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import streamlit as st
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.preprocessing import LabelEncoder, StandardScaler
from scipy.cluster.hierarchy import dendrogram, linkage
from sklearn.cluster import AgglomerativeClustering
from sklearn.metrics import silhouette_score

st.set_page_config(layout="wide")
st.title("Hierarchical Clustering Application")

file = st.file_uploader("Upload Dataset", type=["csv"])
method = st.selectbox("Linkage Method", ["ward", "complete", "average", "single"])
clusters = st.slider("Number of Clusters", 2, 10, 5)

if file:
    df = pd.read_csv(file)
    st.write("Original Data", df)

    for col in df.select_dtypes(include="object").columns:
        df[col] = LabelEncoder().fit_transform(df[col])

    scaler = StandardScaler()
    X = scaler.fit_transform(df)

    Z = linkage(X, method=method)
    fig, ax = plt.subplots(figsize=(10, 5))
    dendrogram(Z, ax=ax)
    st.pyplot(fig)

    model = AgglomerativeClustering(n_clusters=clusters, linkage=method)
    labels = model.fit_predict(X)

    df["Cluster"] = labels
    score = silhouette_score(X, labels)

    st.write("Clustered Data", df)
    st.write("Silhouette Score:", score)

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