A Quantum-Like Analysis of a Real Life Financial Scenario: The Dutch's Bank Loan Application

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Quantum-Like Bayesian Networks (QLBN) are used in quantum cognition to explain human decision problems. In this work, we apply a QLBN to human decision tasks in the financial domain with the aim to model a real life financial log of a loan application belonging to a bank in the Netherlands. The log is robust in terms of data, containing a total of 262 200 event logs, belonging to 13 087 credit applications. A customer selects a certain amount of money and submits his request to the bank's web platform. Some automatic tasks are triggered and it is verified if an application is eligible for credit. The dataset is heterogeneous and consists of a mixture of computer generated automatic processes and manual human tasks.

We investigate the capabilities of QLBN in this real life financial scenario in order to not only assess potential areas of improvement of the institution's internal operations, but also to use the information acquired during the analysis of the business process to make predictions about the outcome of certain events related to the loan application. However, this poses some challenging and interesting problems. First, there is the need to process the large amounts of log events and extract the necessary information. Second, a visualization tool is necessary in order to understand and determine the structure, order and dependencies of each operational task. Third, given a structure, an automatic machine learning algorithm is required in order to learn the conditional probabilities associated to each task given its parents' tasks. Only after these steps are completed, it is possible to analyze and perform quantum-like probabilistic inferences and predictions for the data.

In this work, we give primary focus to human tasks, since they are more susceptible to errors. We will also introduce uncertainty by disturbing the learning dataset (making some events unknown) and verify how the Quantum-Like and Classical Bayesian networks predict the data.