A CONSTRUCTION IN DETAILS

A.1 Bayesian Notation Example

The construction tree for Bayesian notation is shown in Figure 5.

A.2 Area Diagram Example

The full construction of the Area Diagram is shown in Figure 6.

B GENERALISATION EXAMPLES

B.1 Various Probability Problems

The system is applicable to various of mathematical problems. One single variable single expression probability system of $Pr(A) = 0.3$ is shown in Figure 7.

Another example with two variables and three expressions, including negation, is shown in Figure 8.

B.2 Complete Graph Example

The framework is applicable to more diagrams, for example, the complete Graph representation construction is shown in the Figure 9. Counting the number of edges in two ways, we can prove $1 + 2 + 3 = \frac{3\times4}{2}$, or generally $1 + ... + n = \frac{n\times(n+1)}{2}$.

B.3 Venn Diagrams for Propositional Logic

RST can be applied to propositional logic expressions and Venn diagrams as well. One example is shown in Figure 10, for propositional logic expression $(((q \wedge p) \wedge p) \vee r) \vee p$, and $((q \Rightarrow (r \vee p)) \Rightarrow p) \Rightarrow \neg q$, along with corresponding the transformation to Binary Decision Diagrams (BDD).

C COGNITIVE INTELLIGENCE ANALYSIS

C.1 Comparison of Different Diagrams

Figure 11 shows two-column side by side comparison of Contingency Tables and Probability Tree representations, for the same problem and user level.

C.2 Comparison Cognitive Costs for Different User Levels

The screenshot in Figure 12 shows the cognitive cost tables for beginner user and expert user so we can compare the cognitive load different representations place on users with different levels of expertise.

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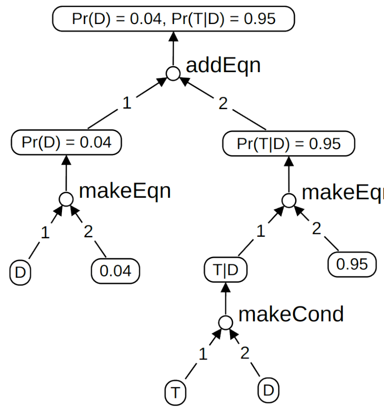


Figure 5: Bayesian notation construction tree structure in representation system theory (RST).

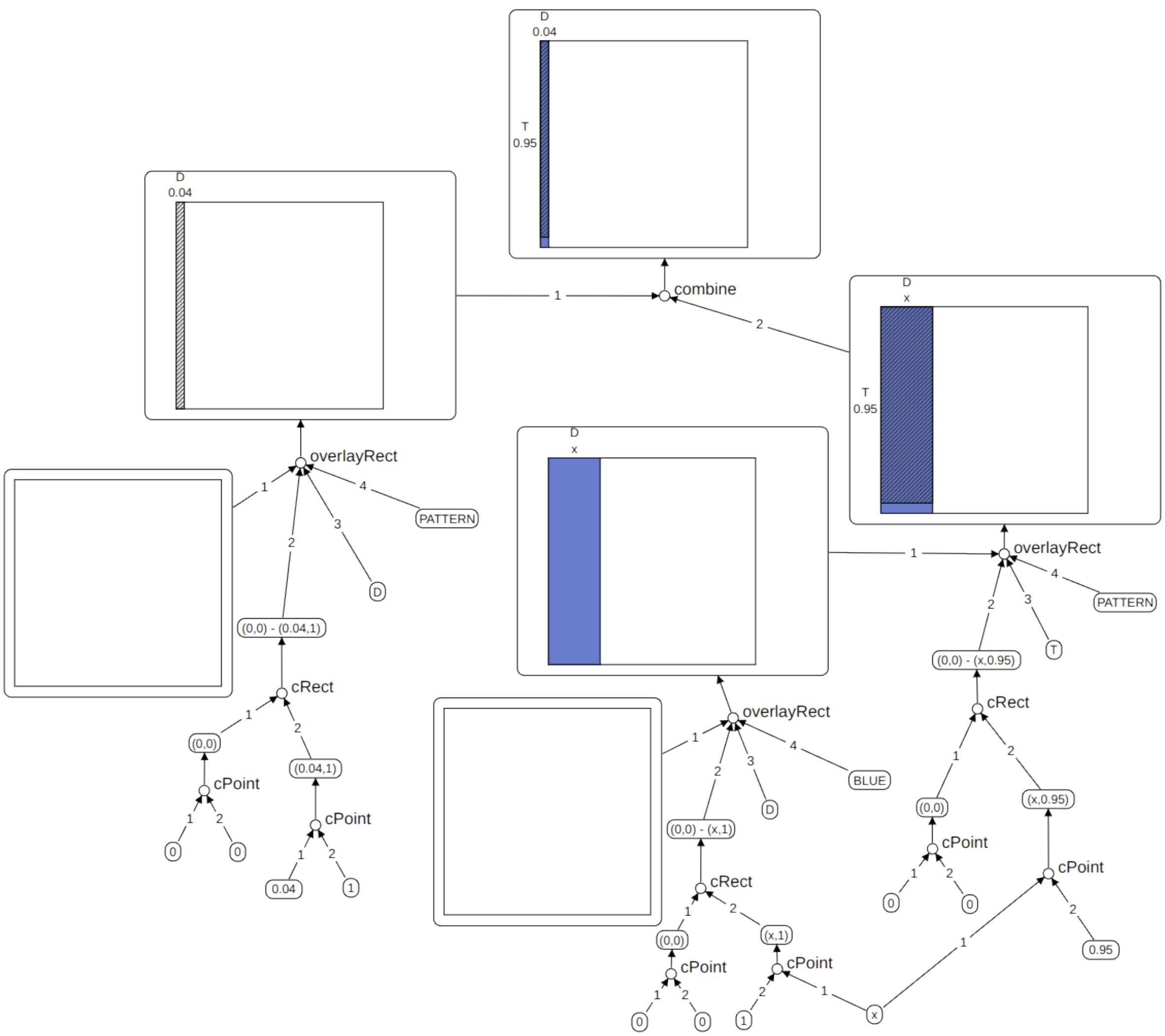


Figure 6: Construction of an Area diagram in representation system theory (RST).

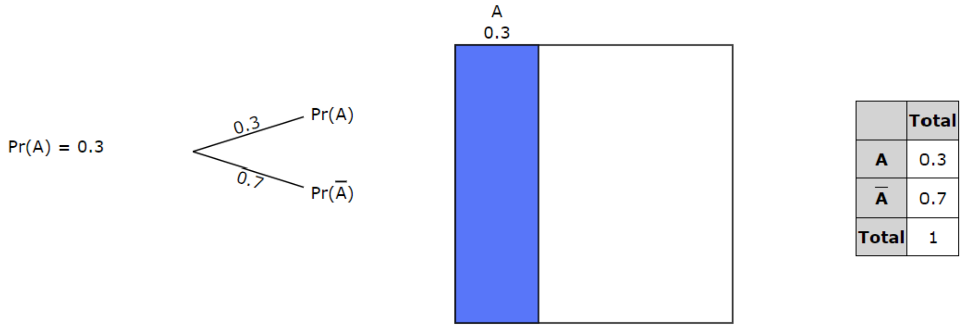


Figure 7: Four representations of a simple probability system.

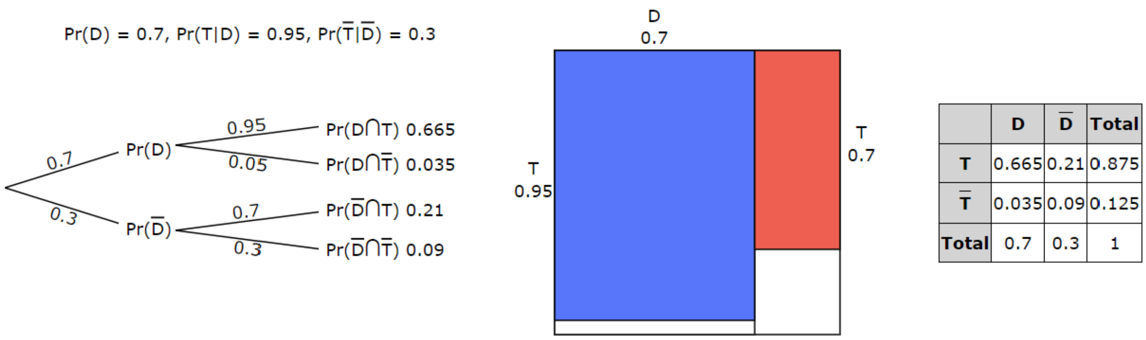


Figure 8: Four representations of another probability system.

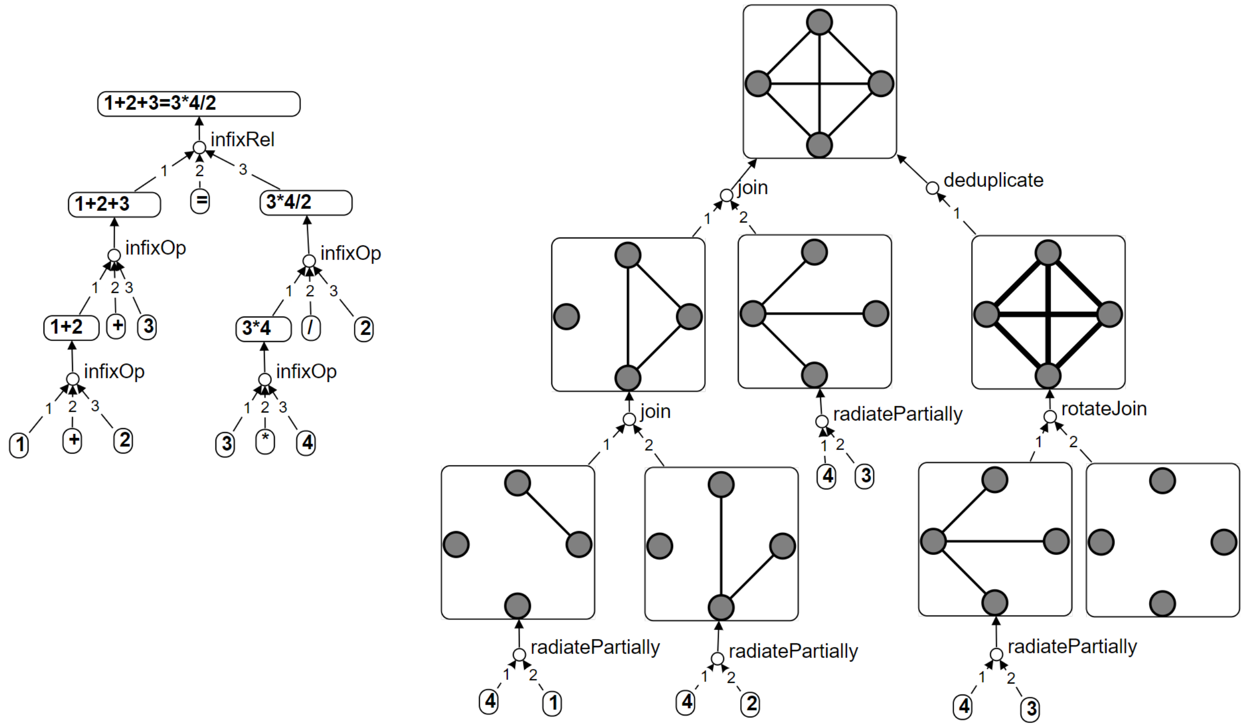
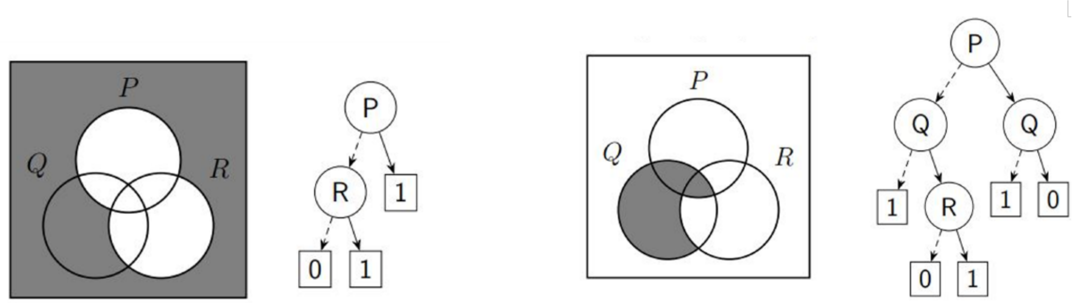


Figure 9: Complete Graph: counting the number of edges in two ways we can prove $1+2+3 = \frac{3\times4}{2}$**, or generally** $1+\ldots+n = \frac{n\times(n+1)}{2}$**.**



(a) (((q∧p)∧p)∨r)∨p **(b)** ((q⇒(r∨p))⇒p)⇒¬q

Figure 10: Venn Diagrams for propositional logic expression $(((q \wedge p) \wedge p) \vee r) \vee p$**, and** $((q \Rightarrow (r \vee p)) \Rightarrow p) \Rightarrow \neg q$**.**

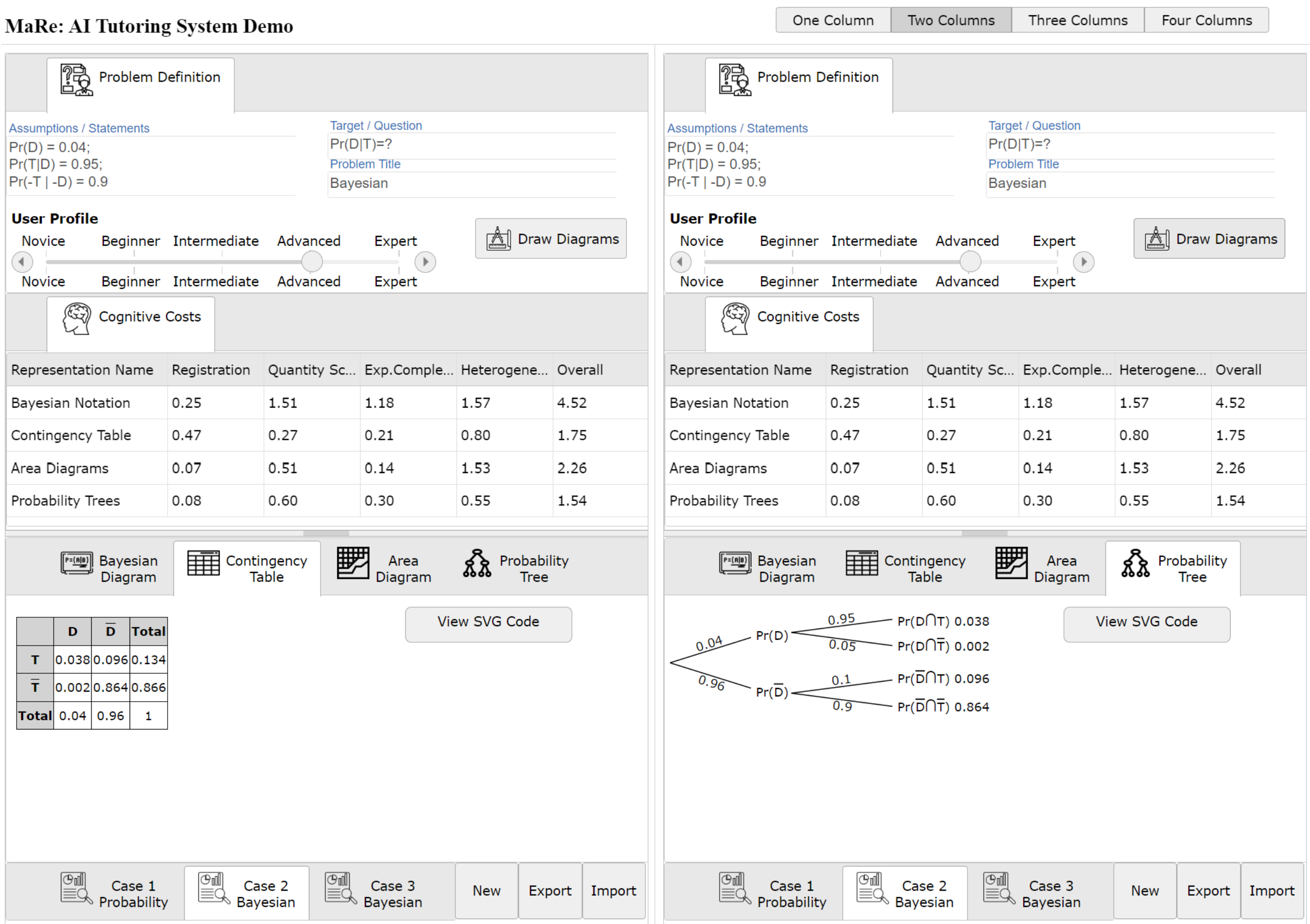


Figure 11: Side by side comparison of Contingency Table and Probability Tree representations for the same level of user expertise.

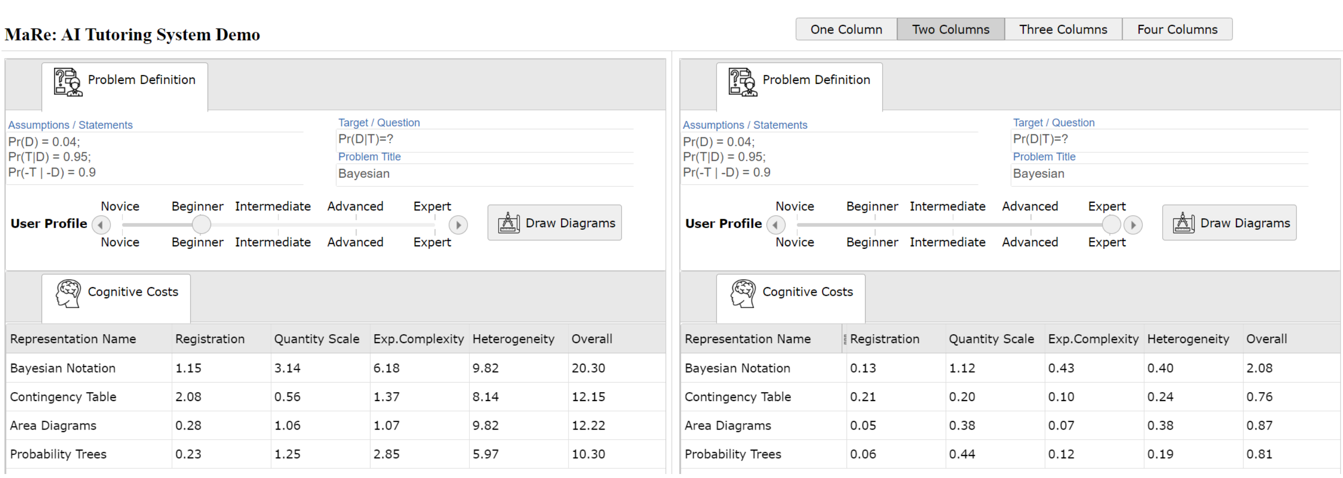


Figure 12: Cognitive cost tables for beginner versus expert users.