FORTANIX TECHNICAL DOCUMENTATION

CONCEPTS

FORTANIX CONFIDENTIAL AI – SUPPORTED ALGORITHMS

VERSION 2.0

TABLE OF CONTENTS

1.0 INTRODUCTION

Welcome to the Fortanix Confidential AI User Guide. This document describes the various algorithms supported by Confidential AI. It also lists the modes and data types supported for each mode.

2.0 ALGORITHMS

ALGORITHM	MODES	PROBLEM SUPPORTED	DATATYPE SUPPORTED
Decision Trees	Inference and Learning	Classification Regression	Tabular
KNN (K-Nearest Neighbor)	Inference and Learning	Classification	Tabular
Logistic Regression	Inference and Learning	Regression	Tabular
SVM (Support Vector Machines)	Inference and Learning	Classification Regression	Tabular
Yolov5	Inference only	Object detection	Images
ResNet50	Inference only	Object Recognition	Images
Gradient-Boosted Trees	Inference and Learning	Classification Regression	Tabular
Gradient-Boosted Random Forest	Inference and Learning	Classification Regression	Tabular

2.1 DECISION TREES

The decision tree implementations provide a decision tree classifier and regression classes, capable of performing multi-class classification and applied to regression problems. The method uses a tree-like model of decisions and their possible consequences to predict the value of a target variable.

References:

- https://scikit-learn.org/stable/modules/tree.html
- https://en.wikipedia.org/wiki/Decision_tree

2.2 K-NEAREST NEIGHBORS (KNN)

The k-nearest neighbor implementation provides a supervised neighbors-based learning method for classification. The classifier implements learning based on the **k**-nearest neighbors of each query point, where **k** is an integer value specified by the user.

References:

- https://en.wikipedia.org/wiki/K-nearest_neighbors_algorithm
- https://scikit-learn.org/stable/modules/neighbors.html#nearest-neighbors-classification

2.3 LOGISTIC REGRESSION

Logistic regression is a statistical method for predicting certain classes or events existing such as pass/fail, high/medium/low, legit/fraud, healthy/unhealthy using a logistic function. The model is used in various fields, including the financial and healthcare sectors to predict the risk involved in the transaction, or to predict the risk of developing a given disease respectively.

References:

https://en.wikipedia.org/wiki/Logistic_regression

https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression

2.4 SUPPORT VECTOR MACHINES (SVM)

Support Vector Machines are supervised learning methods that analyse data used for classification, or regression in tasks such as outliers detection. Support Vector Classification (SVC) can efficiently perform both linear and non-linear classification, as it supports high dimensional spaces. The method of SVC can be extended to solve regression problems with the implemented method of Support Vector Regression (SVR).

References:

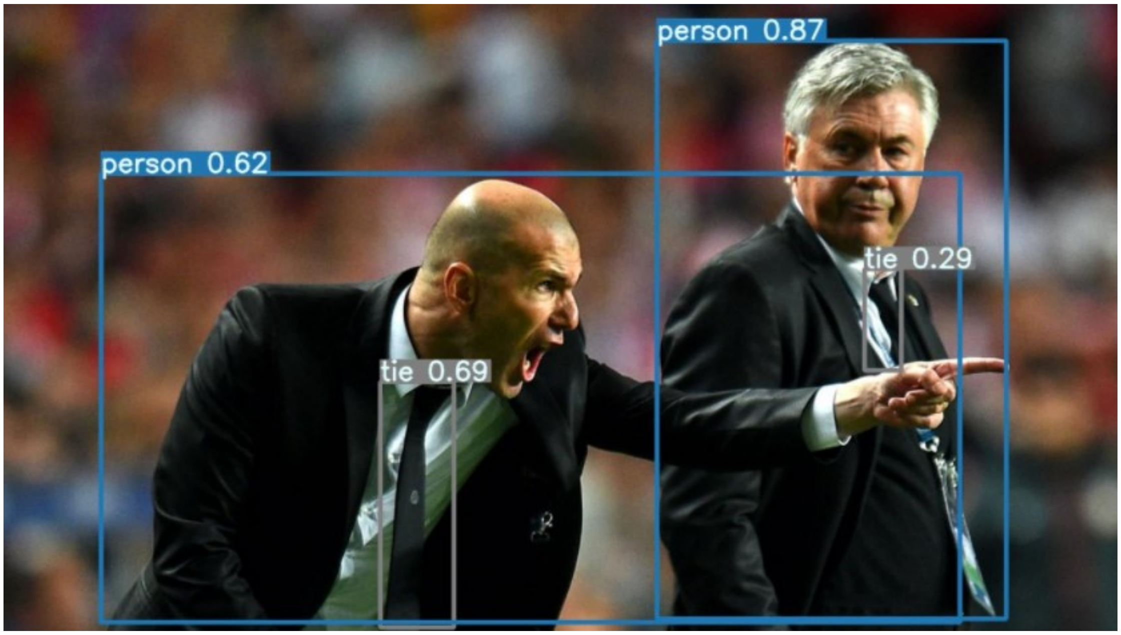
https://en.wikipedia.org/wiki/Support-vector_machine

https://scikit-learn.org/stable/modules/svm.html

2.5 YOLO VERSION 5

YOLO which means 'You only look once' is an object detection algorithm that divides images into a grid system. Each cell in the grid is responsible for detecting objects within itself. YOLOv5 is the latest release of the YOLO family of object detection algorithms trained on the COCO dataset and open-source research activity by Ultralytics.

Use the YOLOv5 implementation of Fortanix Confidential AI to securely detect objects in the input images, without revealing the input dataset or the objects detected. The detected objects will be shown inside boxes and the inferred label and accuracy of detection will be displayed.



References: https://docs.ultralytics.com/

2.6 DEEP RESIDUAL NETWORKS (RESNET50)

ResNet50 is a convolutional neural network that is 50 layers deep, trained by NVIDIA.

With more layers to the residual learning neural network, shortcut identity mappings are used to improve the error rate of the model.

The ResNet50 implementation of Fortanix Confidential AI is able to securely identify objects, without revealing the input dataset or the objects identified.

The detected objects will be provided in a tabular output file that contains the image name, the object identified, and the accuracy of identification.

References:

https://iq.opengenus.org/resnet50-architecture/

https://viso.ai/deep-learning/resnet-residual-neural-network/

2.7 XGBOOST – GRADIENT-BOOSTED DECISION TREES/RANDOM FORESTS

Standard Decision Trees use a True-False pattern for classification or regression in a chain of questions, whereas Gradient-Boosted Decision Trees use an ensemble learning algorithm. This system uses multiple decision trees with subsets of data, essentially using multiple weak tree models to create a stronger final model.

The Random Forest approach uses random bagging in order to create the initial tree subsets, but overall is similar, differing in the way the final results are put together.

Fortanix utilizes the XGBoost family of algorithms.

References:

https://www.nvidia.com/en-us/glossary/data-science/xgboost/

https://towardsdatascience.com/a-visual-guide-to-gradient-boosted-trees-8d9ed578b33

3.0 DOCUMENT INFORMATION

3.1 DOCUMENT LOCATION

The latest published version of this document is located at the URL:

https://support.fortanix.com/hc/en-us/articles/4412299051668-Confidential-AI-Algorithms

3.2 DOCUMENT UPDATES

This document will typically be updated on a periodic review and update cycle.

For any urgent document updates, please send an email to: support@fortanix.com

NOTICE: This document was produced by Fortanix, Inc. (Fortanix) and contains information which is proprietary and confidential to Fortanix. The document contains information that may be protected by patents, copyrights, and/or other IP laws. If you are not the intended recipient of this material, please destroy this document and inform info@fortanix.com immediately.