Discovering Feature Value Importance of Tabular Data as Probabilistic Rules

BenAI Research Lab

Abstract

Given a dataset that contains tabular data as features and *deterministic* target(s), a.k.a. classification, samples labelled positive to specific target constitute a high dimensional space termed the Target Space (TS) which might also contain non-positive samples, Constrained Target Space (CTS) in different representations are to be discovered to effectively explain TS. The DoNde algorithm aims to discover CTS as probabilistic rules which usually show propensities or similarities to target(s) and the probability of a rule is the importance of different values constrained by multivariate to target(s). The discovered rules could be any probability, extend to diverse dimensions such as uni-space that has a common target, handle many data types including continuous, discrete (numerical/categorical), sequential (time-series/events). By defining representations of rules and introducing an objective function for optimisation, an ensemble model is trained using efficiently sampled tuples to find optimal rules that could: *) explain data either perfectly or with probabilities; *) assist identification of subgroups and similarities.

1. Problem Formulation

Given a dataset that contains tabular data as features and *deterministic* target(s), aka classification, all the samples in the dataset constitute a high dimensional space termed the Max Known Space (MKS), the dimensions of which could be continuous, discrete (categorical/numerical), sequential (time-series/events), depending on the data type of features and effects to the target, and there might exist subspace as a whole termed uni-space that has a common target and various features of different data types inside. Samples labelled positive to a specific target constitute the Target Space (TS) and the rest samples are non-positive to that target. In order to discover Constrained Target Spaces (CTS) to explain TS, we need to: *) define representations of CTS; *) discover optimal parameters of CTS; *) obtain data for training and prediction; *) find objective function for optimisation.