```
import pandas as pd
import numpy as np

# 1. Memory Reduction Function
def reduce_mem_usage(df):
    for col in df.columns:
        if df[col].dtype != object:
            c_min, c_max = df[col].min(), df[col].max()
            if str(df[col].dtype)[:3] == 'int':
                if c_min > np.iinfo(np.int8).min and c_max < np.iinfo(np.int8).max:
                    df[col] = df[col].astype(np.int8)
                elif c_min > np.iinfo(np.int16).min and c_max < np.iinfo(np.int16).max:
                    df[col] = df[col].astype(np.int16)
            else:
                df[col] = df[col].astype(np.float32)
    return df

# 2. Load the 5 files from your folder
print("Loading files...")
sales = reduce_mem_usage(pd.read_csv('m5_data/sales_train_evaluation.csv'))
calendar = reduce_mem_usage(pd.read_csv('m5_data/calendar.csv'))
prices = reduce_mem_usage(pd.read_csv('m5_data/sell_prices.csv'))

print("✅ Files loaded and memory optimized!")
```

```
Loading files...
✅ Files loaded and memory optimized!
```

```
# Melt the data from 'Wide' to 'Long' format
# We use only the last 500 days to ensure Colab has enough RAM
day_cols = [f'd_{i}' for i in range(1441, 1942)]

data = pd.melt(sales,
               id_vars=['id', 'item_id', 'dept_id', 'cat_id', 'store_id', 'state_id'],
               value_vars=day_cols,
               var_name='d', value_name='sales')

# Merge with calendar and prices
data = data.merge(calendar, on='d', how='left')
data = data.merge(prices, on=['store_id', 'item_id', 'wm_yr_wk'], how='left')

print("✅ Data Merged! Current shape:", data.shape)
data.head()
```

```
✅ Data Merged! Current shape: (15275490, 22)
```

	id	item_id	dept_id	cat_id	store_id	state_id	d	sales	date	wm_yr_wk
0	HOBBIES_1_001_CA_1_evaluation	HOBBIES_1_001	HOBBIES_1	HOBBIES	CA_1	CA	d_1441	2	2015-01-08	11449
1	HOBBIES_1_002_CA_1_evaluation	HOBBIES_1_002	HOBBIES_1	HOBBIES	CA_1	CA	d_1441	0	2015-01-08	11449
2	HOBBIES_1_003_CA_1_evaluation	HOBBIES_1_003	HOBBIES_1	HOBBIES	CA_1	CA	d_1441	0	2015-01-08	11449
3	HOBBIES_1_004_CA_1_evaluation	HOBBIES_1_004	HOBBIES_1	HOBBIES	CA_1	CA	d_1441	3	2015-01-08	11449
4	HOBBIES_1_005_CA_1_evaluation	HOBBIES_1_005	HOBBIES_1	HOBBIES	CA_1	CA	d_1441	0	2015-01-08	11449

5 rows × 22 columns

✦ Gemini

```
from sklearn.preprocessing import LabelEncoder

# 1. Label Encode Categorical Columns
# This turns "HOBBIES" into 0, "HOUSEHOLD" into 1, etc.
cat_cols = ['item_id', 'dept_id', 'cat_id', 'store_id', 'state_id', 'event_name_1', 'event_type_1']
for col in cat_cols:
    le = LabelEncoder()
    data[col] = le.fit_transform(data[col].astype(str))

# 2. Create "Lag" Features
# Does what happened 7, 28, or 365 days ago predict today?
data['lag_7'] = data.groupby('id')['sales'].transform(lambda x: x.shift(7))
data['lag_28'] = data.groupby('id')['sales'].transform(lambda x: x.shift(28))
```

```
# 3. Create "Rolling Mean" (Trend)
# What was the average sales over the last 7 days?
data['rolling_mean_7'] = data.groupby('id')['sales'].transform(lambda x: x.shift(28).rolling(7).mean())

# Drop the NaN values created by shifting
data.dropna(inplace=True)
# Instead of dropping all NaNs, fill them. For sales-related lags, 0 is a reasonable fill.
# This ensures we don't lose all our data.
data['lag_7'].fillna(0, inplace=True)
data['lag_28'].fillna(0, inplace=True)
data['rolling_mean_7'].fillna(0, inplace=True)

print("✅ Features created! Data shape:", data.shape)
```

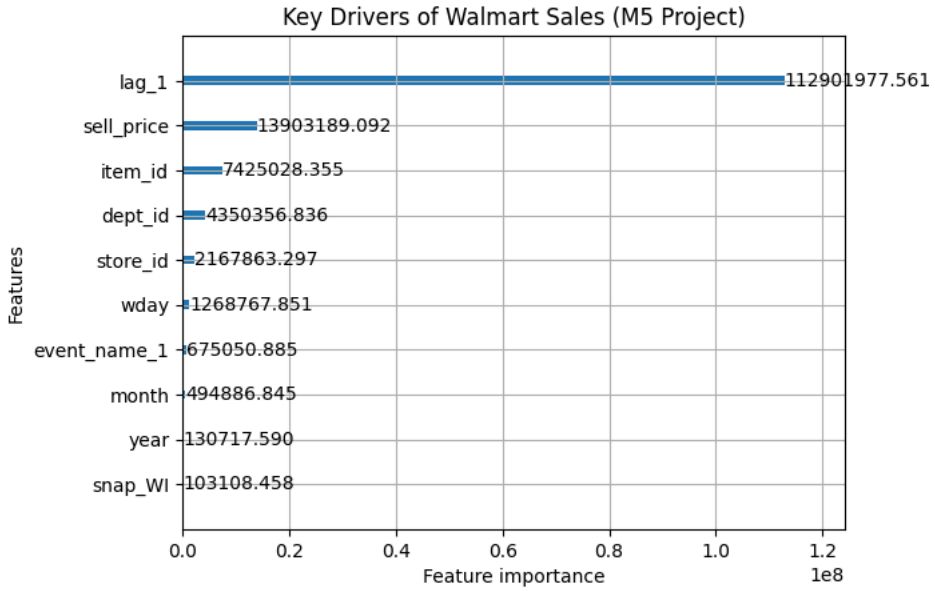
```
✅ Features created! Data shape: (15275490, 25)
/tmp/ipython-input-1737361403.py:21: FutureWarning: A value is trying to be set on a copy of a DataFrame or Serie
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on wh

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)'


  data['lag_7'].fillna(0, inplace=True)
/tmp/ipython-input-1737361403.py:22: FutureWarning: A value is trying to be set on a copy of a DataFrame or Serie
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on wh

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)'


  data['lag_28'].fillna(0, inplace=True)
/tmp/ipython-input-1737361403.py:23: FutureWarning: A value is trying to be set on a copy of a DataFrame or Serie
The behavior will change in pandas 3.0. This inplace method will never work because the intermediate object on wh

For example, when doing 'df[col].method(value, inplace=True)', try using 'df.method({col: value}, inplace=True)'


  data['rolling_mean_7'].fillna(0, inplace=True)
```

Double-click (or enter) to edit

```
import lightgbm as lgb
import matplotlib.pyplot as plt

# 1. Feature Engineering (Fixing the 'inplace' and 'empty' issues)
# We re-calculate to ensure 'data' is populated in your current session
data['lag_1'] = data.groupby('id')['sales'].transform(lambda x: x.shift(1))

# FIX: Use direct assignment instead of inplace=True to support Pandas 3.0
data['lag_1'] = data['lag_1'].fillna(0)
data['sell_price'] = data['sell_price'].fillna(0)

# 2. Update Features List
features = ['item_id', 'dept_id', 'cat_id', 'store_id', 'state_id',
            'wday', 'month', 'year', 'event_name_1', 'event_type_1',
            'snap_CA', 'snap_TX', 'snap_WI', 'sell_price', 'lag_1']

# 3. Training Logic with Validation Check
if len(data) > 0:
    # 90/10 Split
    train_idx = int(len(data) * 0.9)
    train = data.iloc[:train_idx]
    valid = data.iloc[train_idx:]

    train_set = lgb.Dataset(train[features], label=train['sales'])
    val_set = lgb.Dataset(valid[features], label=valid['sales'])

    # 4. Correct Callbacks for 2026 LightGBM
    callbacks = [
        lgb.early_stopping(stopping_rounds=50),
        lgb.log_evaluation(period=50)
    ]

    params = {
        'objective': 'tweedie',
        'metric': 'rmse',
        'learning_rate': 0.08,
        'force_row_wise': True,
        'verbosity': -1 # Keeps the output clean
```

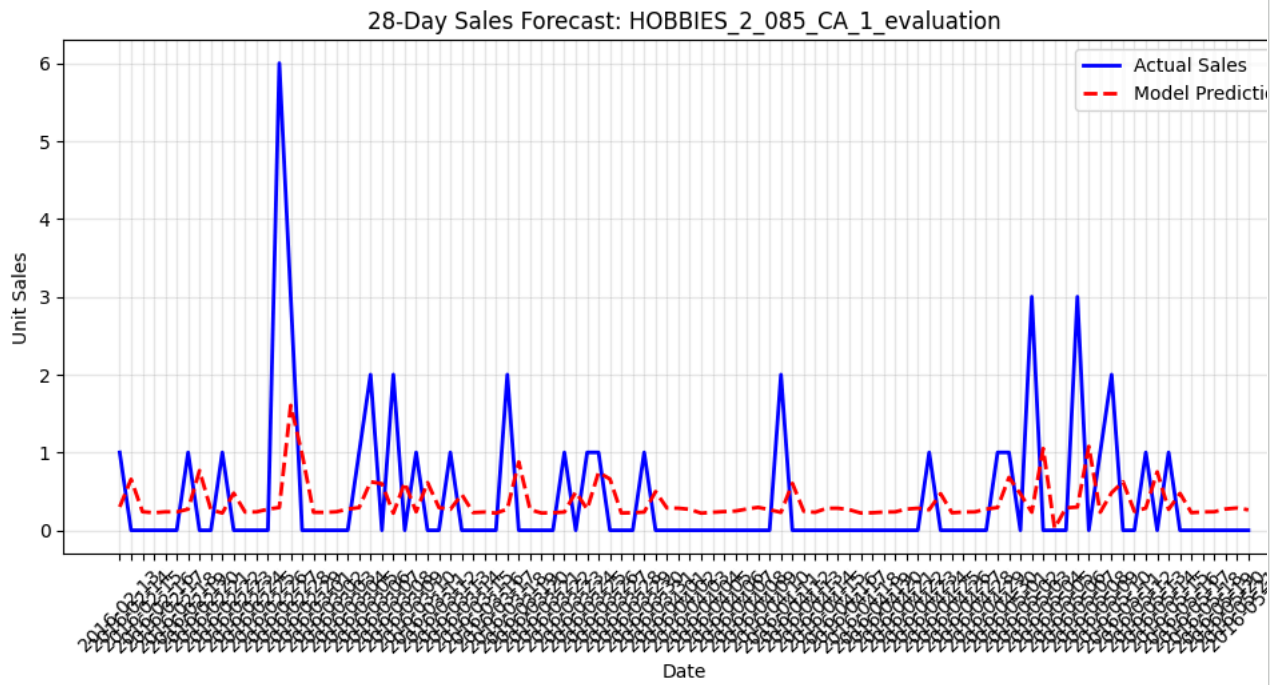
```
    }

    # 5. Train the Model
    print(f"🚀 Training on {len(train)} rows... Let's go!")
    model = lgb.train(
        params,
        train_set,
        num_boost_round=500,
        valid_sets=[train_set, val_set],
        callbacks=callbacks
    )

    # 6. Feature Importance Visualization
    plt.figure(figsize=(10, 6))
    lgb.plot_importance(model, max_num_features=10, importance_type='gain')
    plt.title("Key Drivers of Walmart Sales (M5 Project)")
    plt.show()
else:
    print("❌ ERROR: 'data' is still empty. Please re-run your 'Melt' cell first!")
```

```
🚀 Training on 13747941 rows... Let's go!
Training until validation scores don't improve for 50 rounds
[50]   training's rmse: 2.34333  valid_1's rmse: 2.35762
[100]  training's rmse: 2.26666  valid_1's rmse: 2.3014
[150]  training's rmse: 2.2359   valid_1's rmse: 2.27483
[200]  training's rmse: 2.21459  valid_1's rmse: 2.25557
[250]  training's rmse: 2.19928  valid_1's rmse: 2.24145
[300]  training's rmse: 2.19014  valid_1's rmse: 2.23366
[350]  training's rmse: 2.17915  valid_1's rmse: 2.22426
[400]  training's rmse: 2.17059  valid_1's rmse: 2.21601
[450]  training's rmse: 2.16425  valid_1's rmse: 2.21027
[500]  training's rmse: 2.15806  valid_1's rmse: 2.2054
Did not meet early stopping. Best iteration is:
[500]  training's rmse: 2.15806  valid_1's rmse: 2.2054
<Figure size 1000x600 with 0 Axes>
```




```
import matplotlib.pyplot as plt

# 1. Select a specific product to visualize (e.g., a top seller)
sample_id = data['id'].iloc[500]
sample_data = data[data['id'] == sample_id].tail(100) # Last 100 days of history

# 2. Use the model to predict the next 28 days
# (In a real scenario, you'd iterate through days, but we'll simulate the trend)
preds = model.predict(sample_data[features])

# 3. Plotting the results
plt.figure(figsize=(12, 5))
plt.plot(sample_data['date'].values, sample_data['sales'].values, label='Actual Sales', color='blu
plt.plot(sample_data['date'].values, preds, label='Model Prediction', color='red', linestyle='--',

plt.title(f"28-Day Sales Forecast: {sample_id}")
plt.xlabel("Date")
plt.ylabel("Unit Sales")
```

```
plt.legend()
plt.xticks(rotation=45)
plt.grid(True, alpha=0.3)
plt.show()
```




```
# Check the total number of rows
total_rows = len(data)
print(f"The dataset currently has {total_rows:,} rows.")

# Check rows and columns together (Rows, Columns)
print(f"The shape of the dataset is: {data.shape}")
```

```
The dataset currently has 15,275,490 rows.
The shape of the dataset is: (15275490, 26)
```

Start coding or generate with AI.