Pipeline 2

Technical Documentation and Evaluation Metrics

1. Model Overview

This document provides the technical assessment of the best-performing machine learning pipeline selected by **IBM watsonx.ai AutoAI** for the Telco Customer Churn Prediction project.

Detail	Value
Model Name	Telco Churn Prediction
Selected Pipeline	**Pipeline 2 (AutoAI Optimized)**
Core Algorithm	XGBoost Classifier (Likely)
Prediction Type	Binary Classification (Churn: Yes/No)
Platform	IBM watsonx.ai / AutoAI
Target Variable	Churn

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2. Performance Metrics (Değerlendirme Metrikleri)

The final model was evaluated on the holdout dataset to assess its generalization capability. These metrics confirm the model's reliability in predicting customer churn.

Metric	Score	Interpretation
Accuracy (Doğruluk)	**~80.5%**	The overall percentage of correctly classified predictions (Yes/No).

F1 Score	*[Insert F1 Score from AutoAI]*	Crucial metric for classification on imbalanced data.
ROC AUC	*[Insert ROC AUC Score from AutoAI]*	Measures the model's ability to distinguish between churners and non-churners (Closer to 1.0 is better).
Log Loss	*[Insert Log Loss Score from AutoAI]*	Measures the uncertainty of the probability predictions (Lower is better).

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3. Key Visualizations and Interpretability (Ana Görseller ve Yorumlanabilirlik)

A. Feature Importance (Özellik Önem Sıralaması)

This chart ranks the input variables based on their relative importance in predicting the target (Churn). This provides business context on which factors drive churn.

- **Top Predictors:** The most important features are often related to the customer's commitment and service satisfaction:
    1. **Contract** (e.g., Month-to-month contracts are high risk)
    2. **tenure** (Shorter tenure is high risk)
    3. **MonthlyCharges**
    4. **OnlineSecurity / TechSupport**

B. Confusion Matrix (Karışıklık Matrisi)

The confusion matrix shows the distribution of correct and incorrect predictions made by the model.

Actual \ Predicted	**No Churn (Predicted)**	**Churn (Predicted)**
No Churn (Actual)	**True Negatives** (Correctly predicted to stay)	**False Positives** (Incorrectly predicted to churn)
Churn (Actual)	**False Negatives** (Mistakenly predicted to stay – **High-Cost Error**)	**True Positives** (Correctly predicted to churn)

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4. Deployment and API Validation (Dağıtım ve API Doğrulama)

This model pipeline was successfully promoted to the Deployment Space and published as a real-time API Endpoint.

Endpoint Detail	Value
Deployment Name	churnapi
Public API Endpoint	https://eu-de.ml.cloud.ibm.com/ml/v4/deployments/churnapi/predictions?...
API Integration Result	Model successfully responded to a live HTTP request using an IAM Token.
Example Prediction Result	The high-risk sample customer was predicted to churn with **77.1% probability**.