

# A Table-Based Representation for Probabilistic Logic: Preliminary Results

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## DMN

BMI Level		
U	BMI	BMI Level
1	< 18.5	Underweight
2	[18.5..25]	Normal
3	> 25	Overweight

Healthy		
U	BMI Level	Healthy
1	Normal	Yes
2	Overweight, Underweight	No

- Decision Model and Notation (DMN)
- Notation for (deterministic) decision logic
- User-friendly, intuitive
- Logic expressed in tables
  - Output (blue) is defined by input (green)
  - Each row represents a decision rule
  - “If BMI < 18.5, BMI Level is Underweight”

## ProbLog

```

0.36::vaccine(X, a); 0.63::vaccine(X, b); 0.01::vaccine(X, n) :-
    person(X)

0.8 :: infected(X) :- vaccine(X, n), infected(Y), contacted(X, Y)
0.1 :: infected(X) :- vaccine(X, a), infected(Y), contacted(X, Y)
0.2 :: infected(X) :- vaccine(X, b), infected(Y), contacted(X, Y)
    
```

- ProbLog is a probabilistic extension of Prolog
- Form of Probabilistic Logic Programming (PLP)
- Very expressive!
- Notation can be confusing for domain expert

## Probabilistic Decision Model and Notation

pDMN: combines DMN with probabilistic logic programming

- Aims to support ProbLog's **expressiveness**
- ...while maintaining DMN's **readability** and **user-friendliness!**
- Concepts are declared in a *glossary*
- Logic is contained in the decision tables:
  - which can now contain probabilities;
  - can have a new hit policy, *Ch(oice)*;
  - and support quantification.
- *Query* table is used to indicate required output
- pDMN can be unambiguously translated to ProbLog!

Infection				
U	X contacted Y	Y is infected	vaccine of X	X is infected
				Yes
1	Yes	Yes	n	0.8
2	Yes	Yes	a	0.1
3	Yes	Yes	b	0.2

Vaccine				Query
Ch	vaccine of X			
	a	b	n	vaccine of bob
1	0.36	0.63	0.01	X is infected

<https://gitlab.com/EAVISE/cdmn/pdmn>

## Future work

- Further extend the notation to support more hit policies, such as C and C+
- Formalize complete pDMN semantics
- Extend Decision Requirements Diagram (DRD) to support probabilities
- Implement user-friendly interface for the system