```
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.preprocessing import OneHotEncoder
from sklearn.pipeline import Pipeline
from fairlearn.metrics import (
    MetricFrame,
    selection_rate,
    demographic_parity_difference,
    equalized_odds_difference
)
from sklearn.metrics import accuracy_score

# 1. Load dataset
df = pd.read_csv("fairness_dataset.csv")

# 2. Features, target, and sensitive attributes
X = df[["experience", "test_score", "interview_score", "gender"]]
y = df["hired"]

# Choose sensitive attribute for bias detection (change to "ethnicity" if present)
sensitive_feature = df["gender"]

# 3. Train/test split
X_train, X_test, y_train, y_test, sf_train, sf_test = train_test_split(
    X, y, sensitive_feature, test_size=0.3, random_state=42
)

# 4. Build pipeline (OneHotEncode + Logistic Regression)
pipeline = Pipeline([
    ("encoder", OneHotEncoder(drop="first")),
    ("model", LogisticRegression(solver="liblinear"))
])

# 5. Train model
pipeline.fit(X_train, y_train)

# 6. Predictions
y_pred = pipeline.predict(X_test)

# 7. Fairness metrics by group
metric_frame = MetricFrame(
    metrics={
        "accuracy": accuracy_score,
        "selection_rate": selection_rate
    },
    y_true=y_test,
    y_pred=y_pred,
    sensitive_features=sf_test
)

print("===== Overall Metrics =====")
print(metric_frame.overall)

print("\n===== Metrics by Group =====")
print(metric_frame.by_group)

# 8. Fairness difference metrics
dp_diff = demographic_parity_difference(y_test, y_pred, sensitive_features=sf_test)
eo_diff = equalized_odds_difference(y_test, y_pred, sensitive_features=sf_test)

print(f"\nDemographic Parity Difference: {dp_diff:.4f}")
print(f"Equalized Odds Difference: {eo_diff:.4f}")
```

```
===== Overall Metrics =====
accuracy          0.500000
selection_rate    0.533333
dtype: float64

===== Metrics by Group =====
        accuracy  selection_rate
gender
female       0.5        0.625000
male         0.5        0.428571

Demographic Parity Difference: 0.1964
Equalized Odds Difference: 0.1964
```