'lambda_l1': 7.032101722650669e-05, 'lambda_l2': 0.03949524129305935,
'num_leaves': 185, 'feature_fraction': 0.7647362045528421, 'bagging_fraction':
0.8117756765263789, 'bagging_freq': 5, 'min_child_samples': 88, 'learning_rate':
0.015387168317627374, 'n_estimators': 900, 'max_depth': 8}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 14:37:57,563] Trial 56 finished with value: 0.07542881340804437 and
parameters: {'lambda_l1': 3.761245024595124e-05, 'lambda_l2': 0.07445512211960643,
'num_leaves': 201, 'feature_fraction': 0.7621877033186194, 'bagging_fraction':
0.8092213231526763, 'bagging_freq': 5, 'min_child_samples': 85, 'learning_rate':
0.016975126946986063, 'n_estimators': 900, 'max_depth': 7}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 14:38:35,755] Trial 57 finished with value: 0.07543037935084392 and
parameters: {'lambda_l1': 3.9277768939370914e-05, 'lambda_l2': 0.06253172556766949,
'num_leaves': 202, 'feature_fraction': 0.7719032427072329, 'bagging_fraction':
0.8084269876449429, 'bagging_freq': 5, 'min_child_samples': 88, 'learning_rate':
0.017253305712187337, 'n_estimators': 900, 'max_depth': 7}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 14:39:08,038] Trial 58 finished with value: 0.07562584050490682 and
parameters: {'lambda_l1': 4.644545758566972e-05, 'lambda_l2': 0.07113923418857074,
'num_leaves': 209, 'feature_fraction': 0.7318620458142134, 'bagging_fraction':
0.8057237199052971, 'bagging_freq': 5, 'min_child_samples': 87, 'learning_rate':
0.015268657063665307, 'n_estimators': 900, 'max_depth': 6}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 14:39:32,222] Trial 59 finished with value: 0.07587956670338515 and
parameters: {'lambda_l1': 1.995641202594751e-05, 'lambda_l2': 0.041540187458069956,
'num_leaves': 220, 'feature_fraction': 0.7819653760801112, 'bagging_fraction':
0.8791784696552479, 'bagging_freq': 5, 'min_child_samples': 83, 'learning_rate':
0.01728327727494048, 'n_estimators': 800, 'max_depth': 5}. Best is trial 55 with valu
0.07540261103623838.
[I 2025-11-03 14:40:08,069] Trial 60 finished with value: 0.07551920589501823 and
parameters: {'lambda_l1': 5.230373466120858e-05, 'lambda_l2': 0.1536631201020216,
'num_leaves': 199, 'feature_fraction': 0.7224847611525759, 'bagging_fraction':
0.8124300186162988, 'bagging_freq': 5, 'min_child_samples': 93, 'learning_rate':
0.011968645090039235, 'n_estimators': 800, 'max_depth': 7}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 14:40:50,808] Trial 61 finished with value: 0.07546599177878552 and
parameters: {'lambda_l1': 2.858858565492111e-05, 'lambda_l2': 0.09938367939599571,
'num_leaves': 191, 'feature_fraction': 0.767032517634193, 'bagging_fraction':
0.8365049226568687, 'bagging_freq': 6, 'min_child_samples': 72, 'learning_rate':
0.014226085613903454, 'n_estimators': 1000, 'max_depth': 7}. Best is trial 55 with va
0.07540261103623838.
[I 2025-11-03 14:41:39,900] Trial 62 finished with value: 0.0755497049595676 and
parameters: {'lambda_l1': 0.00044581140844994894, 'lambda_l2': 0.024439601869314303,
'num_leaves': 156, 'feature_fraction': 0.7594523787281963, 'bagging_fraction':
0.8167974976899752, 'bagging_freq': 5, 'min_child_samples': 84, 'learning_rate':
0.006511323567271655, 'n_estimators': 900, 'max_depth': 8}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 14:42:20,249] Trial 63 finished with value: 0.07553216741405121 and
parameters: {'lambda_l1': 0.0010122717288778122, 'lambda_l2': 0.06300738696753366,
'num_leaves': 240, 'feature_fraction': 0.6821372712703546, 'bagging_fraction':
0.7536046025851503, 'bagging_freq': 4, 'min_child_samples': 100, 'learning_rate':
0.011311687939875555, 'n_estimators': 900, 'max_depth': 7}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 14:43:08,907] Trial 64 finished with value: 0.07543610811327131 and
parameters: {'lambda_l1': 8.504744268406878e-05, 'lambda_l2': 0.030432252707717232,
'num_leaves': 168, 'feature_fraction': 0.7532186185678004, 'bagging_fraction':
0.7926612743738075, 'bagging_freq': 5, 'min_child_samples': 91, 'learning_rate':
0.01826773764674273, 'n_estimators': 1000, 'max_depth': 8}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 14:43:47,422] Trial 65 finished with value: 0.07544392184138969 and
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parameters: {'lambda_l1': 2.2722971421406958e-05, 'lambda_l2': 0.08390110938442762,
'num_leaves': 224, 'feature_fraction': 0.7105176826098064, 'bagging_fraction':
0.840960033200879, 'bagging_freq': 7, 'min_child_samples': 74, 'learning_rate':
0.015397657855369009, 'n_estimators': 900, 'max_depth': 7}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 14:44:12,224] Trial 66 finished with value: 0.0760094123843511 and
parameters: {'lambda_l1': 0.0001813907527630261, 'lambda_l2': 0.00824423586696267,
'num_leaves': 256, 'feature_fraction': 0.7930067756520593, 'bagging_fraction':
0.7166784451756113, 'bagging_freq': 6, 'min_child_samples': 65, 'learning_rate':
0.006920930924138049, 'n_estimators': 700, 'max_depth': 6}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 14:45:02,872] Trial 67 finished with value: 0.07542605877053245 and
parameters: {'lambda_l1': 6.873125439835006e-05, 'lambda_l2': 0.23443662782074268,
'num_leaves': 186, 'feature_fraction': 0.736890712131298, 'bagging_fraction':
0.9379503828592607, 'bagging_freq': 5, 'min_child_samples': 82, 'learning_rate':
0.020138267165819547, 'n_estimators': 1000, 'max_depth': 8}. Best is trial 55 with va
0.07540261103623838.
[I 2025-11-03 14:45:44,249] Trial 68 finished with value: 0.07542837549282917 and
parameters: {'lambda_l1': 5.187487409605755e-05, 'lambda_l2': 0.35823523647842326,
'num_leaves': 188, 'feature_fraction': 0.8353405642574245, 'bagging_fraction':
0.9499197596185057, 'bagging_freq': 5, 'min_child_samples': 84, 'learning_rate':
0.020560194997589813, 'n_estimators': 800, 'max_depth': 8}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 14:46:25,449] Trial 69 finished with value: 0.07545466354823774 and
parameters: {'lambda_l1': 1.2902322276076398e-05, 'lambda_l2': 0.39546009267367904,
'num_leaves': 188, 'feature_fraction': 0.6613795506203708, 'bagging_fraction':
0.9855434071796667, 'bagging_freq': 4, 'min_child_samples': 82, 'learning_rate':
0.029809463877077492, 'n_estimators': 800, 'max_depth': 8}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 14:47:04,241] Trial 70 finished with value: 0.07546524491788158 and
parameters: {'lambda_l1': 6.199850160974303e-05, 'lambda_l2': 0.25913899894703013,
'num_leaves': 213, 'feature_fraction': 0.829050673668377, 'bagging_fraction':
0.9529382730550713, 'bagging_freq': 5, 'min_child_samples': 85, 'learning_rate':
0.013637534853431263, 'n_estimators': 700, 'max_depth': 8}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 14:47:39,624] Trial 71 finished with value: 0.07547862808756406 and
parameters: {'lambda_l1': 3.245692896834855e-05, 'lambda_l2': 0.17302731375351643,
'num_leaves': 197, 'feature_fraction': 0.7360228740574374, 'bagging_fraction':
0.9565792898723682, 'bagging_freq': 5, 'min_child_samples': 89, 'learning_rate':
0.020049397077560257, 'n_estimators': 800, 'max_depth': 7}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 14:48:26,859] Trial 72 finished with value: 0.07543061258436164 and
parameters: {'lambda_l1': 6.163352802408631e-05, 'lambda_l2': 0.11553124841848476,
'num_leaves': 185, 'feature_fraction': 0.7815760846409509, 'bagging_fraction':
0.9042826127367982, 'bagging_freq': 4, 'min_child_samples': 68, 'learning_rate':
0.018192417187997 99, 'n_estimators': 900, 'max_depth': 8}. Best is trial 55 with valu
0.07540261103623838.
[I 2025-11-03 14:49:10,736] Trial 73 finished with value: 0.07545772080164423 and
parameters: {'lambda_l1': 4.24826266805636e-05, 'lambda_l2': 0.6696830101487696,
'num_leaves': 167, 'feature_fraction': 0.8376483479292088, 'bagging_fraction':
0.9219059227670786, 'bagging_freq': 5, 'min_child_samples': 96, 'learning_rate':
0.015428970079781942, 'n_estimators': 1000, 'max_depth': 7}. Best is trial 55 with va
0.07540261103623838.
[I 2025-11-03 14:49:43,823] Trial 74 finished with value: 0.0755970968557631 and
parameters: {'lambda_l1': 1.749442642510407e-05, 'lambda_l2': 0.0427045588395629,
'num_leaves': 200, 'feature_fraction': 0.7920323055975589, 'bagging_fraction':
0.9966300233558759, 'bagging_freq': 5, 'min_child_samples': 75, 'learning_rate':
0.02182453938868321, 'n_estimators': 900, 'max_depth': 6}. Best is trial 55 with valu
0.07540261103623838.
[I 2025-11-03 14:50:21,867] Trial 75 finished with value: 0.08042172842175653 and
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parameters: {'lambda_l1': 0.00025414171447734, 'lambda_l2': 0.22854588117567418,
'num_leaves': 158, 'feature_fraction': 0.7272563630406061, 'bagging_fraction':
0.9281834976606174, 'bagging_freq': 5, 'min_child_samples': 81, 'learning_rate':
0.2929333950974092, 'n_estimators': 800, 'max_depth': 8}. Best is trial 55 with value
0.07540261103623838.
[I 2025-11-03 14:51:01,181] Trial 76 finished with value: 0.07549231993779991 and
parameters: {'lambda_l1': 0.00012260388730149778, 'lambda_l2': 0.34451879569492466,
'num_leaves': 213, 'feature_fraction': 0.7450104055818069, 'bagging_fraction':
0.8709106122510424, 'bagging_freq': 5, 'min_child_samples': 86, 'learning_rate':
0.016720721187292314, 'n_estimators': 900, 'max_depth': 7}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 14:51:39,951] Trial 77 finished with value: 0.0754720211340838 and
parameters: {'lambda_l1': 7.320152467977072e-05, 'lambda_l2': 0.5443038451209807,
'num_leaves': 183, 'feature_fraction': 0.7986628575892949, 'bagging_fraction':
0.735307380494982, 'bagging_freq': 4, 'min_child_samples': 91, 'learning_rate':
0.029052706773761695, 'n_estimators': 800, 'max_depth': 8}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 14:52:41,843] Trial 78 finished with value: 0.07543298750624443 and
parameters: {'lambda_l1': 0.0005623353846800191, 'lambda_l2': 0.05129588563282065,
'num_leaves': 191, 'feature_fraction': 0.714071177232145, 'bagging_fraction':
0.9704620768484317, 'bagging_freq': 4, 'min_child_samples': 89, 'learning_rate':
0.011132873891873953, 'n_estimators': 1000, 'max_depth': 9}. Best is trial 55 with va
0.07540261103623838.
[I 2025-11-03 14:53:21,448] Trial 79 finished with value: 0.0754622395725772 and
parameters: {'lambda_l1': 3.0478752694862525e-05, 'lambda_l2': 0.03142490927688453,
'num_leaves': 173, 'feature_fraction': 0.8201637953578658, 'bagging_fraction':
0.8203793032782941, 'bagging_freq': 5, 'min_child_samples': 94, 'learning_rate':
0.013455752357977038, 'n_estimators': 900, 'max_depth': 7}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 14:53:49,140] Trial 80 finished with value: 0.07558394096330752 and
parameters: {'lambda_l1': 0.00014752486548249156, 'lambda_l2': 0.7926355897932809,
'num_leaves': 231, 'feature_fraction': 0.7689026019143032, 'bagging_fraction':
0.8444387982612829, 'bagging_freq': 6, 'min_child_samples': 81, 'learning_rate':
0.020222042230136038, 'n_estimators': 800, 'max_depth': 6}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 14:54:35,781] Trial 81 finished with value: 0.0754408835444656 and
parameters: {'lambda_l1': 5.736115573903177e-05, 'lambda_l2': 0.10924591708006513,
'num_leaves': 151, 'feature_fraction': 0.779823925097271, 'bagging_fraction':
0.8963681800944421, 'bagging_freq': 4, 'min_child_samples': 65, 'learning_rate':
0.01848184929470723, 'n_estimators': 900, 'max_depth': 8}. Best is trial 55 with valu
0.07540261103623838.
[I 2025-11-03 14:55:23,281] Trial 82 finished with value: 0.07543217550494975 and
parameters: {'lambda_l1': 3.94486083606405e-05, 'lambda_l2': 0.12892581357566846,
'num_leaves': 185, 'feature_fraction': 0.7768941861355767, 'bagging_fraction':
0.9375102170458454, 'bagging_freq': 5, 'min_child_samples': 70, 'learning_rate':
0.016585427001092518, 'n_estimators': 900, 'max_depth': 8}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 14:56:19,076] Trial 83 finished with value: 0.07548391399987604 and
parameters: {'lambda_l1': 6.85978387125613e-05, 'lambda_l2': 0.18339166914379576,
'num_leaves': 196, 'feature_fraction': 0.7445318353275182, 'bagging_fraction':
0.8050852306212194, 'bagging_freq': 5, 'min_child_samples': 68, 'learning_rate':
0.022699081405926275, 'n_estimators': 1000, 'max_depth': 9}. Best is trial 55 with va
0.07540261103623838.
[I 2025-11-03 14:57:06,034] Trial 84 finished with value: 0.07543942169618101 and
parameters: {'lambda_l1': 2.16435656063046e-05, 'lambda_l2': 0.0015975673829118093,
'num_leaves': 165, 'feature_fraction': 0.8442664055036927, 'bagging_fraction':
0.9165861136757653, 'bagging_freq': 4, 'min_child_samples': 73, 'learning_rate':
0.019165929746559375, 'n_estimators': 900, 'max_depth': 8}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 14:57:39,195] Trial 85 finished with value: 0.07551268903490116 and
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parameters: {'lambda_l1': 1.5508552811740196e-05, 'lambda_l2': 0.06650898963773012,
'num_leaves': 182, 'feature_fraction': 0.8038215819405249, 'bagging_fraction':
0.9602553181464946, 'bagging_freq': 4, 'min_child_samples': 75, 'learning_rate':
0.014814598030042033, 'n_estimators': 700, 'max_depth': 7}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 14:58:33,232] Trial 86 finished with value: 0.07567286216333532 and
parameters: {'lambda_l1': 0.0001856694150156836, 'lambda_l2': 0.4820295538285944,
'num_leaves': 173, 'feature_fraction': 0.6974766101309395, 'bagging_fraction':
0.941336407386655, 'bagging_freq': 5, 'min_child_samples': 68, 'learning_rate':
0.035166605101102914, 'n_estimators': 1000, 'max_depth': 9}. Best is trial 55 with va
0.07540261103623838.
[I 2025-11-03 14:59:15,234] Trial 87 finished with value: 0.07553827492958651 and
parameters: {'lambda_l1': 0.00033211698874176666, 'lambda_l2': 0.08960567689189466,
'num_leaves': 205, 'feature_fraction': 0.7564231121928493, 'bagging_fraction':
0.6991262730772784, 'bagging_freq': 6, 'min_child_samples': 84, 'learning_rate':
0.028277252833386987, 'n_estimators': 900, 'max_depth': 8}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 14:59:59,309] Trial 88 finished with value: 0.0754408767179509 and
parameters: {'lambda_l1': 0.00011667177806016119, 'lambda_l2': 0.13204295424805093,
'num_leaves': 222, 'feature_fraction': 0.7885300430912123, 'bagging_fraction':
0.8859081316868006, 'bagging_freq': 5, 'min_child_samples': 60, 'learning_rate':
0.012570930080948268, 'n_estimators': 800, 'max_depth': 8}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 15:00:29,082] Trial 89 finished with value: 0.07543891019410201 and
parameters: {'lambda_l1': 2.688048255423714e-05, 'lambda_l2': 0.31178905042370314,
'num_leaves': 193, 'feature_fraction': 0.8200770871437848, 'bagging_fraction':
0.8248262792414679, 'bagging_freq': 5, 'min_child_samples': 91, 'learning_rate':
0.023016197982975 81, 'n_estimators': 700, 'max_depth': 7}. Best is trial 55 with valu
0.07540261103623838.
[I 2025-11-03 15:01:22,778] Trial 90 finished with value: 0.07543864020638741 and
parameters: {'lambda_l1': 0.0017535542467160357, 'lambda_l2': 0.02143905953808668,
'num_leaves': 207, 'feature_fraction': 0.7674106380780792, 'bagging_fraction':
0.9036427569962484, 'bagging_freq': 4, 'min_child_samples': 87, 'learning_rate':
0.017457431664550924, 'n_estimators': 900, 'max_depth': 9}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 15:02:14,912] Trial 91 finished with value: 0.07543762019544548 and
parameters: {'lambda_l1': 4.792957464309901e-05, 'lambda_l2': 0.0026395098373553066,
'num_leaves': 178, 'feature_fraction': 0.7610497509063735, 'bagging_fraction':
0.767051091787427, 'bagging_freq': 6, 'min_child_samples': 80, 'learning_rate':
0.009159729421844976, 'n_estimators': 1000, 'max_depth': 8}. Best is trial 55 with va
0.07540261103623838.
[I 2025-11-03 15:03:06,432] Trial 92 finished with value: 0.075433624645174 and paran
{'lambda_l1': 0.00010587780618466757, 'lambda_l2': 0.05239104646953965, 'num_leaves':
'feature_fraction': 0.7305994306874726, 'bagging_fraction': 0.7912382856339293,
'bagging_freq': 7, 'min_child_samples': 78, 'learning_rate': 0.010843024693674009,
'n_estimators': 1000, 'max_depth': 8}. Best is trial 55 with value: 0.075402611036238
[I 2025-11-03 15:03:53,469] Trial 93 finished with value: 0.0755316800067435 and
parameters: {'lambda_l1': 3.830324084844929e-05, 'lambda_l2': 0.001836062095470539,
'num_leaves': 162, 'feature_fraction': 0.7783423861769592, 'bagging_fraction':
0.7510248782589236, 'bagging_freq': 6, 'min_child_samples': 76, 'learning_rate':
0.026986073555873385, 'n_estimators': 1000, 'max_depth': 8}. Best is trial 55 with va
0.07540261103623838.
[I 2025-11-03 15:04:36,070] Trial 94 finished with value: 0.07541802370360184 and
parameters: {'lambda_l1': 7.588883978779169e-05, 'lambda_l2': 0.011270592963385733,
'num_leaves': 216, 'feature_fraction': 0.7508859146688103, 'bagging_fraction':
0.8003789121186221, 'bagging_freq': 5, 'min_child_samples': 83, 'learning_rate':
0.01610922298217041, 'n_estimators': 1000, 'max_depth': 7}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 15:05:15,126] Trial 95 finished with value: 0.07545079772648643 and
parameters: {'lambda_l1': 7.134801152921063e-05, 'lambda_l2': 0.004959920331794821,
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'num_leaves': 217, 'feature_fraction': 0.7212223531320928, 'bagging_fraction':
0.8012159102387506, 'bagging_freq': 5, 'min_child_samples': 89, 'learning_rate':
0.015815980211079852, 'n_estimators': 900, 'max_depth': 7}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 15:05:53,814] Trial 96 finished with value: 0.07547288495778658 and
parameters: {'lambda_l1': 0.00019201620538691994, 'lambda_l2': 0.03460697855979364,
'num_leaves': 202, 'feature_fraction': 0.737989801614585, 'bagging_fraction':
0.8682546630133804, 'bagging_freq': 5, 'min_child_samples': 97, 'learning_rate':
0.019201734737318347, 'n_estimators': 900, 'max_depth': 7}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 15:06:15,844] Trial 97 finished with value: 0.07639812393792955 and
parameters: {'lambda_l1': 5.840719382252488e-05, 'lambda_l2': 0.01101068297974837,
'num_leaves': 227, 'feature_fraction': 0.6811653241091804, 'bagging_fraction':
0.7602843457022184, 'bagging_freq': 5, 'min_child_samples': 83, 'learning_rate':
0.013992644824415866, 'n_estimators': 900, 'max_depth': 4}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 15:06:52,155] Trial 98 finished with value: 0.07550164136388207 and
parameters: {'lambda_l1': 1.0081053938713522e-05, 'lambda_l2': 0.010567595533699964,
'num_leaves': 128, 'feature_fraction': 0.8020814536048385, 'bagging_fraction':
0.8500633176196002, 'bagging_freq': 5, 'min_child_samples': 86, 'learning_rate':
0.01215859043298298, 'n_estimators': 800, 'max_depth': 7}. Best is trial 55 with valu
0.07540261103623838.
[I 2025-11-03 15:07:41,873] Trial 99 finished with value: 0.0754390195966747 and
parameters: {'lambda_l1': 0.00013614273421216186, 'lambda_l2': 0.23809729568084764,
'num_leaves': 211, 'feature_fraction': 0.7481314667773243, 'bagging_fraction':
0.8107115508194224, 'bagging_freq': 5, 'min_child_samples': 80, 'learning_rate':
0.020877239757136696, 'n_estimators': 1000, 'max_depth': 8}. Best is trial 55 with va
0.07540261103623838.
[I 2025-11-03 15:08:22,860] Trial 100 finished with value: 0.07540730381977268 and
parameters: {'lambda_l1': 2.5833725472542366e-05, 'lambda_l2': 0.07616836324647253,
'num_leaves': 195, 'feature_fraction': 0.7123565391053156, 'bagging_fraction':
0.7874065275632292, 'bagging_freq': 5, 'min_child_samples': 82, 'learning_rate':
0.017393996475576767, 'n_estimators': 800, 'max_depth': 8}. Best is trial 55 with val
0.07540261103623838.
[I 2025-11-03 15:09:03,757] Trial 101 finished with value: 0.07540077829294446 and
parameters: {'lambda_l1': 8.300887229492018e-05, 'lambda_l2': 0.07804378200106936,
'num_leaves': 201, 'feature_fraction': 0.7113282245222258, 'bagging_fraction':
0.7843731251398333, 'bagging_freq': 5, 'min_child_samples': 82, 'learning_rate':
0.01735715987394651, 'n_estimators': 800, 'max_depth': 8}. Best is trial 101 with val
0.07540077829294446.
[I 2025-11-03 15:09:43,806] Trial 102 finished with value: 0.07543907836378397 and
parameters: {'lambda_l1': 3.673476586321362e-05, 'lambda_l2': 0.07321412455130429,
'num_leaves': 237, 'feature_fraction': 0.666203080977426, 'bagging_fraction':
0.7872781183784281, 'bagging_freq': 5, 'min_child_samples': 82, 'learning_rate':
0.023386495395671614, 'n_estimators': 800, 'max_depth': 8}. Best is trial 101 with va
0.07540077829294446.
[I 2025-11-03 15:10:18,335] Trial 103 finished with value: 0.07544804566705357 and
parameters: {'lambda_l1': 2.562207585120187e-05, 'lambda_l2': 0.05200449150111586,
'num_leaves': 194, 'feature_fraction': 0.7099347341176364, 'bagging_fraction':
0.7794638943020052, 'bagging_freq': 5, 'min_child_samples': 85, 'learning_rate':
0.016627944357209563, 'n_estimators': 800, 'max_depth': 7}. Best is trial 101 with va
0.07540077829294446.
[I 2025-11-03 15:10:55,925] Trial 104 finished with value: 0.07545110506573202 and
parameters: {'lambda_l1': 1.605216315546361e-05, 'lambda_l2': 0.024375824466640904,
'num_leaves': 200, 'feature_fraction': 0.695961415150639, 'bagging_fraction':
0.8328517717108579, 'bagging_freq': 5, 'min_child_samples': 88, 'learning_rate':
0.01451410345711558, 'n_estimators': 700, 'max_depth': 8}. Best is trial 101 with val
0.07540077829294446.
[I 2025-11-03 15:11:37,458] Trial 105 finished with value: 0.07541273690272682 and
parameters: {'lambda_l1': 9.311948158247687e-05, 'lambda_l2': 0.03752268841837053,
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'num_leaves': 215, 'feature_fraction': 0.7167266368858378, 'bagging_fraction':
0.7445409392982086, 'bagging_freq': 5, 'min_child_samples': 92, 'learning_rate':
0.013296226429296005, 'n_estimators': 700, 'max_depth': 9}. Best is trial 101 with va
0.07540077829294446.
[I 2025-11-03 15:12:22,488] Trial 106 finished with value: 0.07541542198687327 and
parameters: {'lambda_l1': 9.604119916670557e-05, 'lambda_l2': 0.01822987733355947,
'num_leaves': 218, 'feature_fraction': 0.7159139411293632, 'bagging_fraction':
0.7434291629284664, 'bagging_freq': 5, 'min_child_samples': 93, 'learning_rate':
0.013007118264081938, 'n_estimators': 700, 'max_depth': 10}. Best is trial 101 with v
0.07540077829294446.
[I 2025-11-03 15:13:07,225] Trial 107 finished with value: 0.07542664819073719 and
parameters: {'lambda_l1': 8.725898134659011e-05, 'lambda_l2': 0.01709194050497872,
'num_leaves': 218, 'feature_fraction': 0.6864323717086926, 'bagging_fraction':
0.7431546854246266, 'bagging_freq': 5, 'min_child_samples': 93, 'learning_rate':
0.013172547369087635, 'n_estimators': 700, 'max_depth': 10}. Best is trial 101 with v
0.07540077829294446.
[I 2025-11-03 15:13:52,973] Trial 108 finished with value: 0.07556952640995743 and
parameters: {'lambda_l1': 8.513158325055836e-05, 'lambda_l2': 0.015573791112423593,
'num_leaves': 217, 'feature_fraction': 0.6400356126547254, 'bagging_fraction':
0.7300111593067443, 'bagging_freq': 5, 'min_child_samples': 100, 'learning_rate':
0.008293975669005641, 'n_estimators': 700, 'max_depth': 10}. Best is trial 101 with v
0.07540077829294446.
[I 2025-11-03 15:14:32,268] Trial 109 finished with value: 0.0754327134380824 and
parameters: {'lambda_l1': 0.00022065081357553991, 'lambda_l2': 0.019943793865921062,
'num_leaves': 235, 'feature_fraction': 0.6801667021256089, 'bagging_fraction':
0.7420126207951947, 'bagging_freq': 5, 'min_child_samples': 94, 'learning_rate':
0.012954642840996919, 'n_estimators': 600, 'max_depth': 10}. Best is trial 101 with v
0.07540077829294446.
[I 2025-11-03 15:15:18,591] Trial 110 finished with value: 0.07544372449801592 and
parameters: {'lambda_l1': 0.00029439584621548985, 'lambda_l2': 0.03503630436853077,
'num_leaves': 247, 'feature_fraction': 0.6531873175690849, 'bagging_fraction':
0.7230850217430473, 'bagging_freq': 6, 'min_child_samples': 92, 'learning_rate':
0.011629427288749316, 'n_estimators': 700, 'max_depth': 10}. Best is trial 101 with v
0.07540077829294446.
[I 2025-11-03 15:15:57,802] Trial 111 finished with value: 0.07543371822411495 and
parameters: {'lambda_l1': 0.00015882834086922585, 'lambda_l2': 0.00855619003753843,
'num_leaves': 228, 'feature_fraction': 0.7077982621568232, 'bagging_fraction':
0.7679954427994993, 'bagging_freq': 5, 'min_child_samples': 97, 'learning_rate':
0.013082616542122455, 'n_estimators': 600, 'max_depth': 10}. Best is trial 101 with v
0.07540077829294446.
[I 2025-11-03 15:16:38,373] Trial 112 finished with value: 0.07542924167093416 and
parameters: {'lambda_l1': 8.100281006794444e-05, 'lambda_l2': 0.02588019033920669,
'num_leaves': 214, 'feature_fraction': 0.7206649085848043, 'bagging_fraction':
0.7114947515907603, 'bagging_freq': 5, 'min_child_samples': 95, 'learning_rate':
0.015130383793063433, 'n_estimators': 700, 'max_depth': 9}. Best is trial 101 with va
0.07540077829294446.
[I 2025-11-03 15:17:20,914] Trial 113 finished with value: 0.07544416667074383 and
parameters: {'lambda_l1': 0.00011554694588228631, 'lambda_l2': 0.014037588514635628,
'num_leaves': 219, 'feature_fraction': 0.6874201366754086, 'bagging_fraction':
0.7452448134457083, 'bagging_freq': 5, 'min_child_samples': 90, 'learning_rate':
0.01085955708268409, 'n_estimators': 700, 'max_depth': 9}. Best is trial 101 with val
0.07540077829294446.
[I 2025-11-03 15:18:04,633] Trial 114 finished with value: 0.07554864866899721 and
parameters: {'lambda_l1': 4.96417162339142e-05, 'lambda_l2': 0.038200383939633625,
'num_leaves': 207, 'feature_fraction': 0.5754252573195127, 'bagging_fraction':
0.7564449390603509, 'bagging_freq': 5, 'min_child_samples': 82, 'learning_rate':
0.010275325914285934, 'n_estimators': 700, 'max_depth': 9}. Best is trial 101 with va
0.07540077829294446.
[I 2025-11-03 15:18:53,991] Trial 115 finished with value: 0.07548582168808593 and
parameters: {'lambda_l1': 0.0003938050329394732, 'lambda_l2': 0.005551170152643982,
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'num_leaves': 224, 'feature_fraction': 0.622354384759794, 'bagging_fraction':
0.6871261775754015, 'bagging_freq': 5, 'min_child_samples': 87, 'learning_rate':
0.019661922915295425, 'n_estimators': 800, 'max_depth': 10}. Best is trial 101 with v
0.07540077829294446.
[I 2025-11-03 15:19:39,013] Trial 116 finished with value: 0.07540927454261372 and
parameters: {'lambda_l1': 8.2641467108522e-05, 'lambda_l2': 0.019066964381871634,
'num_leaves': 170, 'feature_fraction': 0.6708218919383377, 'bagging_fraction':
0.7326243191100184, 'bagging_freq': 5, 'min_child_samples': 93, 'learning_rate':
0.013651747163467043, 'n_estimators': 800, 'max_depth': 9}. Best is trial 101 with va
0.07540077829294446.
[I 2025-11-03 15:20:14,304] Trial 117 finished with value: 0.07549678555565147 and
parameters: {'lambda_l1': 9.75842966873721e-05, 'lambda_l2': 0.011994996455431665,
'num_leaves': 172, 'feature_fraction': 0.675118263310538, 'bagging_fraction':
0.7959686048539313, 'bagging_freq': 5, 'min_child_samples': 93, 'learning_rate':
0.012195650420114505, 'n_estimators': 600, 'max_depth': 9}. Best is trial 101 with va
0.07540077829294446.
[I 2025-11-03 15:20:57,998] Trial 118 finished with value: 0.07541748289991014 and
parameters: {'lambda_l1': 0.00013676441326430987, 'lambda_l2': 0.028903366984897504,
'num_leaves': 195, 'feature_fraction': 0.7025541443196438, 'bagging_fraction':
0.7830327794223215, 'bagging_freq': 5, 'min_child_samples': 92, 'learning_rate':
0.013883036179570119, 'n_estimators': 700, 'max_depth': 10}. Best is trial 101 with v
0.07540077829294446.
[I 2025-11-03 15:21:43,569] Trial 119 finished with value: 0.07539044463913189 and
parameters: {'lambda_l1': 0.0002359975158610665, 'lambda_l2': 0.028442614733351673,
'num_leaves': 191, 'feature_fraction': 0.7014891905562832, 'bagging_fraction':
0.7723989111078657, 'bagging_freq': 6, 'min_child_samples': 98, 'learning_rate':
0.014107136381220638, 'n_estimators': 800, 'max_depth': 9}. Best is trial 119 with va
0.07539044463913189.
[I 2025-11-03 15:22:26,517] Trial 120 finished with value: 0.07541786008673575 and
parameters: {'lambda_l1': 0.0006058168049375882, 'lambda_l2': 0.03080184915017936,
'num_leaves': 146, 'feature_fraction': 0.7034554081593252, 'bagging_fraction':
0.7796234586487176, 'bagging_freq': 6, 'min_child_samples': 97, 'learning_rate':
0.01603412811036058, 'n_estimators': 800, 'max_depth': 9}. Best is trial 119 with val
0.07539044463913189.
[I 2025-11-03 15:23:10,068] Trial 121 finished with value: 0.07541962704896041 and
parameters: {'lambda_l1': 0.0010233567156454758, 'lambda_l2': 0.028472814694711964,
'num_leaves': 148, 'feature_fraction': 0.7010317621094787, 'bagging_fraction':
0.7807317547855583, 'bagging_freq': 6, 'min_child_samples': 99, 'learning_rate':
0.014115010107348622, 'n_estimators': 800, 'max_depth': 9}. Best is trial 119 with va
0.07539044463913189.
[I 2025-11-03 15:23:52,138] Trial 122 finished with value: 0.07543602905890465 and
parameters: {'lambda_l1': 0.0005378695468469842, 'lambda_l2': 0.04480240814621984,
'num_leaves': 141, 'feature_fraction': 0.7155707001796626, 'bagging_fraction':
0.7687953091490001, 'bagging_freq': 6, 'min_child_samples': 98, 'learning_rate':
0.017600241838299193, 'n_estimators': 800, 'max_depth': 9}. Best is trial 119 with va
0.07539044463913189.
[I 2025-11-03 15:24:33,837] Trial 123 finished with value: 0.07543031619115134 and
parameters: {'lambda_l1': 0.00025052106730336576, 'lambda_l2': 0.020599871653198355,
'num_leaves': 135, 'feature_fraction': 0.6597730608674542, 'bagging_fraction':
0.7578735467001182, 'bagging_freq': 6, 'min_child_samples': 96, 'learning_rate':
0.015457886063495152, 'n_estimators': 800, 'max_depth': 11}. Best is trial 119 with v
0.07539044463913189.
[I 2025-11-03 15:25:11,666] Trial 124 finished with value: 0.07538836222490984 and
parameters: {'lambda_l1': 0.00015634656811347447, 'lambda_l2': 0.029742933191211518,
'num_leaves': 153, 'feature_fraction': 0.7053987149402208, 'bagging_fraction':
0.7864158715078888, 'bagging_freq': 7, 'min_child_samples': 91, 'learning_rate':
0.016361428199384055, 'n_estimators': 700, 'max_depth': 9}. Best is trial 124 with va
0.07538836222490984.
[I 2025-11-03 15:25:45,627] Trial 125 finished with value: 0.07543073439210207 and
parameters: {'lambda_l1': 0.0001327785262761027, 'lambda_l2': 0.05504879446001535,
```

```
'num_leaves': 155, 'feature_fraction': 0.7067859406333884, 'bagging_fraction':
0.786943914491002, 'bagging_freq': 6, 'min_child_samples': 92, 'learning_rate':
0.015856203746134553, 'n_estimators': 600, 'max_depth': 10}. Best is trial 124 with v
0.07538836222490984.
[I 2025-11-03 15:26:30,296] Trial 126 finished with value: 0.07537951987011014 and
parameters: {'lambda_l1': 0.00018313921988314782, 'lambda_l2': 0.030161660855068575,
'num_leaves': 180, 'feature_fraction': 0.6952700125088407, 'bagging_fraction':
0.732692814506615, 'bagging_freq': 7, 'min_child_samples': 90, 'learning_rate':
0.014726348239944098, 'n_estimators': 800, 'max_depth': 9}. Best is trial 126 with va
0.07537951987011014.
[I 2025-11-03 15:27:16,231] Trial 127 finished with value: 0.07546520472742352 and
parameters: {'lambda_l1': 0.0004498935916555644, 'lambda_l2': 0.030680504754429294,
'num_leaves': 178, 'feature_fraction': 0.6735142516881456, 'bagging_fraction':
0.7355759211094778, 'bagging_freq': 7, 'min_child_samples': 95, 'learning_rate':
0.009881732248762308, 'n_estimators': 800, 'max_depth': 9}. Best is trial 126 with va
0.07537951987011014.
[I 2025-11-03 15:27:54,831] Trial 128 finished with value: 0.07541065937628219 and
parameters: {'lambda_l1': 0.0003050706146688928, 'lambda_l2': 0.04185662394336568,
'num_leaves': 169, 'feature_fraction': 0.7261651830382618, 'bagging_fraction':
0.6991198946821139, 'bagging_freq': 7, 'min_child_samples': 90, 'learning_rate':
0.014073546485932656, 'n_estimators': 700, 'max_depth': 9}. Best is trial 126 with va
0.07537951987011014.
[I 2025-11-03 15:28:34,949] Trial 129 finished with value: 0.07540097015483002 and
parameters: {'lambda_l1': 0.00016844914938229087, 'lambda_l2': 0.041261821846875005,
'num_leaves': 168, 'feature_fraction': 0.727269571915319, 'bagging_fraction':
0.6856731169368294, 'bagging_freq': 7, 'min_child_samples': 90, 'learning_rate':
0.01414083122834078, 'n_estimators': 700, 'max_depth': 10}. Best is trial 126 with va
0.07537951987011014.
[I 2025-11-03 15:29:13,579] Trial 130 finished with value: 0.07540830877362842 and
parameters: {'lambda_l1': 0.00029188549453178274, 'lambda_l2': 0.09646832065550284,
'num_leaves': 169, 'feature_fraction': 0.7295048979483354, 'bagging_fraction':
0.6708837982603958, 'bagging_freq': 7, 'min_child_samples': 90, 'learning_rate':
0.011611960980669982, 'n_estimators': 700, 'max_depth': 9}. Best is trial 126 with va
0.07537951987011014.
[I 2025-11-03 15:29:52,253] Trial 131 finished with value: 0.07542085393860633 and
parameters: {'lambda_l1': 0.00029875074429365885, 'lambda_l2': 0.09057848423275691,
'num_leaves': 168, 'feature_fraction': 0.7296134136494934, 'bagging_fraction':
0.6673059467708101, 'bagging_freq': 7, 'min_child_samples': 90, 'learning_rate':
0.011568536956923465, 'n_estimators': 700, 'max_depth': 9}. Best is trial 126 with va
0.07537951987011014.
[I 2025-11-03 15:30:30,043] Trial 132 finished with value: 0.0754017712933448 and
parameters: {'lambda_l1': 0.00019478818982207428, 'lambda_l2': 0.046101876848271 33,
'num_leaves': 162, 'feature_fraction': 0.6909020866468605, 'bagging_fraction':
0.6809015194504633, 'bagging_freq': 7, 'min_child_samples': 89, 'learning_rate':
0.01267208501663967, 'n_estimators': 700, 'max_depth': 9}. Best is trial 126 with val
0.07537951987011014.
[I 2025-11-03 15:31:07,723] Trial 133 finished with value: 0.07539471850463482 and
parameters: {'lambda_l1': 0.00018188648807150224, 'lambda_l2': 0.041775323617028536,
'num_leaves': 159, 'feature_fraction': 0.6931738054693115, 'bagging_fraction':
0.6856179546215179, 'bagging_freq': 7, 'min_child_samples': 89, 'learning_rate':
0.014467358948345214, 'n_estimators': 700, 'max_depth': 9}. Best is trial 126 with va
0.07537951987011014.
[I 2025-11-03 15:31:46,077] Trial 134 finished with value: 0.07543816653478445 and
parameters: {'lambda_l1': 0.00018033039360688822, 'lambda_l2': 0.0441722257448997,
'num_leaves': 160, 'feature_fraction': 0.6928527251636765, 'bagging_fraction':
0.6807569976695717, 'bagging_freq': 7, 'min_child_samples': 88, 'learning_rate':
0.0104115338588544, 'n_estimators': 700, 'max_depth': 9}. Best is trial 126 with valu
0.07537951987011014.
[I 2025-11-03 15:32:23,762] Trial 135 finished with value: 0.07542678484187283 and
parameters: {'lambda_l1': 0.00016250965593673974, 'lambda_l2': 0.064362085676064,
```

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'num_leaves': 152, 'feature_fraction': 0.7260422553833252, 'bagging_fraction':
0.699191854934403, 'bagging_freq': 7, 'min_child_samples': 90, 'learning_rate':
0.011893742511349498, 'n_estimators': 700, 'max_depth': 9}. Best is trial 126 with va
0.07537951987011014.
[I 2025-11-03 15:33:01,780] Trial 136 finished with value: 0.07543280849273772 and
parameters: {'lambda_l1': 0.00021472683968046838, 'lambda_l2': 0.055261743214559025,
'num_leaves': 163, 'feature_fraction': 0.670243136090531, 'bagging_fraction':
0.6592367151383375, 'bagging_freq': 7, 'min_child_samples': 86, 'learning_rate':
0.013524582873086593, 'n_estimators': 700, 'max_depth': 9}. Best is trial 126 with va
0.07537951987011014.
[I 2025-11-03 15:33:34,999] Trial 137 finished with value: 0.07542063577218779 and
parameters: {'lambda_l1': 0.0002911107794008097, 'lambda_l2': 0.04009419867960422,
'num_leaves': 171, 'feature_fraction': 0.6906233627285401, 'bagging_fraction':
0.7104663133772228, 'bagging_freq': 7, 'min_child_samples': 95, 'learning_rate':
0.01430996159888361, 'n_estimators': 600, 'max_depth': 9}. Best is trial 126 with val
0.07537951987011014.
[I 2025-11-03 15:34:13,359] Trial 138 finished with value: 0.07545217392517302 and
parameters: {'lambda_l1': 0.0008414400367304754, 'lambda_l2': 0.08845600501156521,
'num_leaves': 177, 'feature_fraction': 0.7388822783970713, 'bagging_fraction':
0.6169536140618069, 'bagging_freq': 7, 'min_child_samples': 89, 'learning_rate':
0.012245651152021952, 'n_estimators': 700, 'max_depth': 9}. Best is trial 126 with va
0.07537951987011014.
[I 2025-11-03 15:34:57,156] Trial 139 finished with value: 0.07545261276987504 and
parameters: {'lambda_l1': 0.0002512977910227162, 'lambda_l2': 0.023287375210618983,
'num_leaves': 159, 'feature_fraction': 0.7127628052761796, 'bagging_fraction':
0.6705966924659309, 'bagging_freq': 7, 'min_child_samples': 90, 'learning_rate':
0.008924814863241792, 'n_estimators': 800, 'max_depth': 9}. Best is trial 126 with va
0.07537951987011014.
[I 2025-11-03 15:35:30,690] Trial 140 finished with value: 0.07573847528123398 and
parameters: {'lambda_l1': 0.00015617327185949546, 'lambda_l2': 0.1505611207868946,
'num_leaves': 166, 'feature_fraction': 0.7226380621742374, 'bagging_fraction':
0.6524644288654922, 'bagging_freq': 7, 'min_child_samples': 87, 'learning_rate':
0.007417488019606597, 'n_estimators': 600, 'max_depth': 9}. Best is trial 126 with va
0.07537951987011014.
[I 2025-11-03 15:36:14,197] Trial 141 finished with value: 0.07546314552504642 and
parameters: {'lambda_l1': 0.00034955453446173027, 'lambda_l2': 0.07758171139629651,
'num_leaves': 181, 'feature_fraction': 0.6971462371444742, 'bagging_fraction':
0.6971424242322988, 'bagging_freq': 7, 'min_child_samples': 85, 'learning_rate':
0.018124218285339475, 'n_estimators': 800, 'max_depth': 9}. Best is trial 126 with va
0.07537951987011014.
[I 2025-11-03 15:36:52,642] Trial 142 finished with value: 0.0754138920911185 and
parameters: {'lambda_l1': 0.00020826851228130581, 'lambda_l2': 0.037046103242383915,
'num_leaves': 172, 'feature_fraction': 0.6479785686452191, 'bagging_fraction':
0.6796762746106391, 'bagging_freq': 7, 'min_child_samples': 91, 'learning_rate':
0.01463631259398974, 'n_estimators': 700, 'max_depth': 9}. Best is trial 126 with val
0.07537951987011014.
[I 2025-11-03 15:37:38,333] Trial 143 finished with value: 0.07539838320516086 and
parameters: {'lambda_l1': 0.00046196104058557786, 'lambda_l2': 0.04905214173160346,
'num_leaves': 168, 'feature_fraction': 0.7352418849161886, 'bagging_fraction':
0.6899325361155905, 'bagging_freq': 7, 'min_child_samples': 88, 'learning_rate':
0.011027422208371667, 'n_estimators': 800, 'max_depth': 9}. Best is trial 126 with va
0.07537951987011014.
[I 2025-11-03 15:38:21,555] Trial 144 finished with value: 0.0754199371612947 and
parameters: {'lambda_l1': 0.00010799709012109962, 'lambda_l2': 0.050053601151281615,
'num_leaves': 152, 'feature_fraction': 0.740937167901658, 'bagging_fraction':
0.6413531444609226, 'bagging_freq': 7, 'min_child_samples': 88, 'learning_rate':
0.010826813354609964, 'n_estimators': 800, 'max_depth': 9}. Best is trial 126 with va
0.07537951987011014.
[I 2025-11-03 15:39:01,994] Trial 145 finished with value: 0.07548288505627161 and
parameters: {'lambda_l1': 0.0004746536318127248, 'lambda_l2': 0.060998102196859895,
```

```
'num_leaves': 189, 'feature_fraction': 0.7329050708202471, 'bagging_fraction':
0.6897186561904968, 'bagging_freq': 7, 'min_child_samples': 94, 'learning_rate':
0.009514228973142063, 'n_estimators': 700, 'max_depth': 9}. Best is trial 126 with va
0.07537951987011014.
[I 2025-11-03 15:39:45,696] Trial 146 finished with value: 0.07539310325410044 and
parameters: {'lambda_l1': 0.0007480271377814823, 'lambda_l2': 0.10045995428612034,
'num_leaves': 170, 'feature_fraction': 0.6808773211681168, 'bagging_fraction':
0.6779630757852483, 'bagging_freq': 7, 'min_child_samples': 86, 'learning_rate':
0.012875746727075652, 'n_estimators': 800, 'max_depth': 9}. Best is trial 126 with va
0.07537951987011014.
[I 2025-11-03 15:40:30,282] Trial 147 finished with value: 0.07538806003236562 and
parameters: {'lambda_l1': 0.00037007748090326585, 'lambda_l2': 0.0981054050301598,
'num_leaves': 163, 'feature_fraction': 0.6790248496505606, 'bagging_fraction':
0.7040638406013242, 'bagging_freq': 7, 'min_child_samples': 86, 'learning_rate':
0.011221860946981037, 'n_estimators': 800, 'max_depth': 9}. Best is trial 126 with va
0.07537951987011014.
[I 2025-11-03 15:41:15,797] Trial 148 finished with value: 0.07551835971483555 and
parameters: {'lambda_l1': 0.0007149533926158606, 'lambda_l2': 0.14638424075374368,
'num_leaves': 162, 'feature_fraction': 0.6608570340501273, 'bagging_fraction':
0.6732045384806566, 'bagging_freq': 7, 'min_child_samples': 85, 'learning_rate':
0.008291293292894162, 'n_estimators': 800, 'max_depth': 10}. Best is trial 126 with v
0.07537951987011014.
[I 2025-11-03 15:42:01,391] Trial 149 finished with value: 0.07540733876266698 and
parameters: {'lambda_l1': 0.0011957869811005674, 'lambda_l2': 0.10825585333816426,
'num_leaves': 177, 'feature_fraction': 0.6778691015283929, 'bagging_fraction':
0.7181237561473428, 'bagging_freq': 7, 'min_child_samples': 87, 'learning_rate':
0.011783677889647015, 'n_estimators': 800, 'max_depth': 9}. Best is trial 126 with va
0.07537951987011014.
✅ Best LGBMRegressor parameters: {'lambda_l1': 0.00018313921988314782, 'lambda_l2':
0.030161660855068575, 'num_leaves': 180, 'feature_fraction': 0.6952700125088407,
'bagging_fraction': 0.732692814506615, 'bagging_freq': 7, 'min_child_samples': 90,
'learning_rate': 0.014726348239944098, 'n_estimators': 800, 'max_depth': 9}

⚡ Evaluating Tuned Models on GPU...

XGBRegressor (GPU)              | MSE: 0.07543 | MAE: 0.15229 | R²: 0.53207
LGBMRegressor (GPU)             | MSE: 0.07540 | MAE: 0.15307 | R²: 0.53224
```

In [7]:
```python
best_idx = np.argmin(mse_scores)
best_model_name = model_names[best_idx]
best_model = models[best_idx][1] # This line is correct, it selects the model ob
print(f"\n✅ Best Model Based on MSE: {best_model_name}")
```

```
✅ Best Model Based on MSE: LGBMRegressor (GPU)
```

In [8]:
```python
# --- 9. Final Training on Full Data ---
print("\n🚀 Retraining the best model on full training data...")
X_full = train_processed.drop(columns=['loan_paid_back'], errors='ignore')
y_full = train_processed['loan_paid_back']
X_full = X_full.select_dtypes(include=[np.number])

# --- REMOVED SCALING --- ---
# Retrain best model on the full UN-SCALED dataset
X_full_scaled = X_full # Keep variable name for consistency
best_model.fit(X_full_scaled, y_full)
print(f"✅ Model retrained successfully: {best_model_name} ({best_model.__class_
```

```
🚀 Retraining the best model on full training data...
✅ Model retrained successfully: LGBMRegressor (GPU) (LGBMRegressor)
```

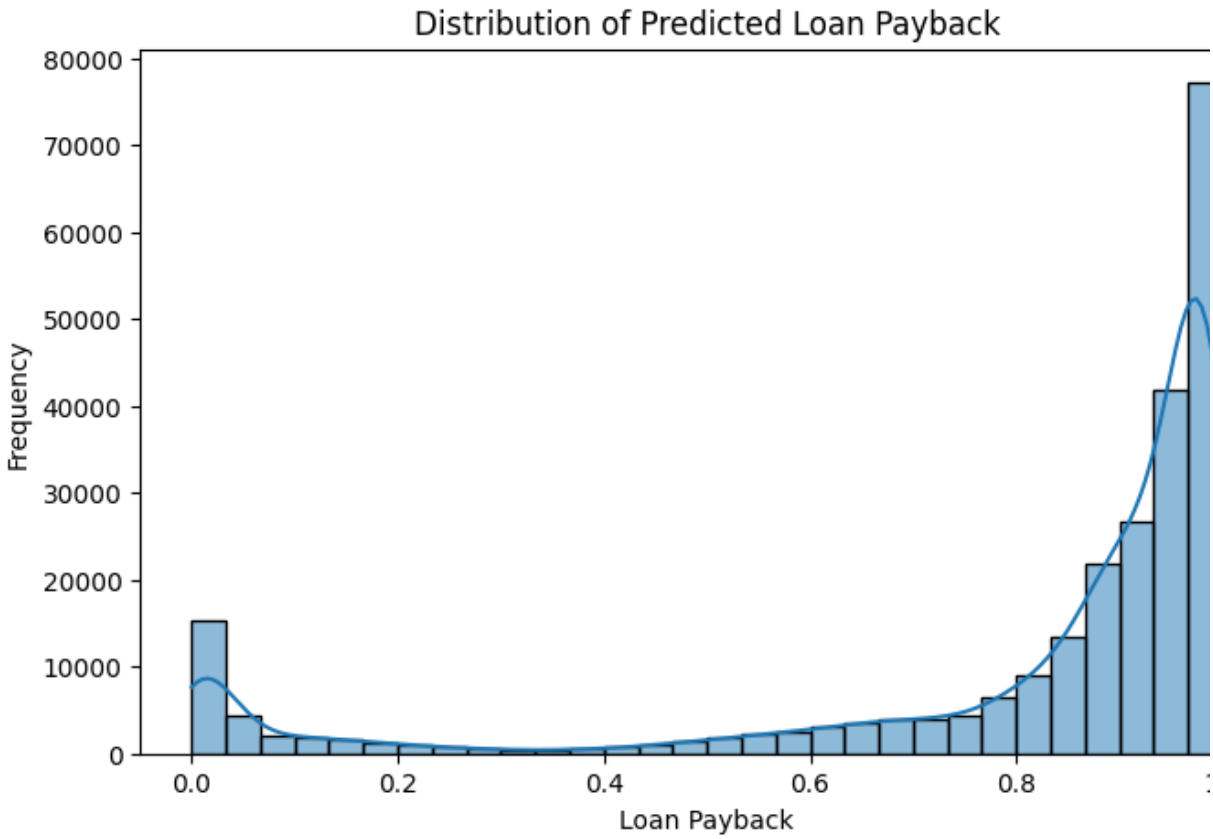
Selecting best model and Generating Submission

In [9]:
```python
# --- 10. Generate Submission ---
print("💡 Generating predictions using the best model...")

X_submission = test_processed.select_dtypes(include=[np.number])
X_submission = X_submission[X_full.columns] # Align column order

# --- REMOVED SCALING --- ---
# Predict on the UN-SCALED test data
X_submission_scaled = X_submission # Keep variable name for consistency
submission_preds_raw = best_model.predict(X_submission_scaled)
# --- END OF CHANGE ---

# Clip the predictions
submission_preds = np.clip(submission_preds_raw, 0, 1)

# --- Create Submission File ---
submission = pd.DataFrame({
    'id': test_ids,
    'loan_paid_back': submission_preds
})
submission.to_csv('submission.csv', index=False)
print("\n✅ Submission file 'submission.csv' generated successfully!")
display(submission.head())
```

```
💡 Generating predictions using the best model...

✅ Submission file 'submission.csv' generated successfully!
```

	id	loan_paid_back
0	593994	0.952849
1	593995	0.956750
2	593996	0.524125
3	593997	0.959660
4	593998	0.991163

In [10]:
```python
# --- 11. Final Plot ---
plt.figure(figsize=(8, 5))
sns.histplot(submission['loan_paid_back'], bins=30, kde=True)
plt.title('Distribution of Predicted Loan Payback')
plt.xlabel('Loan Payback')
plt.ylabel('Frequency')
plt.show()
```


Distribution of Predicted Loan Payback
Frequency
Loan Payback
80000
70000
60000
50000
40000
30000
20000
10000
0
0.0
0.2
0.4
0.6
0.8

In [ ]: