# Cortex Certifai Sandbox Case-Studies

Section below contains details of Certifai Evaluation components that are common across each evaluation [use case / project]

> *Glossary of common terms*

### Models

This tab includes: - List of ML Models that are to evaluated using Cortex Certifai

### Evaluation Dataset

This tab includes: - an `Evaluation Dataset` of **X** no. of instances, used to assess global properties such as model robustness and fairness - **X** `Rows Explanations Dataset` containing **X** no. of instances for which counterfactual (CF) explanations are desired

### Evaluations

This tab shows the following evaluation results: - `Robustness` : Robustness is compared across all the pre-built models.

> *Higher means more robust*- `Fairness` : For Fairness, first the desired outcome along with the grouping feature needs to be specified. Panel on the left shows the fairness scores (*Higher is fairer*) for all the pre-built models. Panel on the Right compares the burden across the sub-groups specified by the grouping feature *similar bar lengths indicate fairer models*

- `Explanations` : Here one can specify the model (e.g. SVM) and theobservation (#), and then the CF explanation is displayed by highlighting the fields that change.

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## Use Cases Around Binary Classification

### Banking: Loan Approval

- In this use case, each entry in thedataset represents a person who takes a credit loan from a bank
- Learning task is to classify each person as either a good or bad credit risk based on the set of attributes of that person.
- Model predicts whether loan will be *granted* or *not-granted* based on the credit risk evaluation
- This dataset was sourced from Kaggle. Originally from the UCI Machine Learning Repository

  This use-case comes with 4 pre-trainedmodels, based respectively on

- SVM
- Logistic Regression

- Decision Tree
- Multi-Layered Perceptron.

  Evaluations:

  - Robustness
  - Fairness

## - Explanations

### HealthCare: Disease Prediction

- In this use case, each entry in the dataset represents a patient
- Learning task is to predict whether or not a patient has diabetes, based on certain diagnostic measurements included in the dataset
- Several constraints were placed on the selection of these instances from a larger database
- In particular, all patients here are females at least 21 years old of Pima Indian heritage
- This dataset was sourced from Kaggle. Originally from the National Institute of Diabetes and Digestive and Kidney Diseases

This use-case comes with 4 pre-trained models, based respectively on - SVM - Logistic Regression - Decision Tree - Multi-Layered Perceptron.

Evaluations: - Robustness

## - Explanations

### Banking: Propensity to Buy

- In this use case, each entry in the dataset represents a target of a previous marketing campaign
- Learning task is to predict who will make a term deposit with the bank as a result of a similar campaign
- This dataset was sourced from Kaggle. Originally from the UCI Machine Learning Repository

This use-case comes with 4 pre-trained models, based respectively on - SVM - Logistic Regression - Decision Tree - Multi-Layered Perceptron.

Evaluations: - Robustness - Fairness

## - Explanations

### Banking: Predicting Customer Churn

- In this use case, each entry in the dataset represents a customer or previous customer of the bank
- Learning task is to predict who is likely to quit as a customer
- This dataset was sourced from Kaggle

This use-case comes with 4 pre-trained models, based respectively on - SVM - Random Forest - Gradient

Boosting - Multi-Layered Perceptron.

Evaluations: - Robustness - Fairness

## - Explanations

### Finance: Income Prediction

- In this use case, each entry in the dataset represents attributes of a de-identified individual
- Learning task is to predict the income bracket of the individual, which has two possible values `>50K` and `<=50K`
- This dataset was sourced from UCI Machine Learning Repository

This use-case comes with 3 pre-trained models, based respectively on - Logistic Regression - Random Forest - XGBoost

Evaluations: - Robustness - Fairness

## - Explanations

# Use Cases Around Predicting a Numeric Value (Regression/Function approximation)

### Insurance: Auto Insurance Claims

- In this use case, each entry in the dataset represents an auto insurance claim
- Learning task is to predict the final settled claim amount
- This dataset was sourced from Emcien

This use-case comes with 5 pre-trained models, based respectively on - L1 Linear Regression - L2 Linear Regression - Neural Network - Random Forest Regressor - SVR

Evaluations: - Robustness - Fairness

## - Explanations

***Commonly Referenced Terms***

| *Terms* | *Meaning* |
|---|---|
| *Models* | *Machine Learning models that are to be evaluated using Certifai* |
| *Counterfactual* | *Alternative suggested feature values that would result in change of outcome* |
| *Robustness* | *Measure of how well models maintain an outcome given small changes to the data feature values. The more robust a model is, the greater the changes required to alter the outcome* |

| Fairness Terms | Meaning |
| --- | --- |
| *Fairness* | *Measure of amount of change required to alter the outcome for the different groups defined by the specified feature given the same model and dataset* |
| *Explanations* | *Comparison of the dataset features, original and counterfactual values for the change that must occur in a dataset with given restrictions to obtain a different outcome* |