

Model RF dan LR

```
import numpy as np
import pandas as pd

import matplotlib.pyplot as plt
from sklearn.preprocessing import PolynomialFeatures
from sklearn.model_selection import train_test_split
from sklearn.model_selection import StratifiedKFold, GridSearchCV

from sklearn.preprocessing import MinMaxScaler, StandardScaler
from sklearn.feature_selection import SelectKBest, SelectPercentile, mutual_info_classif

from sklearn.linear_model import LogisticRegression
from sklearn.ensemble import RandomForestClassifier

from sklearn.pipeline import Pipeline
from sklearn.base import clone
import time

from sklearn.metrics import (
    confusion_matrix,
    ConfusionMatrixDisplay,
    classification_report
)

df_cuaca = pd.read_csv('dpc.csv',header=0)

df_cuaca.head()
print("Jumlah baris, kolom:", df_cuaca.shape)
print("\nTipe data:")
print(df_cuaca.dtypes)
```

```
df_cuaca = df_cuaca.drop(columns=['Tekanan (hPa)', 'pH Tanah', 'Kelembapan Tanah (%)'],  
errors='ignore')
```

```
# Tampilkan 5 baris pertama untuk verifikasi
```

```
df_cuaca.head()
```

```
# (1) Cek nilai NULL
```

```
print("\nJumlah nilai kosong (null) per kolom:\n", df_cuaca.isnull().sum())
```

```
# (2) Cek nilai NaN
```

```
nan_counts = df_cuaca.isna().sum()
```

```
print("\nJumlah nilai NaN per kolom:\n", nan_counts)
```

```
median_suhu = df_cuaca['Suhu (°C)'].median()
```

```
median_awan = df_cuaca['Awan (%)'].median()
```

```
# Isi nilai NaN dengan median
```

```
df_cuaca['Suhu (°C)'] = df_cuaca['Suhu (°C)'].fillna(median_suhu)
```

```
df_cuaca['Awan (%)'] = df_cuaca['Awan (%)'].fillna(median_awan)
```

```
df_cuaca['Kelembapan (%)'] = df_cuaca['Kelembapan (%)'].fillna(median_awan)
```

```
df_cuaca['Curah Hujan (mm)'] = df_cuaca['Curah Hujan (mm)'].fillna(median_awan)
```

```
# Tampilkan hasil median
```

```
print("Median Suhu (°C):", median_suhu)
```

```
print("Median Awan (%):", median_awan)
```

```
# Cek kembali apakah masih ada NaN
```

```
print("\nJumlah nilai kosong setelah penanganan:")
```

```
print(df_cuaca.isnull().sum())
```

```
# Validasi ulang
```

```
print("\nSetelah imputasi, nilai kosong per kolom:\n", df_cuaca.isnull().sum())
```

```
before = df_cuaca.shape
```

```

dupes = df_cuaca[df_cuaca.duplicated(keep=False)]
print(f"Jumlah baris duplikat (terhitung ganda): {dupes.shape[0]}")
df_cuaca2 = df_cuaca.drop_duplicates(keep='first')
print("Bentuk data sebelum/sesudah hapus duplikat:", before, "->", df_cuaca.shape)

```

```

# Deteksi OUTLIER dengan metode IQR
df_cuaca3 = df_cuaca2.select_dtypes(include=[np.number])
Q1 = df_cuaca3.quantile(0.25)
Q3 = df_cuaca3.quantile(0.75)
IQR = Q3 - Q1
outliers = ((df_cuaca3 < (Q1 - 1.5 * IQR)) | (df_cuaca3 > (Q3 + 1.5 * IQR))).any(axis=1)
print("\nJumlah baris yang terdeteksi memiliki outlier:", outliers.sum())

```

```

# Hapus baris yang memiliki outlier
df_cuaca_clean = df_cuaca2.loc[~outliers]
print("Ukuran Data Asli:", df_cuaca2.shape)
print("Ukuran Data Setelah Outlier Dihapus:", df_cuaca_clean.shape)
print("Jumlah baris yang dihapus:", outliers.sum())

```

```

# =====

```

```

# Encode Label & Pisahkan Fitur-Target

```

```

# =====

```

```

# Hujan → 0 (Cuaca Hujan)

```

```

# Cerah → 1 (Cuaca Cerah)

```

```

# Mengubah label prakiraan cuaca dari huruf menjadi angka

```

```

df_cuaca2['Prakiraan Cuaca'] = df_cuaca2['Prakiraan Cuaca'].map({'Hujan': 0, 'Cerah': 1})

```

```

# Menentukan X sebagai fitur (semua kolom kecuali 'Prakiraan Cuaca')

```

```

X = df_cuaca2.drop(columns=['Prakiraan Cuaca'])

```

```

# Menentukan y sebagai target (kolom 'Prakiraan Cuaca')
y = df_cuaca2['Prakiraan Cuaca']

# Menampilkan 5 baris pertama dataframe setelah perubahan
df_cuaca2.head()

X_train, X_test, y_train, y_test = train_test_split(
    X, y, test_size=0.3, random_state = 45, stratify=y
)
print("Ukuran X_train, X_test:", X_train.shape, X_test.shape)

# =====
# PIPELINE: Scaling → Feature Selection → Logistic Regression
# =====

# Rancang pipeline: gabungkan preprocessing + feature selection + model
pipe_lr = Pipeline(steps=[
    ('scaler', MinMaxScaler()),
    ('feat_select', SelectKBest()),
    ('clf', LogisticRegression( # model klasifikasi
        class_weight='balanced',
        solver='liblinear',
        max_iter=500
    ))
])

# GridSearch: daftar kombinasi parameter yang akan diuji
params_grid_lr = [
    {
        'feat_select__k': np.arange(2, 10),
        'clf__penalty': ['l1', 'l2'],

```

```

        'clf__C': [0.01, 0.1, 1, 10],
    },
    {
        'feat_select': [SelectPercentile()],      # alternatif: seleksi berdasar persentase
        'feat_select__percentile': np.arange(20, 80, 10),
        'clf__penalty': ['l1', 'l2'],
        'clf__C': [0.01, 0.1, 1, 10],
    }
]

```

Stratified K-Fold: menjaga proporsi label seimbang di setiap fold CV

```
SKF = StratifiedKFold(n_splits=5, shuffle=True, random_state=42)
```

Jalankan GridSearchCV untuk mencari kombinasi parameter terbaik

```

gscv_lr = GridSearchCV(
    pipe_lr,
    params_grid_lr,
    cv=SKF,
    scoring='f1',    # metrik utama: F1-score
    verbose=1,       # tampilkan progres selama proses
    n_jobs=-1        # gunakan semua core CPU
)

```

```
print("Menjalankan GridSearch untuk Logistic Regression...")
```

```
start = time.time()
```

```
gscv_lr.fit(X_train, y_train)
```

```
print(f"GridSearch Logistic Regression selesai dalam {time.time() - start:.2f} detik")
```

Tampilkan hasil terbaik dari GridSearch

```
print("CV Score (F1) terbaik:", gscv_lr.best_score_)
```

```
print("Kombinasi model terbaik:", gscv_lr.best_estimator_)
```

```

# Hitung akurasi model terbaik pada data uji
lr_test_score = gscv_lr.best_estimator_.score(X_test, y_test)
print("\nSkor Test (akurasi) Logistic Regression:", lr_test_score)

# Tampilkan fitur terbaik (jika feature selector mendukung metode get_support)
selector = gscv_lr.best_estimator_.named_steps['feat_select']
if hasattr(selector, 'get_support'):
    mask = selector.get_support()
    selected = np.array(X.columns)[mask]
    print("\nFitur terbaik (terpilih):", selected)

# Buat prediksi pada data uji dan tampilkan Confusion Matrix
lr_pred = gscv_lr.predict(X_test)
cm_lr = confusion_matrix(y_test, lr_pred)
disp_lr = ConfusionMatrixDisplay(confusion_matrix=cm_lr, display_labels=['0 = Hujan!', '1 = Cerah'])
disp_lr.plot(cmap=plt.cm.Blues)
plt.title("Confusion Matrix — Logistic Regression")
plt.show()

# Tampilkan classification report (precision, recall, f1-score)
print("\nClassification Report — Logistic Regression:\n", classification_report(y_test, lr_pred))

# =====

# PIPELINE: Scaling → Feature Selection → Random Forest

# =====

# Rancang pipeline: gabungkan scaling, seleksi fitur, dan model Random Forest
pipe_rf = Pipeline(steps=[
    ('scaling', MinMaxScaler()),

```

```

('feat_select', SelectKBest()),
('clf', RandomForestClassifier(
    class_weight='balanced',
    random_state=42,
    n_estimators=-1
))
])

```

GridSearch: dua jenis seleksi fitur (KBest dan Percentile) dengan kombinasi parameter model

```

params_grid_rf = [
    # Kandidat 1: pakai SelectKBest
    {
        'feat_select__k': np.arange(5, 15),    # jumlah fitur terbaik yang diuji
        'clf__n_estimators': [200, 300, 500],  # jumlah pohon
        'clf__max_depth': [None, 5, 10],       # batas kedalaman tiap pohon
        'clf__min_samples_split': [2, 5, 10]   # jumlah minimal sampel untuk split node
    },
    # Kandidat 2: pakai SelectPercentile
    {
        'feat_select': [SelectPercentile()],
        'feat_select__percentile': np.arange(30, 80, 10),
        'clf__n_estimators': [200, 300, 500],
        'clf__max_depth': [None, 5, 10],
        'clf__min_samples_split': [2, 5, 10]
    }
]

```

StratifiedKFold: memastikan proporsi kelas tetap sama di setiap fold CV

```
SKF = StratifiedKFold(n_splits=5, shuffle=True, random_state=42)
```

Jalankan GridSearchCV: mencari kombinasi parameter terbaik dengan metrik F1

```

gscv_rf = GridSearchCV(
    pipe_rf,
    params_grid_rf,
    cv=SKF,
    scoring='f1',
    verbose=1,
    n_jobs=-1
)

print("Menjalankan GridSearch untuk Random Forest...")
start = time.time()

gscv_rf.fit(X_train, y_train)

print(f"GridSearch Random Forest selesai dalam {time.time() - start:.2f} detik")

# Evaluasi hasil GridSearch
print("CV Score (F1) terbaik:", gscv_rf.best_score_)
print("Kombinasi model terbaik:", gscv_rf.best_estimator_)

rf_test_score = gscv_rf.best_estimator_.score(X_test, y_test)
print("\nSkor Test (akurasi) Random Forest:", rf_test_score)

# Fitur terbaik (jika selector mendukung get_support)
selector = gscv_rf.best_estimator_.named_steps['feat_select']
if hasattr(selector, 'get_support'):
    mask = selector.get_support()
    selected = np.array(X.columns)[mask]
    print("\nFitur terbaik (terpilih):", selected)

# Confusion Matrix & Classification Report

```



```
rf_pred = gscv_rf.predict(X_test)

cm_rf = confusion_matrix(y_test, rf_pred)

disp_rf = ConfusionMatrixDisplay(confusion_matrix=cm_rf, display_labels=['0 = Hujan','1 =
Cerah'])

disp_rf.plot(cmap=plt.cm.Greens)

plt.title("Confusion Matrix — Random Forest")

plt.show()
```

```
print("\nClassification Report — Random Forest:\n", classification_report(y_test, rf_pred))
```

```
# Buat figure dengan 2 subplot berdampingan (1 baris, 3 kolom)
```

```
fig, (ax1, ax2) = plt.subplots(ncols=2, figsize=(16, 4))
```

```
# Plot Confusion Matrix untuk Logistic Regression
```

```
disp_lr.plot(ax=ax1, cmap=plt.cm.Blues, colorbar=False)
```

```
ax1.set_title("Logistic Regression (L1)") # judul subplot pertama
```

```
# Plot Confusion Matrix untuk Random Forest
```

```
disp_rf.plot(ax=ax2, cmap=plt.cm.Greens, colorbar=False)
```

```
ax2.set_title("Random Forest (Best Model)") # judul subplot ketiga
```

```
# Rapikan tata letak agar subplot tidak tumpang tindih
```

```
plt.tight_layout()
```

```
plt.show() # tampilkan semua plot
```

```
import pickle
```

```
# Simpan pipeline terbaik (bukan hanya model clf)
```

```
best_rf_pipeline = gscv_rf.best_estimator_
```

```
# Simpan pipeline lengkap ke file pickle
```

```
with open("BestModel_CLF_RandomForest_pingouin.pkl", "wb") as f:
```

```
    pickle.dump(best_rf_pipeline, f)
```

```
print("✅ Pipeline Random Forest terbaik berhasil disimpan ke  
'BestModel_CLF_RandomForest_pingouin.pkl'")
```

Model GCS dan SVM

```
import numpy as np
```

```
import pandas as pd
```

```
import matplotlib.pyplot as plt
```

```
from sklearn.preprocessing import PolynomialFeatures
```

```
from sklearn.model_selection import train_test_split
```

```
from sklearn.model_selection import StratifiedKFold, GridSearchCV
```

```
from sklearn.ensemble import GradientBoostingClassifier
```

```
from sklearn.preprocessing import MinMaxScaler, StandardScaler
```

```
from sklearn.feature_selection import SelectKBest, SelectPercentile, mutual_info_classif
```

```
from sklearn.svm import SVC
```

```
from sklearn.linear_model import LogisticRegression
```

```
from sklearn.ensemble import RandomForestClassifier
```

```
from sklearn.pipeline import Pipeline
```

```
from sklearn.base import clone
```

```
import time
```

```
from sklearn.metrics import (
```

```
    confusion_matrix,
```

```
    ConfusionMatrixDisplay,
```

```
    classification_report
```

```
)
```

```

from sklearn.metrics import (
    confusion_matrix,
    ConfusionMatrixDisplay,
    classification_report
)

df_cuaca = pd.read_csv('dpc.csv', header=0)

df_cuaca.head()
print("Jumlah baris, kolom:", df_cuaca.shape)
print("\nTipe data:")
print(df_cuaca.dtypes)

df_cuaca = df_cuaca.drop(columns=['Tekanan (hPa)', 'pH Tanah', 'Kelembapan Tanah (%)'],
errors='ignore')

# Tampilkan 5 baris pertama untuk verifikasi
df_cuaca.head()

# (1) Cek nilai NULL
print("\nJumlah nilai kosong (null) per kolom:\n", df_cuaca.isnull().sum())

# (2) Cek nilai NaN
nan_counts = df_cuaca.isna().sum()
print("\nJumlah nilai NaN per kolom:\n", nan_counts)

median_suhu = df_cuaca['Suhu (°C)'].median()
median_awan = df_cuaca['Awan (%)'].median()

# Isi nilai NaN dengan median
df_cuaca['Suhu (°C)'] = df_cuaca['Suhu (°C)'].fillna(median_suhu)

```

```
df_cuaca['Awan (%)'] = df_cuaca['Awan (%)'].fillna(median_awan)
df_cuaca['Kelembapan (%)'] = df_cuaca['Kelembapan (%)'].fillna(median_awan)
df_cuaca['Curah Hujan (mm)'] = df_cuaca['Curah Hujan (mm)'].fillna(median_awan)
```

```
# Tampilkan hasil median
```

```
print("Median Suhu (°C):", median_suhu)
```

```
print("Median Awan (%):", median_awan)
```

```
# Cek kembali apakah masih ada NaN
```

```
print("\nJumlah nilai kosong setelah penanganan:")
```

```
print(df_cuaca.isnull().sum())
```

```
# Validasi ulang
```

```
print("\nSetelah imputasi, nilai kosong per kolom:\n", df_cuaca.isnull().sum())
```

```
before = df_cuaca.shape
```

```
dupes = df_cuaca[df_cuaca.duplicated(keep=False)]
```

```
print(f"Jumlah baris duplikat (terhitung ganda): {dupes.shape[0]}")
```

```
df_cuaca2 = df_cuaca.drop_duplicates(keep='first')
```

```
print("Bentuk data sebelum/sesudah hapus duplikat:", before, "->", df_cuaca2.shape)
```

```
# Deteksi OUTLIER dengan metode IQR
```

```
df_cuaca3 = df_cuaca2.select_dtypes(include=[np.number])
```

```
Q1 = df_cuaca3.quantile(0.25)
```

```
Q3 = df_cuaca3.quantile(0.75)
```

```
IQR = Q3 - Q1
```

```
outliers = ((df_cuaca3 < (Q1 - 1.5 * IQR)) | (df_cuaca3 > (Q3 + 1.5 * IQR))).any(axis=1)
```

```
print("\nJumlah baris yang terdeteksi memiliki outlier:", outliers.sum())
```

```
# Hapus baris yang memiliki outlier
```

```
df_cuaca_clean = df_cuaca2.loc[~outliers]
```

```
print("Ukuran Data Asli:", df_cuaca2.shape)
```

```

print("Ukuran Data Setelah Outlier Dihapus:", df_cuaca_clean.shape)

print("Jumlah baris yang dihapus:", outliers.sum())

# =====

# Encode Label & Pisahkan Fitur-Target

# =====

# Hujan → 0 (Cuaca Hujan)
# Cerah → 1 (Cuaca Cerah)

# Mengubah label prakiraan cuaca dari huruf menjadi angka
df_cuaca2['Prakiraan Cuaca'] = df_cuaca2['Prakiraan Cuaca'].map({'Hujan': 0, 'Cerah': 1})

# Menentukan X sebagai fitur (semua kolom kecuali 'Prakiraan Cuaca')
X = df_cuaca2.drop(columns=['Prakiraan Cuaca'])

# Menentukan y sebagai target (kolom 'Prakiraan Cuaca')
y = df_cuaca2['Prakiraan Cuaca']

# Menampilkan 5 baris pertama dataframe setelah perubahan
df_cuaca2.head()

X_train, X_test, y_train, y_test = train_test_split(
    X, y, test_size=0.3, random_state = 45, stratify=y
)

print("Ukuran X_train, X_test:", X_train.shape, X_test.shape)

# =====

# PIPELINE: Scaling → Feature Selection → Gradient Boosting

# =====

pipe_gb = Pipeline(steps=[
    ('scaling', MinMaxScaler()),

```

```

('feat_select', SelectKBest()),
('clf', GradientBoostingClassifier(
    random_state=42
))
])

params_grid_gb = [
    # Kandidat 1: SelectKBest
    {
        'feat_select__k': np.arange(5, 15),
        'clf__n_estimators': [50, 100, 150],
        'clf__learning_rate': [0.001, 0.002, 0.01],
        'clf__max_depth': [1, 2, 3],
        'clf__min_samples_split': [10, 15, 20]
    },
]

# -----
# 3 StratifiedKFold untuk menjaga proporsi kelas di setiap fold
# -----

SKF = StratifiedKFold(n_splits=5, shuffle=True, random_state=42)

# -----
# 4 Jalankan GridSearchCV untuk mencari kombinasi terbaik
# -----

gscv_gb = GridSearchCV(
    pipe_gb,
    params_grid_gb,
    cv=SKF,
    scoring='f1',      # gunakan F1 agar seimbang antara precision & recall
    verbose=1,

```

```

    n_jobs=-1
)

print("Menjalankan GridSearch untuk Gradient Boosting...")
start = time.time()

gscv_gb.fit(X_train, y_train)

print(f"GridSearch Gradient Boosting selesai dalam {time.time() - start:.2f} detik")
# -----

# 5 Evaluasi hasil GridSearch
# -----

print("CV Score (F1) terbaik:", gscv_gb.best_score_)
print("\nKombinasi model terbaik:\n", gscv_gb.best_estimator_)

gb_test_score = gscv_gb.best_estimator_.score(X_test, y_test)
print("\nSkor Test (akurasi) Gradient Boosting:", gb_test_score)

# -----

# 6 Fitur terbaik (jika selector mendukung get_support)
# -----

selector = gscv_gb.best_estimator_.named_steps['feat_select']
if hasattr(selector, 'get_support'):
    mask = selector.get_support()
    selected = np.array(X.columns)[mask]
    print("\nFitur terbaik (terpilih):", selected)

# -----

# 7 Confusion Matrix & Classification Report
# -----

gb_pred = gscv_gb.predict(X_test)

```

```

cm_gb = confusion_matrix(y_test, gb_pred)

disp_gb = ConfusionMatrixDisplay(confusion_matrix=cm_gb, display_labels=['0 = Hujan','1 =
Cerah'])

disp_gb.plot(cmap=plt.cm.Oranges)

plt.title("Confusion Matrix — Gradient Boosting")

plt.show()


print("\nClassification Report — Gradient Boosting:\n", classification_report(y_test, gb_pred))

pipe_svm = Pipeline(steps=[
    ('scaling', MinMaxScaler()),
    ('feat_select', SelectKBest()),
    ('clf', SVC(
        class_weight='balanced', # menyeimbangkan kelas minoritas
        probability=True,      # agar bisa menghitung probabilitas prediksi
        random_state=42
    ))
])

# -----
# 2 GridSearch: kombinasi parameter seleksi fitur & model
# -----

params_grid_svm = [
    # Kandidat 1: SelectKBest
    {
        'feat_select__k': np.arange(5, 15),
        'clf__C': [0.1, 1, 10, 100],      # regularisasi
        'clf__kernel': ['linear', 'rbf', 'poly'], # jenis kernel
        'clf__gamma': ['scale', 'auto']    # parameter kernel RBF/poly
    },
    # Kandidat 2: SelectPercentile

```



```

{
    'feat_select': [SelectPercentile()],
    'feat_select__percentile': np.arange(30, 80, 10),
    'clf__C': [0.1, 1, 10, 100],
    'clf__kernel': ['linear', 'rbf', 'poly'],
    'clf__gamma': ['scale', 'auto']
}
]

# -----
# 3 StratifiedKFold untuk validasi berstrata
# -----

SKF = StratifiedKFold(n_splits=5, shuffle=True, random_state=42)

# -----
# 4 Jalankan GridSearchCV
# -----

gscv_svm = GridSearchCV(
    pipe_svm,
    params_grid_svm,
    cv=SKF,
    scoring='f1',
    verbose=1,
    n_jobs=-1
)

print("Menjalankan GridSearch untuk Support Vector Machine...")

start = time.time()

gscv_svm.fit(X_train, y_train)

```

```

print(f"GridSearch SVM selesai dalam {time.time() - start:.2f} detik")

# -----

# 5 Evaluasi hasil GridSearch

# -----

print("CV Score (F1) terbaik:", gscv_svm.best_score_)

print("\nKombinasi model terbaik:\n", gscv_svm.best_estimator_)


svm_test_score = gscv_svm.best_estimator_.score(X_test, y_test)

print("\nSkor Test (akurasi) SVM:", svm_test_score)


# -----

# 6 Fitur terbaik (jika selector mendukung get_support)

# -----

selector = gscv_svm.best_estimator_.named_steps['feat_select']

if hasattr(selector, 'get_support'):
    mask = selector.get_support()
    selected = np.array(X.columns)[mask]
    print("\nFitur terbaik (terpilih):", selected)


# -----

# 7 Confusion Matrix & Classification Report

# -----

svm_pred = gscv_svm.predict(X_test)


cm_svm = confusion_matrix(y_test, svm_pred)

disp_svm = ConfusionMatrixDisplay(confusion_matrix=cm_svm, display_labels=['0 = Hujan', '1 =
Cerah'])

disp_svm.plot(cmap=plt.cm.Blues)

plt.title("Confusion Matrix — Support Vector Machine")

plt.show()

```

```

print("\nClassification Report — Support Vector Machine:\n", classification_report(y_test,
svm_pred))

# Buat figure dengan 2 subplot berdampingan (1 baris, 3 kolom)
fig, (ax1, ax2) = plt.subplots(ncols=2, figsize=(16, 4))

# Plot Confusion Matrix untuk Logistic Regression
disp_gb.plot(ax=ax1, cmap=plt.cm.Oranges, colorbar=False)
ax1.set_title("Gradient Boosting Classifier") # judul subplot pertama

# Plot Confusion Matrix untuk Random Forest
disp_svm.plot(ax=ax2, cmap=plt.cm.Blues, colorbar=False)
ax2.set_title("Support Vector Machine") # judul subplot ketiga

# Rapikan tata letak agar subplot tidak tumpang tindih
plt.tight_layout()

plt.show() # tampilkan semua plot

import pickle

# Ambil model terbaik dari hasil GridSearchCV
best_gb_model = gscv_gb.best_estimator_.named_steps['clf']

# Simpan model terbaik ke file pickle
with open("BestModel_CLF_GradientBoost_pingouin.pkl", "wb") as f:
    pickle.dump(best_gb_model, f)

print("✅ Model Gradient Boosting terbaik berhasil disimpan ke
'BestModel_CLF_GradientBoost_pingouin.pkl'")

```

python Streamlit

```
import streamlit as st

import pandas as pd

import numpy as np

import joblib

import altair as alt

from pathlib import Path


from streamlit_option_menu import option_menu


# Navigasi sidebar

with st.sidebar:

    selected = option_menu("Tugas UTS Streamlit UTS ML 24/25",

                           ['Upload Dataset',

                            'Klasifikasi Cuaca',

                            'Catatan'],

                           default_index=0)


if selected == 'Upload Dataset':

    st.header("")


CSV_PATH = "dpc.csv"

MODEL_PATH = "BestModel_CLF_RandomForest_pingouin.pkl"

UI_FEATURES = ["Suhu (°C)", "Kelembapan (%)"]

LABEL_MAP = {0: "Hujan", 1: "Cerah"}


st.set_page_config(page_title="Prediksi Cuaca", page_icon="☀️", layout="centered")

st.title("🌦️ Prediksi Cuaca (Klasifikasi)")


st.markdown("""

<style>
```

```
/* Warna dasar aplikasi */
```

```
.stApp {  
  background: linear-gradient(180deg, #0a0a0a 0%, #1a1a1a 100%);  
  color: #f0f0f0;  
}
```

```
/* Panel transparan di atas background hitam */
```

```
.panel {  
  padding: 18px;  
  border-radius: 16px;  
  background: rgba(255, 255, 255, 0.08);  
  border: 1px solid rgba(255, 255, 255, 0.1);  
  box-shadow: 0 10px 30px rgba(0,0,0,0.4);  
}
```

```
/* Tombol oranye gradasi */
```

```
.stButton > button {  
  background: linear-gradient(90deg, #ff9966 0%, #ff5e62 100%);  
  border: none;  
  color: white;  
  padding: 10px 16px;  
  border-radius: 12px;  
  font-weight: 700;  
  box-shadow: 0 10px 20px rgba(255, 94, 98, .35);  
}
```

```
.stButton > button:hover {  
  filter: brightness(1.1);  
}
```

```
/* Teks & Header */
```

```
.title {
```

```
font-weight: 800;

font-size: 32px;

background: linear-gradient(90deg,#36d1dc 0%,#5b86e5 100%);

-webkit-background-clip: text;

-webkit-text-fill-color: transparent;

margin-bottom: 6px;

}

.subtle {

    color: #ccc;

    margin-bottom: 8px;

}

/* Nama tim animasi warna */

.rainbow {

    display:inline-block;

    font-weight:800;

    padding:4px 10px;

    border-radius:10px;

    background:linear-gradient(90deg,#ff6a88,#ffcc70,#a1c4fd,#c2ffd8,#ff6a88);

    -webkit-background-clip:text;

    -webkit-text-fill-color:transparent;

    animation:hueCycle 6s linear infinite;

}

@keyframes hueCycle {0%{filter:hue-rotate(0)}100%{filter:hue-rotate(360deg)}}

/* Chip probabilitas */

.metric-chip {

    display:inline-block;

    padding:10px 16px;

    border-radius:999px;

    background:linear-gradient(90deg,#36d1dc 0%,#5b86e5 100%);
```

```
color:#fff;

font-weight:700;

box-shadow:0 8px 20px rgba(91,134,229,.28);

margin-top:8px;

}
```

```
/* Footer */
```

```
.footer{

    text-align:center;

    color:#aaa;

    font-size:13px;

    margin-top:12px;

}
```

```
</style>
```

```
<div class="wrap">
```

```
    <div class="subtle">
```

```
        Masukkan <b>Suhu (°C)</b> & <b>Kelembapan (%)</b>. Fitur lain dilengkapi otomatis dari median dataset.
```

```
    </div>
```

```
    <div class="subtle">Dibuat oleh <span class="rainbow">BENY, DENIS, RENALDI</span></div>
```

```
</div>
```

```
""", unsafe_allow_html=True)
```

```
if not Path(CSV_PATH).exists():
```

```
    st.error(f"File {CSV_PATH} tidak ditemukan di folder ini.")
```

```
    st.stop()
```

```
if not Path(MODEL_PATH).exists():
```

```
    st.error(f"File model {MODEL_PATH} tidak ditemukan di folder ini.")
```

```
    st.stop()
```

```
df = pd.read_csv(CSV_PATH)
model = joblib.load(MODEL_PATH)
```

```
st.write('Untuk Inputan File dataset (csv) bisa menggunakan st.file_uploader')
```

```
file = st.file_uploader("Masukkan File", type=["csv", "txt"])
```

```
if file is not None:
```

```
    try:
```

```
        df = pd.read_csv(file)
```

```
        st.success("File berhasil diunggah!")
```

```
        st.dataframe(df) # menampilkan isi CSV di Streamlit
```

```
    except Exception as e:
```

```
        st.error(f"Terjadi kesalahan saat membaca file: {e}")
```

```
def ensure_features(X_input, model, df):
```

```
    expected = list(model.feature_names_in_)
```

```
    for f in expected:
```

```
        if f not in X_input.columns:
```

```
            if f in df.columns:
```

```
                X_input[f] = pd.to_numeric(df[f], errors="coerce").median()
```

```
            else:
```

```
                X_input[f] = 0
```

```
    return X_input[expected].apply(pd.to_numeric, errors="coerce")
```

```
def pretty_label(y_pred, model):
```

```
    if hasattr(model, "classes_"):
```

```
        if isinstance(y_pred, str):
```

```
            return y_pred
```

```
            return LABEL_MAP.get(int(y_pred), str(y_pred))
```

```
    return LABEL_MAP.get(int(y_pred), str(y_pred))
```

```
st.markdown('<div class="wrap"><div class="panel">', unsafe_allow_html=True)
```



```

if selected == 'Klasifikasi Cuaca':

    st.header("Input Fitur Cuaca")

    c1, c2 = st.columns(2)

    with c1:

        suhu = st.number_input("Suhu (°C)", value=float(pd.to_numeric(df["Suhu (°C)"],
errors="coerce").median()))

    with c2:

        kelembapan = st.number_input("Kelembapan (%)",
value=float(pd.to_numeric(df["Kelembapan (%)"], errors="coerce").median()))

    st.markdown('</div></div>', unsafe_allow_html=True)

st.markdown('<div class="wrap"><div class="panel">', unsafe_allow_html=True)
X_user = pd.DataFrame([[suhu, kelembapan]], columns=UI_FEATURES)
X = ensure_features(X_user, model, df)

if st.button("🔍 Prediksi Cuaca"):

    try:

        y_pred = model.predict(X)[0]

        hasil = pretty_label(y_pred, model)

        proba = model.predict_proba(X)[0] if hasattr(model, "predict_proba") else None

        st.success(f"Hasil Prediksi: **{hasil}**")

        if proba is not None and hasattr(model, "classes_"):

            kelas = [pretty_label(c, model) for c in model.classes_]

            prob_df = pd.DataFrame({"Kelas": kelas, "Probabilitas": proba})

            color_range = ["#7bdf2", "#f2b5d4", "#b2f7ef", "#f7d6e0", "#c5d6ff"][:len(prob_df)]

            chart = alt.Chart(prob_df).mark_bar(cornerRadiusTopLeft=10,
cornerRadiusTopRight=10).encode(

                x=alt.X("Kelas:N", title="Kelas Cuaca"),

                y=alt.Y("Probabilitas:Q", title="Probabilitas", scale=alt.Scale(domain=[0,1])),

                color=alt.Color("Kelas:N", scale=alt.Scale(range=color_range), legend=None),

                tooltip=[alt.Tooltip("Kelas:N"), alt.Tooltip("Probabilitas:Q", format=".2%")]

            ).properties(height=280)

```

```

st.altair_chart(chart, use_container_width=True)

st.markdown(f'<div class="metric-chip"> Probabilitas Prediksi:
{proba[np.argmax(proba)]*100:.2f}%</div>', unsafe_allow_html=True)

else:

    st.info("Model tidak menyediakan probabilitas (predict_proba).")

except Exception as e:

    st.error(f"Gagal memprediksi: {e}")

st.markdown('</div></div>', unsafe_allow_html=True)

st.markdown('<div class="wrap"><div class="footer">Made with • Beny Denis
Renaldi</div></div>', unsafe_allow_html=True)

```

if selected == 'Catatan':

```
st.header("📝 Catatan Penting – Aplikasi Prediksi Cuaca")
```

```
st.markdown("""
```

```
### 🧠 **1. Tujuan Aplikasi**
```

Aplikasi ini digunakan untuk **memprediksi kondisi cuaca (Hujan atau Cerah)** berdasarkan **parameter suhu (°C)** dan **kelembapan (%)** menggunakan model klasifikasi **Random Forest** yang telah dilatih sebelumnya.

Tujuannya adalah memberikan simulasi **penerapan Machine Learning (ML)** di bidang **analisis data cuaca** dalam bentuk **web interaktif berbasis Streamlit**.

```
### ✅ **2. Fitur Input & Output**
```

```
**Input:**
```

- Suhu (°C)
- Kelembapan (%)
- Dataset eksternal (opsional)

```
**Output:**
```

- Prediksi kondisi cuaca: ☁️ *Hujan* atau ☀️ *Cerah*
- Probabilitas hasil prediksi dalam bentuk grafik (Altair).
- Nilai probabilitas tertinggi ditampilkan dalam **metric chip** berwarna.

""")