Motivation

Reducing redundancy in stored information
Approximation of decisions by reducing captured information
Reducing time for learning and decision
Exponentially growing memory capacity

Goals

1. Comparing and benchmarking the data structures for capturing decision information.
   In order to provide the right benchmark there is a need for defining the common interface, which we call decision algebra DA. It provides us with the number of standard operations on these data structures.

2. Contributing to a classification of an existing technology in a field.

Decision function representation:

Let DF be a set of all decision functions df over the decision values D. Each df has a unique decision tree representation: \( G_2 = (N, E, r) \), where \( N \in DF \) is a set of nodes, \( E \) is a set of edges, and \( r \in DT \) is the root of the tree. Each df is a subgraph of a larger graph which represents the whole decision domain.

Algebraic laws:

\[ \text{Learn: } DF \times DF \times \ldots \times DF_{\text{attr}} \rightarrow DA \times \ldots \times DA_{\text{attr}}, D > \]

Decision lattice implementation:

Since all the operations are defined, we can even provide axioms of decision algebra OP: \( \{\cup, \cap, \top, \bot, \triangledown, \triangleright, \downarrow\} \). The set of df form the decision lattice DL = (DF, OP), where dfs are partially ordered, \( T \) is the set of all possible decision values, and \( \bot \) is the empty set (“don’t know” situation in classification).

Conclusions:

• Replication, duplication : non redundant DL.
• Ambiguity, fragmentation :
  • Reordering \( \rightarrow \) Evert;
  • Partitioning \( \rightarrow \) Approximation;

Future work:

• More thorough analysis of the technologies to be classified.
• Introduce current learning algorithms and data structures implementation as alternative implementations of DL.

Selected references:


Contact information:
PhD student Antonina Khairova
Linnaeus University, Sweden www.lnu.se
E-mail: antonina.khairova@lnu.se