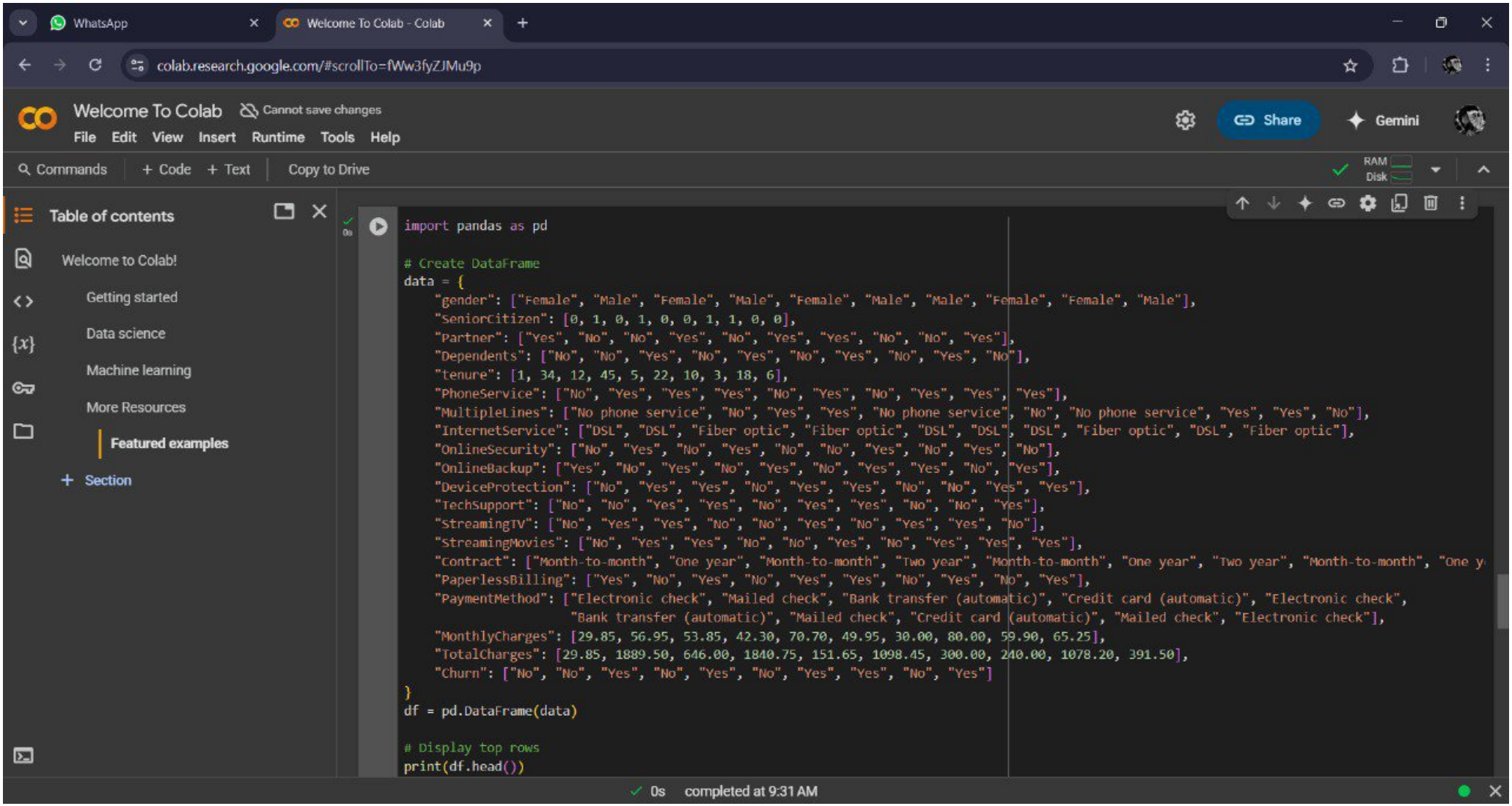
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import pandas as pd
# Create DataFrame
data = {
"gender": ["Female", "Male", "Female", "Male", "Female", "Male", "Male", "Female", "Female", "Male"],
"SeniorCitizen": [0, 1, 0, 1, 0, 0, 1, 1, 0, 0],
"Partner": ["Yes", "No", "No", "Yes", "No", "Yes", "Yes", "No", "No", "Yes"],
"Dependents": ["No", "No", "Yes", "No", "Yes", "No", "Yes", "No", "Yes", "No"],
"tenure": [1, 34, 12, 45, 5, 22, 10, 3, 18, 6],
"PhoneService": ["No", "Yes", "Yes", "Yes", "No", "Yes", "No", "Yes", "Yes", "Yes"],
"MultipleLines": ["No phone service", "No", "Yes", "Yes", "No phone service", "No", "No phone service", "Yes", "Yes", "No"],
"InternetService": ["DSL", "DSL", "Fiber optic", "Fiber optic", "DSL", "DSL", "DSL", "Fiber optic", "DSL", "Fiber optic"],
"OnlineSecurity": ["No", "Yes", "No", "Yes", "No", "No", "Yes", "No", "Yes", "No"],
"OnlineBackup": ["Yes", "No", "Yes", "No", "Yes", "No", "Yes", "Yes", "No", "Yes"],
"DeviceProtection": ["No", "Yes", "Yes", "No", "Yes", "Yes", "No", "No", "Yes", "Yes"],
"TechSupport": ["No", "No", "Yes", "Yes", "No", "Yes", "Yes", "No", "No", "Yes"],
"StreamingTV": ["No", "Yes", "Yes", "No", "No", "Yes", "No", "Yes", "Yes", "No"],
"StreamingMovies": ["No", "Yes", "Yes", "No", "No", "Yes", "No", "Yes", "Yes", "Yes"],
"Contract": ["Month-to-month", "One year", "Month-to-month", "Two year", "Month-to-month", "One year", "Two year", "Month-to-month", "One y
"PaperlessBilling": ["Yes", "No", "Yes", "No", "Yes", "Yes", "No", "Yes", "No", "Yes"],
"PaymentMethod": ["Electronic check", "Mailed check", "Bank transfer (automatic)", "Credit card (automatic)", "Electronic check",
"Bank transfer (automatic)", "Mailed check", "Credit card (automatic)", "Mailed check", "Electronic check"],
"MonthlyCharges": [29.85, 56.95, 53.85, 42.30, 70.70, 49.95, 30.00, 80.00, 59.90, 65.25],
"TotalCharges": [29.85, 1889.50, 646.00, 1840.75, 151.65, 1098.45, 300.00, 240.00, 1078.20, 391.50],
"Churn": ["No", "No", "Yes", "No", "Yes", "No", "Yes", "Yes", "No", "Yes"]
}
df = pd.DataFrame(data)
# Display top rows
print(df.head())
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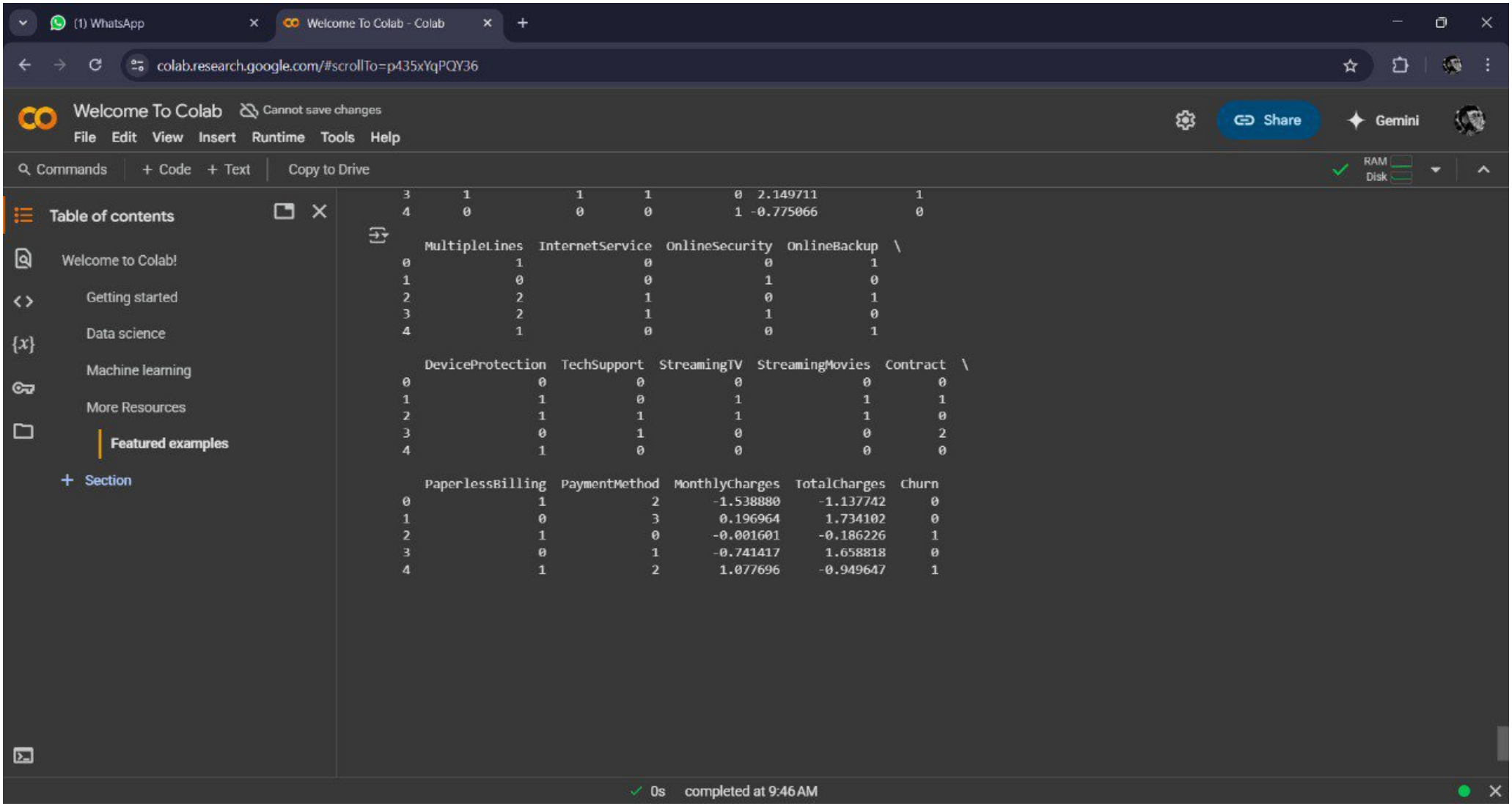
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3 1 1 1 0 2.149711 1
4 0 0 0 1 -0.775066 0
MultipleLines InternetService OnlineSecurity OnlineBackup \
0 1 0 0 1
1 0 0 1 0
2 2 1 0 1
3 2 1 1 0
4 1 0 0 1
DeviceProtection TechSupport StreamingTV StreamingMovies Contract \
0 0 0 0 0 0
1 1 0 1 1 1
2 1 1 1 1 0
3 0 1 0 0 2
4 1 0 0 0 0
PaperlessBilling PaymentMethod MonthlyCharges TotalCharges Churn
0 1 2 -1.538880 -1.137742 0
1 0 3 0.196964 1.734102 0
2 1 0 -0.001601 -0.186226 1
3 0 1 -0.741417 1.658818 0
4 1 2 1.077696 -0.949647 1
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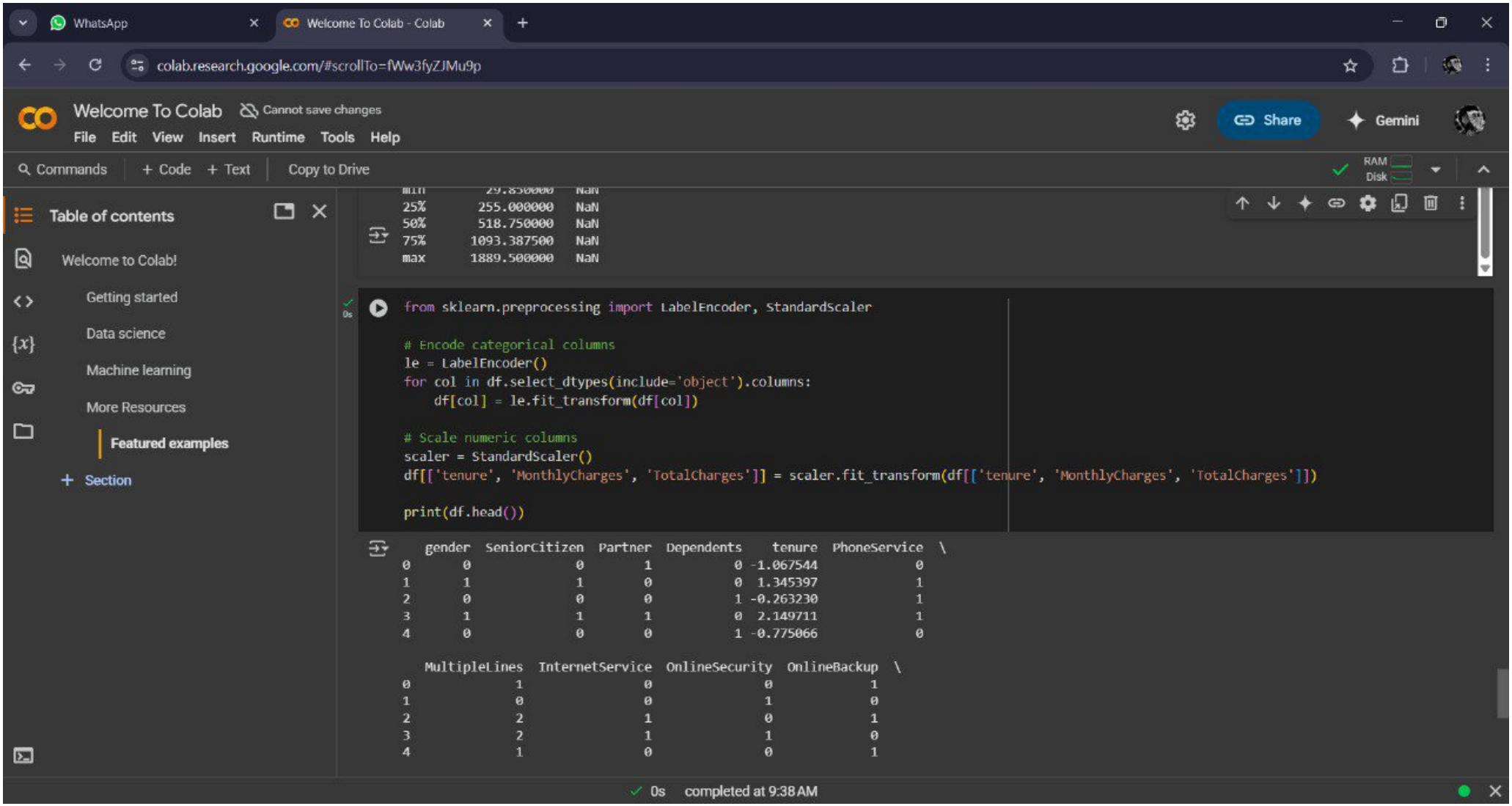
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min 29.850000 NaN
25% 255.000000 NaN
50% 518.750000 NaN
75% 1093.387500 NaN
max 1889.500000 NaN
from sklearn.preprocessing import LabelEncoder, StandardScaler
# Encode categorical columns
le = LabelEncoder()
for col in df.select_dtypes(include='object').columns:
df[col] = le.fit_transform(df[col])
# Scale numeric columns
scaler = StandardScaler()
df[['tenure', 'MonthlyCharges', 'TotalCharges']] = scaler.fit_transform(df[['tenure', 'MonthlyCharges', 'TotalCharges']])
print(df.head())
gender SeniorCitizen Partner Dependents tenure PhoneService \
0 0 0 1 0 -1.067544 0
1 1 1 0 0 1.345397 1
2 0 0 0 1 -0.263230 1
3 1 1 1 0 2.149711 1
4 0 0 0 1 -0.775066 0
MultipleLines InternetService OnlineSecurity OnlineBackup \
0 1 0 0 1
1 0 0 1 0
2 2 1 0 1
3 2 1 1 0
4 1 0 0 1
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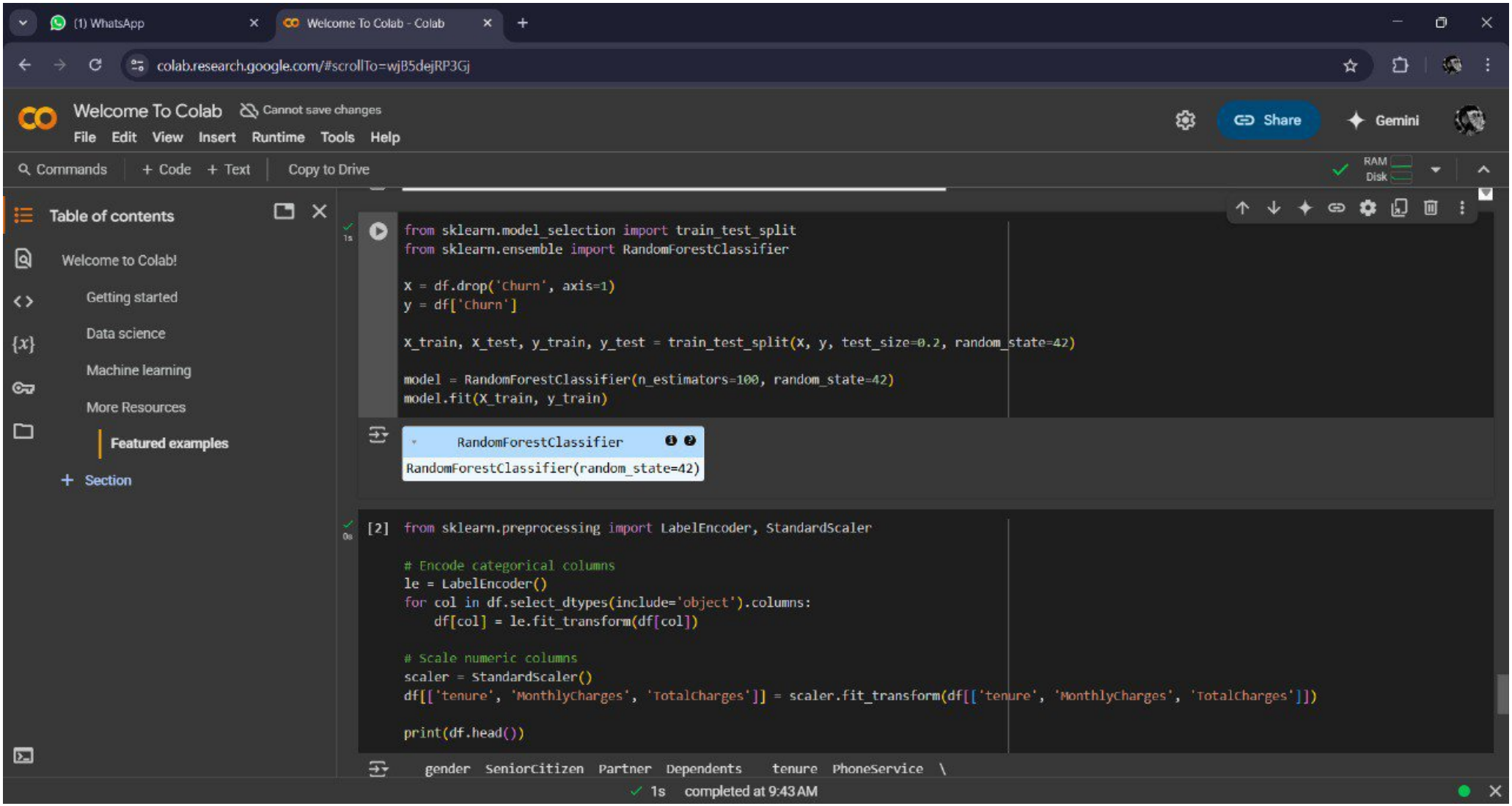
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from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestClassifier
X = df.drop('Churn', axis=1)
y = df['Churn']
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
model = RandomForestClassifier(n_estimators=100, random_state=42)
model.fit(X_train, y_train)
RandomForestClassifier
RandomForestClassifier(random_state=42)
[2]
from sklearn.preprocessing import LabelEncoder, StandardScaler
# Encode categorical columns
le = LabelEncoder()
for col in df.select_dtypes(include='object').columns:
df[col] = le.fit_transform(df[col])
# Scale numeric columns
scaler = StandardScaler()
df[['tenure', 'MonthlyCharges', 'TotalCharges']] = scaler.fit_transform(df[['tenure', 'MonthlyCharges', 'TotalCharges']])
print(df.head())
gender SeniorCitizen Partner Dependents tenure PhoneService \
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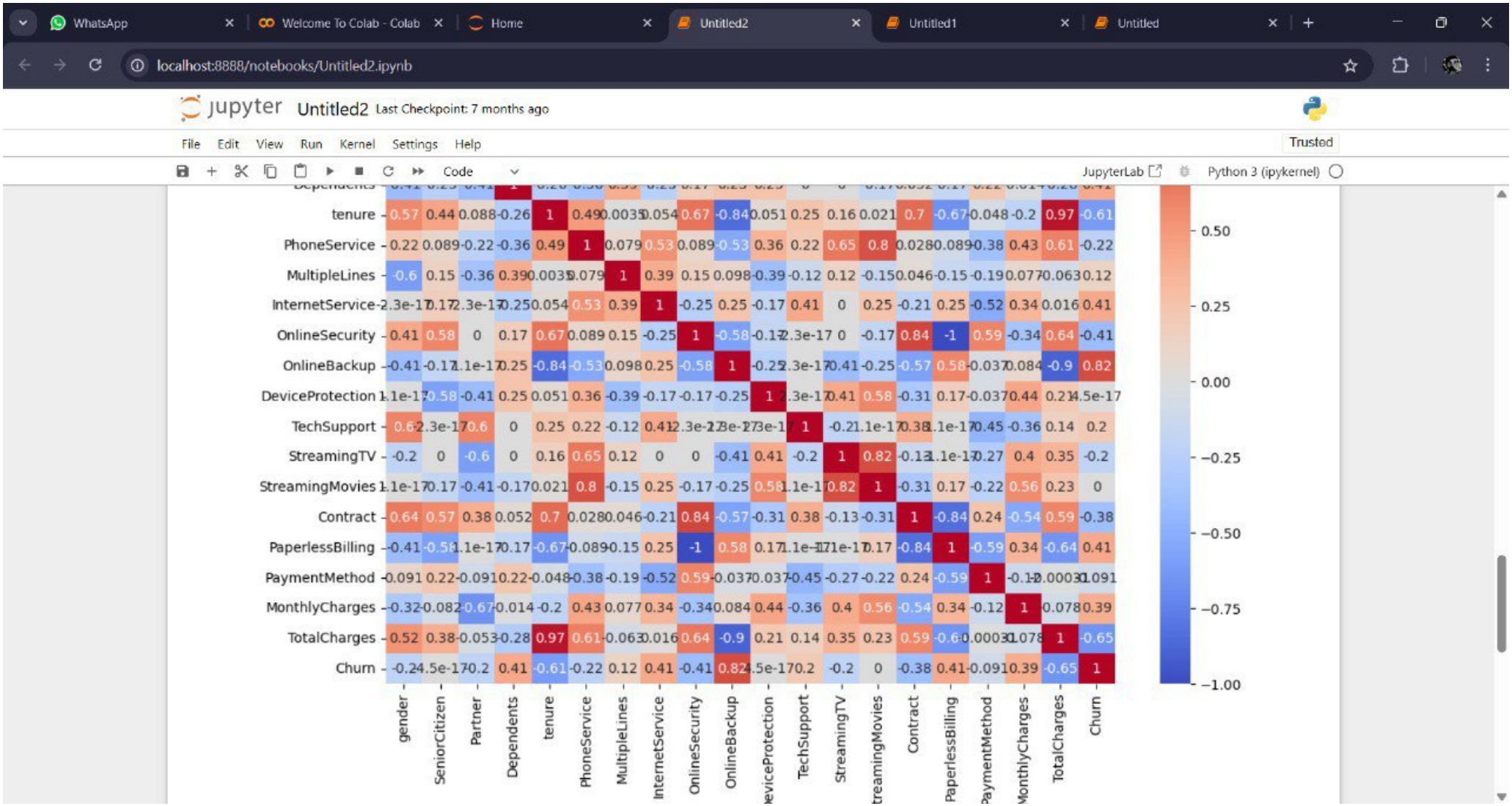
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localhost:8888/notebooks/Untitled2.ipynb
jupyter Untitled2 Last Checkpoint: 7 months ago
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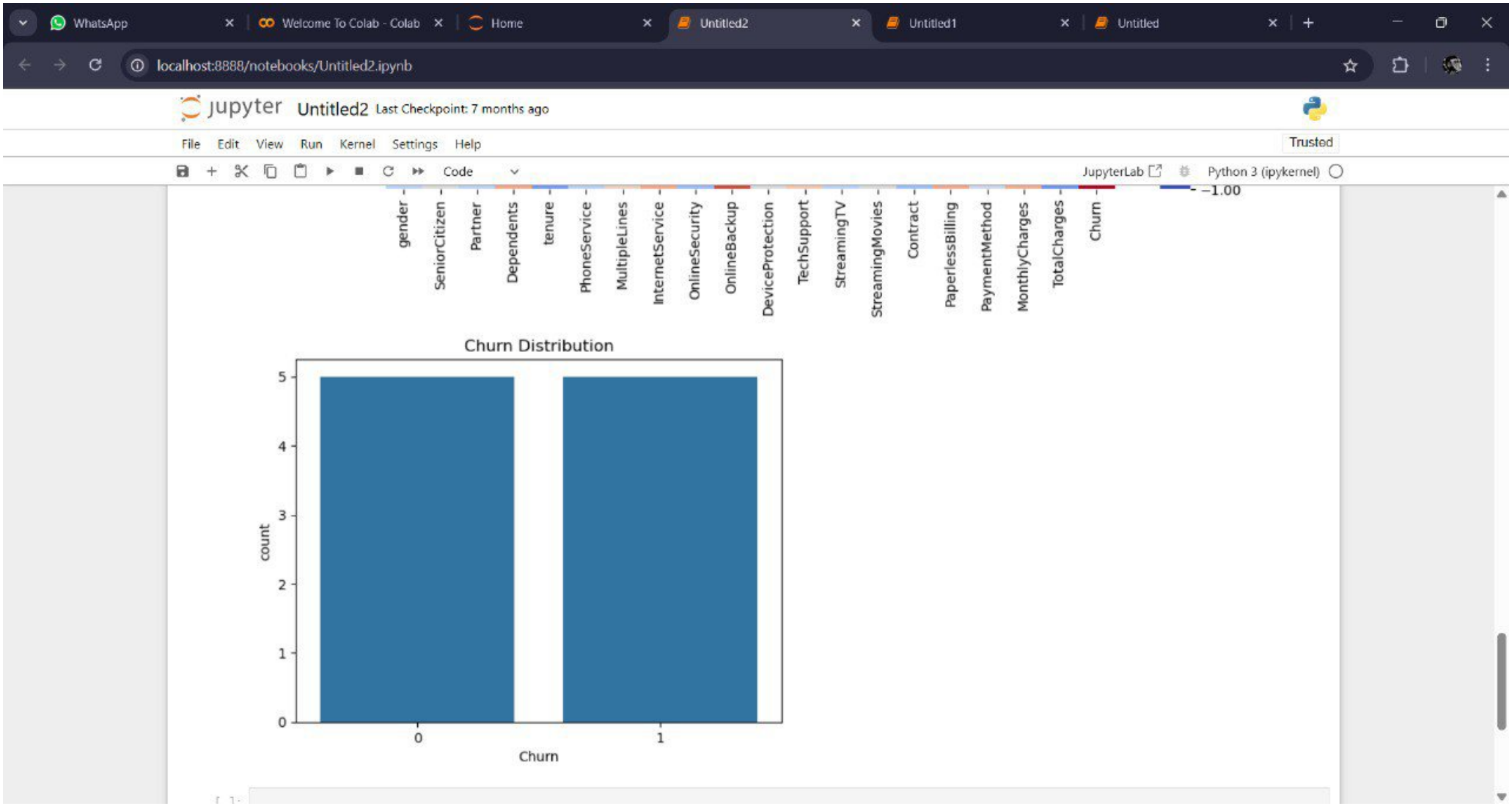
Code
JupyterLab
Python 3 (ipykernel)
tenure 0.57 0.44 0.088 -0.26 1 0.49 0.0035 0.054 0.67 -0.84 0.051 0.25 0.16 0.021 0.7 -0.67 0.048 -0.2 0.97 -0.61
PhoneService 0.22 0.089 -0.22 -0.36 0.49 1 0.079 0.53 0.089 -0.53 0.36 0.22 0.65 0.8 0.028 0.089 -0.38 0.43 0.61 -0.22
MultipleLines -0.6 0.15 -0.36 0.39 0.0035 0.079 1 0.39 0.15 0.098 -0.39 -0.12 0.12 -0.15 0.046 -0.15 -0.19 0.077 0.063 0.12
InternetService -2.3e-17 0.17 2.3e-17 0.25 0.054 0.53 0.39 1 -0.25 0.25 -0.17 0.41 0 0.25 -0.21 0.25 -0.52 0.34 0.016 0.41
OnlineSecurity 0.41 0.58 0 0.17 0.67 0.089 0.15 -0.25 1 -0.58 -0.17 2.3e-17 0 -0.17 0.84 -1 0.59 -0.34 0.64 -0.41
OnlineBackup -0.41 -0.17 1.1e-17 0.25 -0.84 -0.53 0.098 0.25 -0.58 1 -0.25 2.3e-17 0.41 -0.25 -0.57 0.58 -0.037 0.084 -0.9 0.82
DeviceProtection 1.1e-17 -0.58 -0.41 0.25 0.051 0.36 -0.39 -0.17 -0.17 -0.25 1 2.3e-17 0.41 0.58 -0.31 0.17 -0.037 0.44 0.21 4.5e-17
TechSupport 0.6 2.3e-17 0.6 0 0.25 0.22 -0.12 0.41 2.3e-17 2.3e-17 2.3e-17 1 -0.21 1.1e-17 0.38 1.1e-17 0.45 -0.36 0.14 0.2
StreamingTV -0.2 0 -0.6 0 0.16 0.65 0.12 0 0 -0.41 0.41 -0.2 1 0.82 -0.13 1.1e-17 0.27 0.4 0.35 -0.2
StreamingMovies 1.1e-17 0.17 -0.41 -0.17 0.021 0.8 -0.15 0.25 -0.17 -0.25 0.58 1.1e-17 0.82 1 -0.31 0.17 -0.22 0.56 0.23 0
Contract 0.64 0.57 0.38 0.052 0.7 0.028 0.046 -0.21 0.84 -0.57 -0.31 0.38 -0.13 -0.31 1 -0.84 0.24 -0.54 0.59 -0.38
PaperlessBilling -0.41 -0.58 1.1e-17 0.17 -0.67 -0.089 -0.15 0.25 -1 0.58 0.17 1.1e-17 1.1e-17 0.17 -0.84 1 -0.59 0.34 -0.64 0.41
PaymentMethod -0.091 0.22 -0.091 0.22 -0.048 -0.38 -0.19 -0.52 0.59 -0.037 -0.037 -0.45 -0.27 -0.22 0.24 -0.59 1 -0.11 0.00031 0.091
MonthlyCharges -0.32 -0.082 -0.67 -0.014 -0.2 0.43 0.077 0.34 -0.34 0.084 0.44 -0.36 0.4 0.56 -0.54 0.34 -0.12 1 0.078 0.39
TotalCharges 0.52 0.38 -0.053 -0.28 0.97 0.61 -0.063 0.016 0.64 -0.9 0.21 0.14 0.35 0.23 0.59 -0.6 0.00031 0.078 1 -0.65
Churn -0.24 4.5e-17 0.2 0.41 -0.61 -0.22 0.12 0.41 -0.41 0.82 4.5e-17 0.2 -0.2 0 -0.38 0.41 -0.091 0.39 -0.65 1
gender
SeniorCitizen
Partner
Dependents
tenure
PhoneService
MultipleLines
InternetService
OnlineSecurity
OnlineBackup
TechSupport
StreamingTV
Contract
PaperlessBilling
PaymentMethod
MonthlyCharges
TotalCharges
Churn
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00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JupyterLab
Python 3 (ipykernel)
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SeniorCitizen
Partner
Dependents
tenure
PhoneService
MultipleLines
InternetService
OnlineSecurity
OnlineBackup
DeviceProtection
TechSupport
StreamingTV
StreamingMovies
Contract
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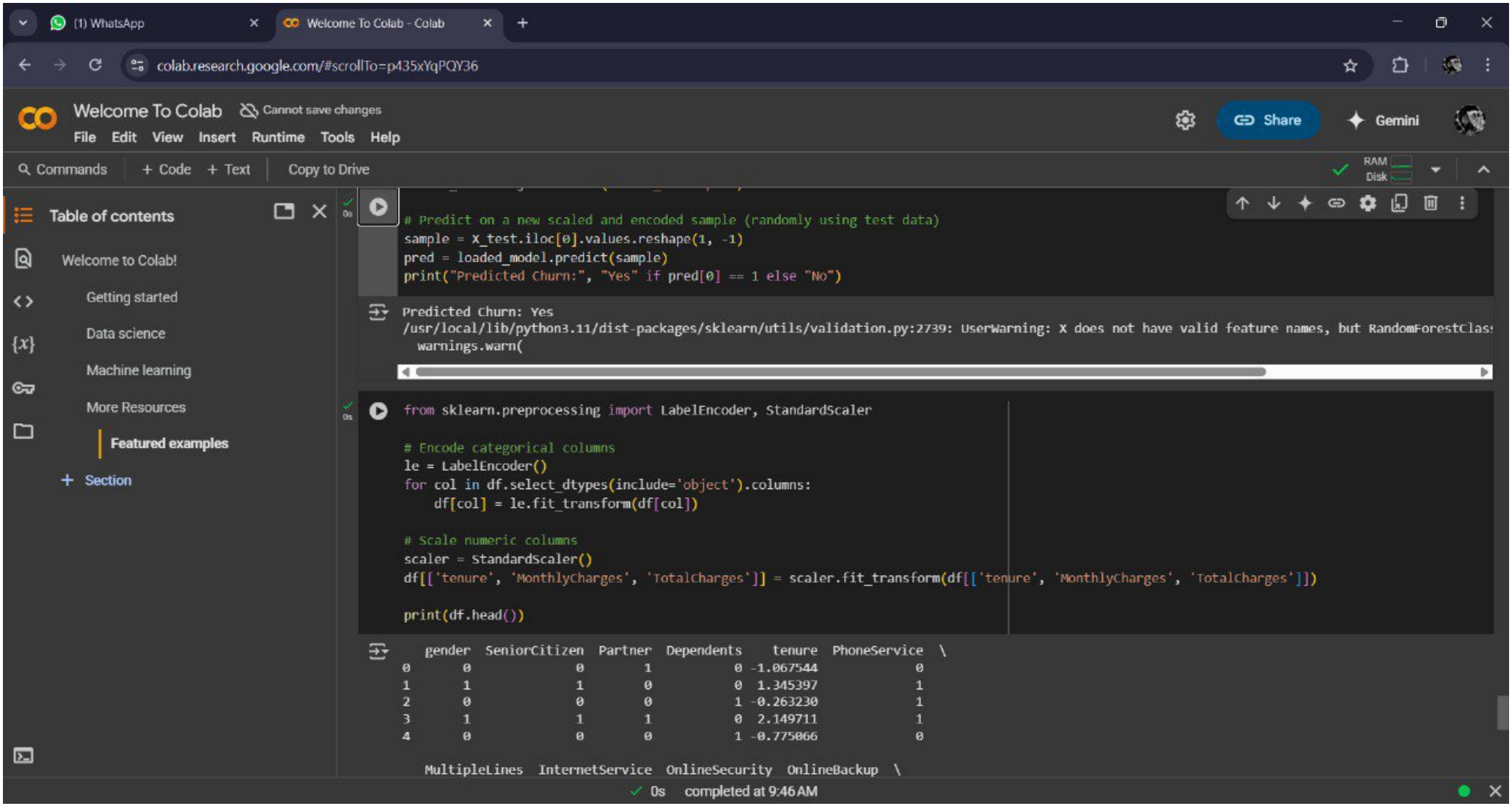
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# Predict on a new scaled and encoded sample (randomly using test data)
sample = X_test.iloc[0].values.reshape(1, -1)
pred = loaded_model.predict(sample)
print("Predicted Churn:", "Yes" if pred[0] == 1 else "No")
Predicted Churn: Yes
/usr/local/lib/python3.11/dist-packages/sklearn/utils/validation.py:2739: UserWarning: X does not have valid feature names, but RandomForestClas
warnings.warn(
from sklearn.preprocessing import LabelEncoder, StandardScaler
# Encode categorical columns
le = LabelEncoder()
for col in df.select_dtypes(include='object').columns:
df[col] = le.fit_transform(df[col])
# Scale numeric columns
scaler = StandardScaler()
df[['tenure', 'MonthlyCharges', 'TotalCharges']] = scaler.fit_transform(df[['tenure', 'MonthlyCharges', 'TotalCharges']])
print(df.head())
gender SeniorCitizen Partner Dependents tenure PhoneService \
0 0 0 1 0 -1.067544 0
1 1 1 0 0 1.345397 1
2 0 0 0 1 -0.263230 1
3 1 1 1 0 2.149711 1
4 0 0 0 1 -0.775066 0
MultipleLines InternetService OnlineSecurity OnlineBackup \
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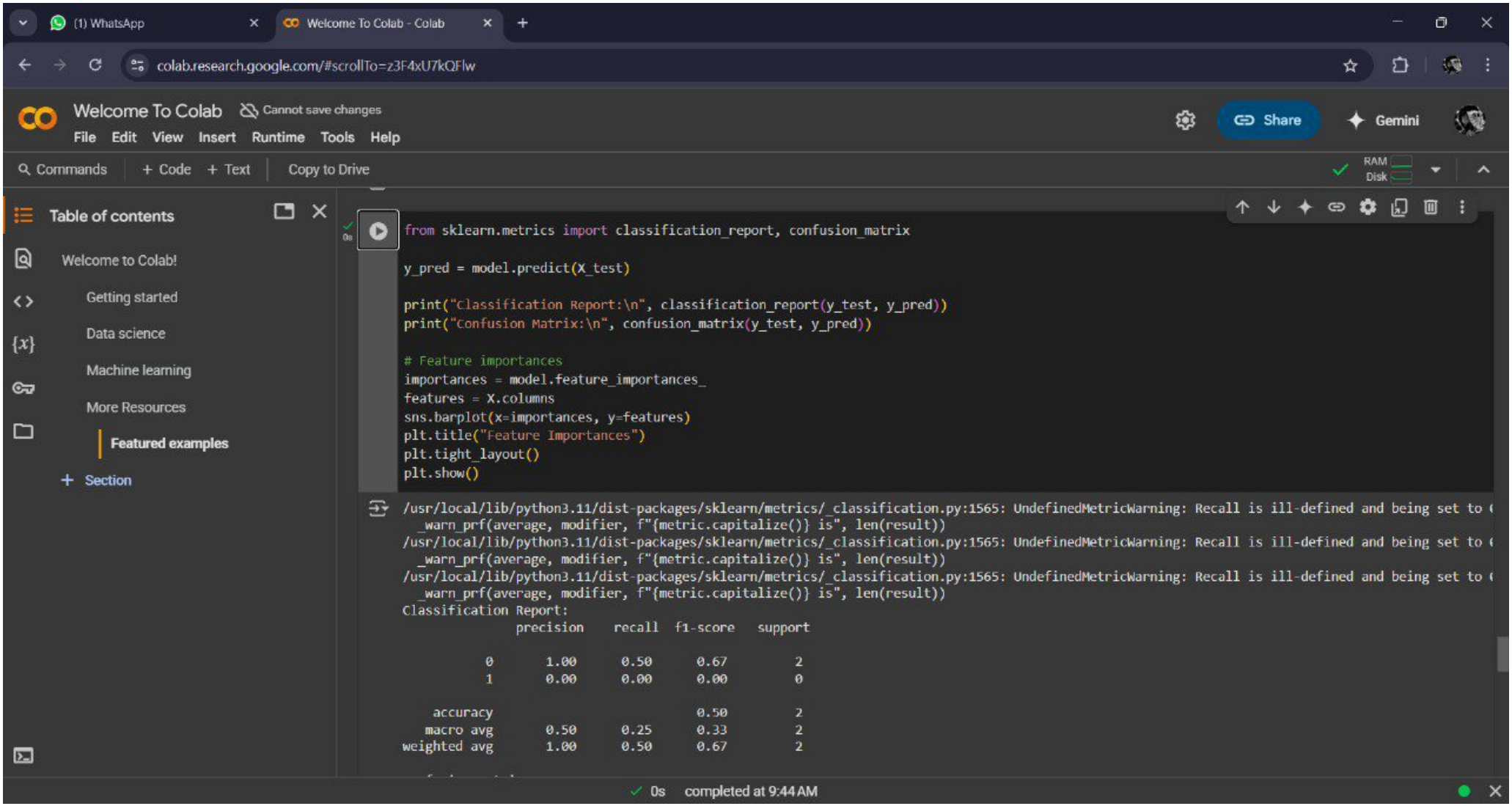
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from sklearn.metrics import classification_report, confusion_matrix
y_pred = model.predict(X_test)
print("Classification Report:\n", classification_report(y_test, y_pred))
print("Confusion Matrix:\n", confusion_matrix(y_test, y_pred))
# Feature importances
importances = model.feature_importances_
features = X.columns
sns.barplot(x=importances, y=features)
plt.title("Feature Importances")
plt.tight_layout()
plt.show()
/usr/local/lib/python3.11/dist-packages/sklearn/metrics/_classification.py:1565: UndefinedMetricWarning: Recall is ill-defined and being set to
_warn_prf(average, modifier, f"{metric.capitalize()} is", len(result))
/usr/local/lib/python3.11/dist-packages/sklearn/metrics/_classification.py:1565: UndefinedMetricWarning: Recall is ill-defined and being set to
_warn_prf(average, modifier, f"{metric.capitalize()} is", len(result))
/usr/local/lib/python3.11/dist-packages/sklearn/metrics/_classification.py:1565: UndefinedMetricWarning: Recall is ill-defined and being set to
_warn_prf(average, modifier, f"{metric.capitalize()} is", len(result))
Classification Report:
precision recall f1-score support
0 1.00 0.50 0.67 2
1 0.00 0.00 0.00 0
accuracy 0.50 2
macro avg 0.50 0.25 0.33 2
weighted avg 1.00 0.50 0.67 2
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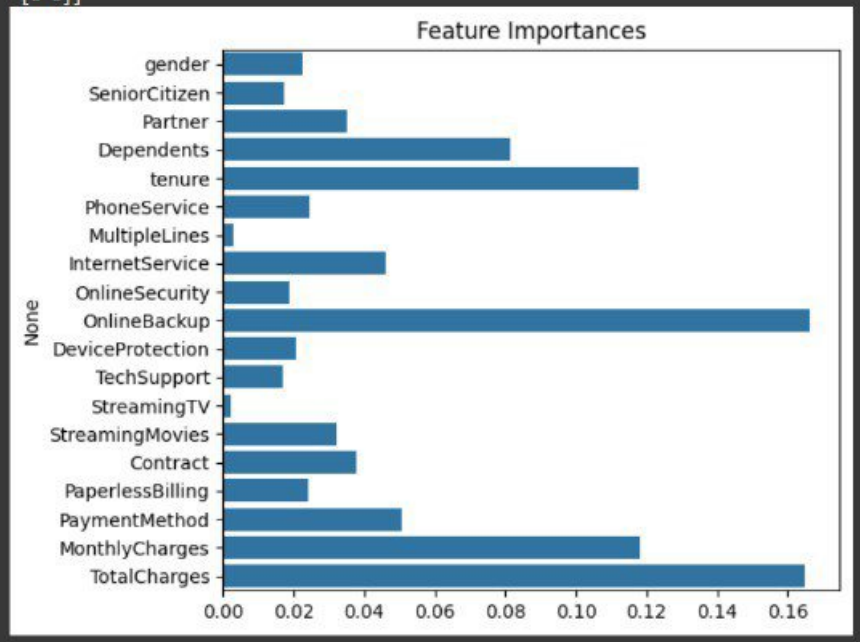
```
accuracy                           0.50         2
   macro avg       0.50      0.25      0.33         2
weighted avg       1.00      0.50      0.67         2

Confusion Matrix:
 [[1 1]
 [0 0]]
```



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