Supervised learning

Unsupervised learning

Semi-supervised learning

Self-supervised learning

Reinforcement learning

Meta-learning

Online learning

Batch learning

Curriculum learning

Rule-based learning

Neuro-symbolic AI

Neuromorphic engineering

Quantum machine learning

Classification

Generative modeling

Regression

Clustering

Dimensionality reduction

Density estimation

Anomaly detection

Data cleaning

AutoML

Association rules

Semantic analysis

Structured prediction

Feature engineering

Feature learning

Learning to rank

Grammar induction

Ontology learning

Multimodal learning

Apprenticeship learning

Decision trees

Ensembles Bagging Boosting Random forest

Bagging

Boosting

Random forest

k -NN

Linear regression

Naive Bayes

Artificial neural networks

Logistic regression

Perceptron

Relevance vector machine (RVM)

Support vector machine (SVM)

BIRCH

CURE

Hierarchical

k -means

Fuzzy

Expectation–maximization (EM)

DBSCAN

OPTICS

Mean shift

Factor analysis

CCA

ICA

LDA

NMF

PCA

PGD

t-SNE

SDL

Graphical models Bayes net Conditional random field Hidden Markov

Bayes net

Conditional random field

Hidden Markov

RANSAC

k -NN

Local outlier factor

Isolation forest

Autoencoder

Deep learning

Feedforward neural network

Recurrent neural network LSTM GRU ESN reservoir computing

LSTM

GRU

ESN

reservoir computing

Boltzmann machine Restricted

Restricted

GAN

Diffusion model

SOM

Convolutional neural network U-Net LeNet AlexNet DeepDream

U-Net

LeNet

AlexNet

DeepDream

Neural field Neural radiance field Physics-informed neural networks

Neural radiance field

Physics-informed neural networks

Transformer Vision

Vision

Mamba

Spiking neural network

Memtransistor

Electrochemical RAM (ECRAM)

Q-learning

Policy gradient

SARSA

Temporal difference (TD)

Multi-agent Self-play

Self-play

Active learning

Crowdsourcing

Human-in-the-loop

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Rule-based machine learning (RBML) is a term in computer science intended to encompass any machine learning method that identifies, learns, or evolves 'rules' to store, manipulate or apply. [1] [2] [3] The defining characteristic of a rule-based machine learner is the identification and utilization of a set of relational rules that collectively represent the knowledge captured by the system.

Rule-based machine learning approaches include learning classifier systems , [4] association rule learning , [5] artificial immune systems , [6] and any other method that relies on a set of rules, each covering contextual knowledge.

While rule-based machine learning is conceptually a type of rule-based system, it is distinct from traditional rule-based systems , which are often hand-crafted, and other rule-based decision

makers. This is because rule-based machine learning applies some form of learning algorithm such as Rough sets theory [7] to identify and minimise the set of features and to automatically identify useful rules, rather than a human needing to apply prior domain knowledge to manually construct rules and curate a rule set.

Rules

Rules typically take the form of an '{IF:THEN} expression' , (e.g. { IF 'condition' THEN 'result'}, or as a more specific example, {IF 'red' AND 'octagon' THEN 'stop-sign}). An individual rule is not in itself a model, since the rule is only applicable when its condition is satisfied. Therefore rule-based machine learning methods typically comprise a set of rules, or knowledge base , that collectively make up the prediction model usually known as decision algorithm. Rules can also be interpreted in various ways depending on the domain knowledge, data types(discrete or continuous) and in combinations.

RIPPER

Repeated incremental pruning to produce error reduction (RIPPER) is a propositional rule learner proposed by William W. Cohen as an optimized version of IREP. [8]

See also

Learning classifier system

Association rule learning

Associative classifier

Artificial immune system

Expert system

Decision rule

Rule induction

Inductive logic programming

Rule-based machine translation

Genetic algorithm

Rule-based system

Rule-based programming

RuleML

Production rule system

Business rule engine

Business rule management system

References