MULTI-LAYER BELIEF MODEL

CONNECTING DEMPSTER-SHAFER THEORY AND THE TOPOLOGY OF EVIDENCE

Universiteit van Amsterdam
ILLC

INPUT

Total set: ● ● ● ●

Pieces of evidence (● ● , p1)
+ : (● ● , p2)
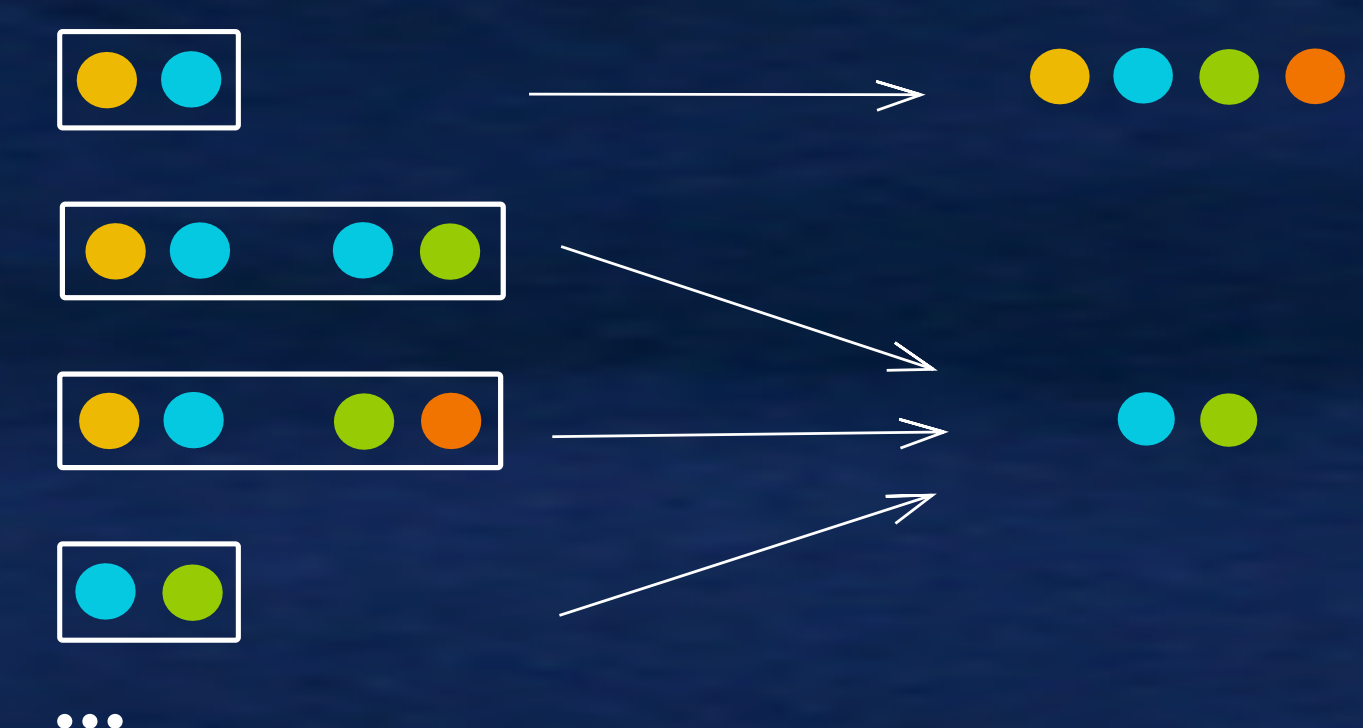Certainty degree (● ● , p3)

LAYER I

Selection of justifications

Evidence   Arguments   Justifications

LAYER II

Combination of values

● ● ● ⟼ p1·(1-p2)·(1-p3)

● ● ● ⟼ p1·p2·(1-p3)

● ● ● ⟼ p1·p3·(1-p2)

● ● ⟼ p2·(1-p1)·(1-p3)

...   ...
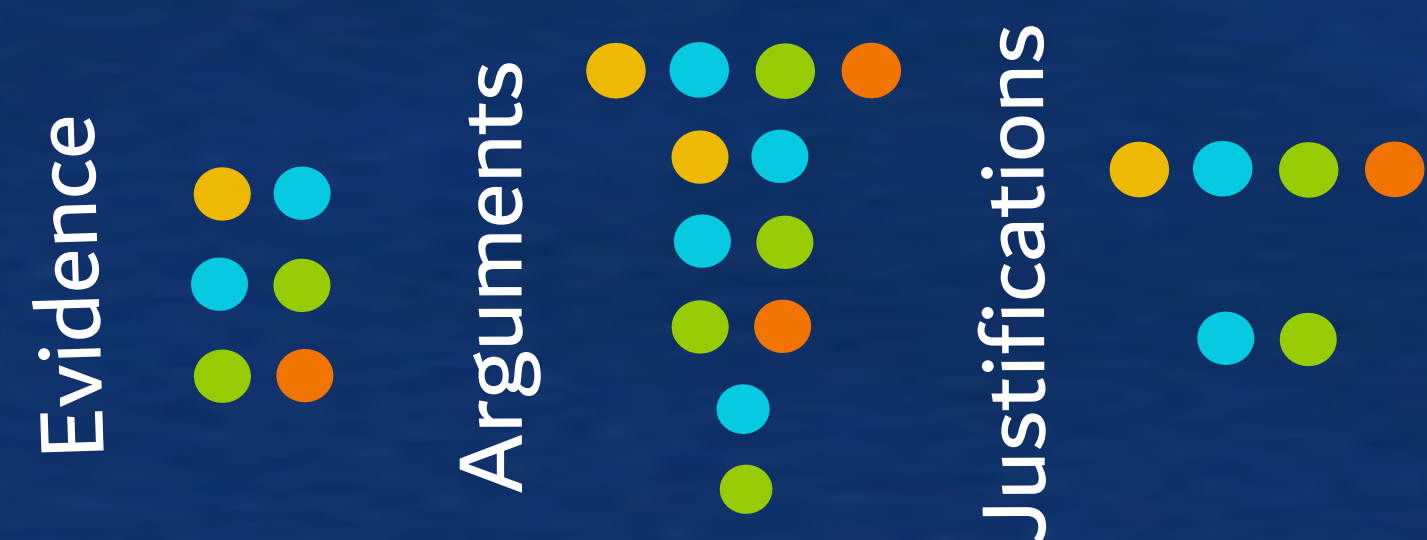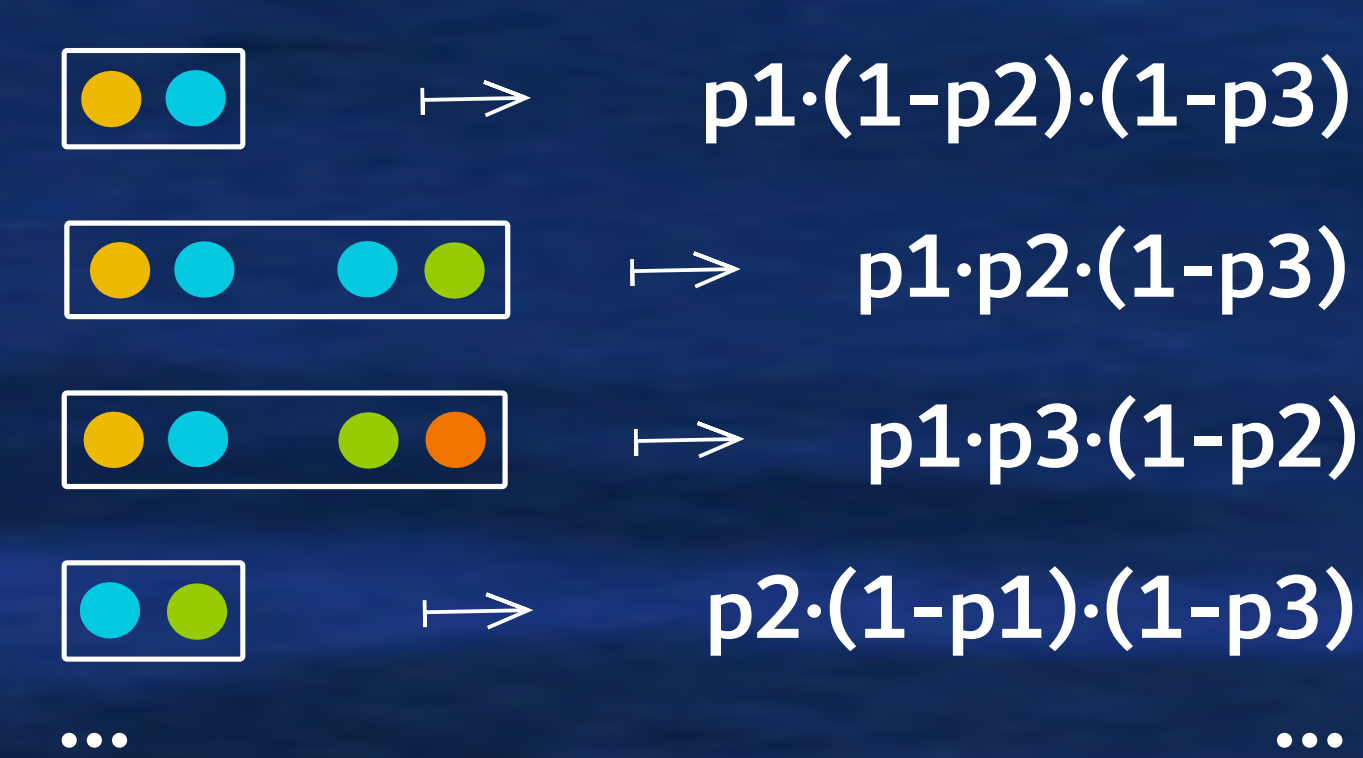
LAYER III

Mapping of combined values and justifications

● ●   ⟶   ● ● ●

● ● ● ●   ⟶

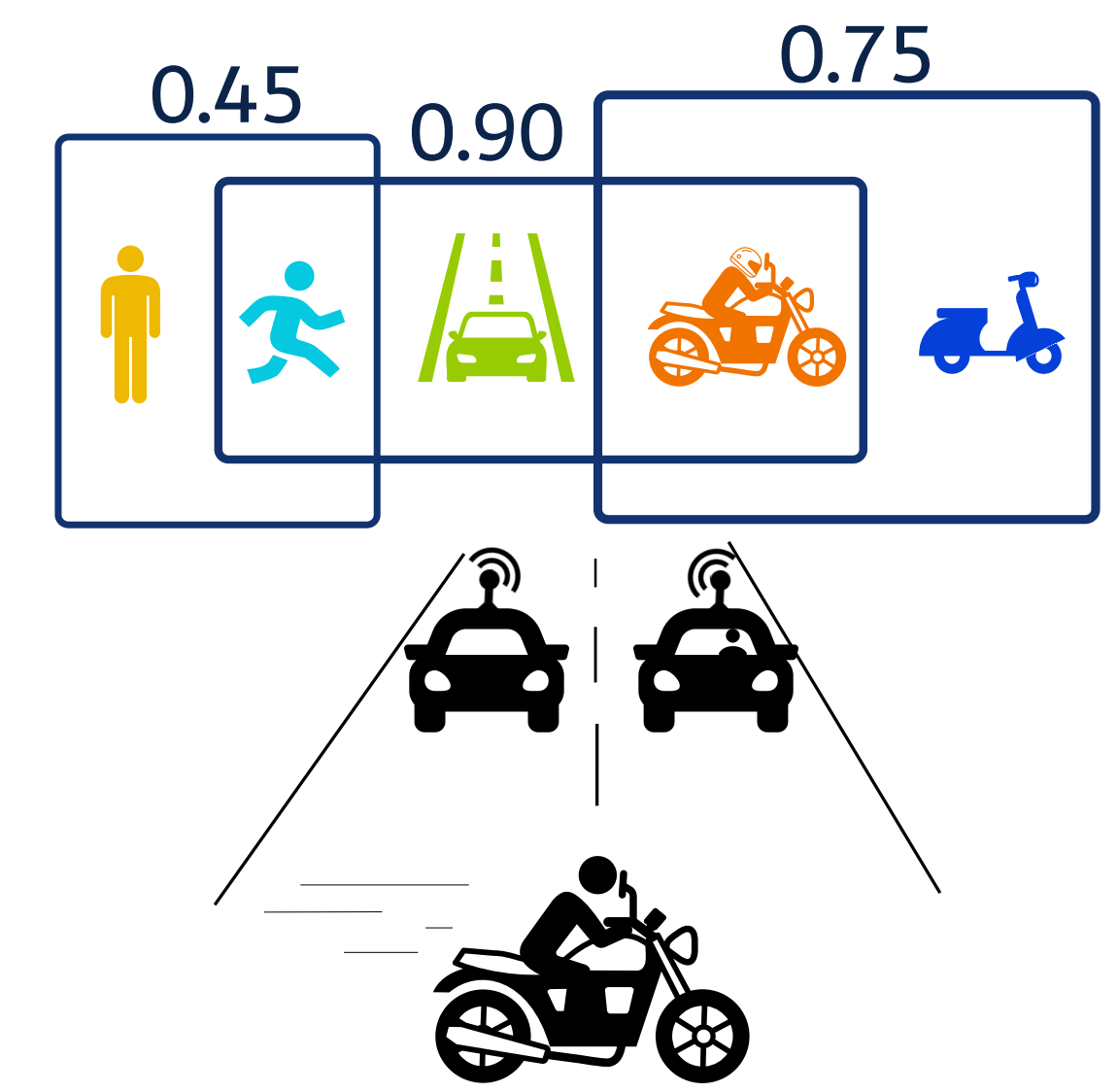● ● ● ●   ⟶   ● ●

● ●

...

OUTPUT

Degree of belief for ● ● ●

= combined value of ● ●

EXAMPLE

INPUT + SITUATION

0.45   0.90   0.75

LAYER I

Autonomous car   Drive-assist car

prioritizes reducing false negatives.   prioritizes reducing false positives.

In this case, 🏃 is a justification.   In this case, 🏃 is **not** a justification.

LAYER II
Combination of values

{ , } ⟼ 0.10

LAYER III

Autonomous car   Drive-assist car

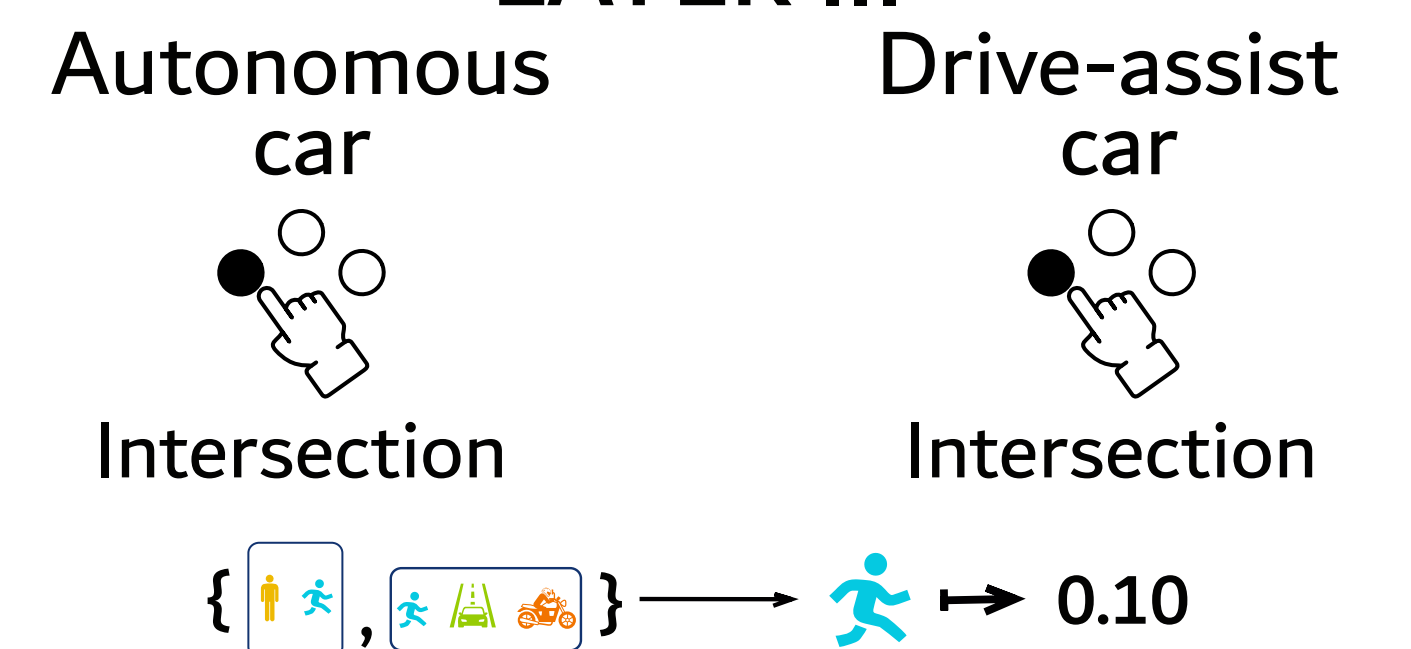Intersection   Intersection

{ , } ⟶ 🏃 ⟼ 0.10
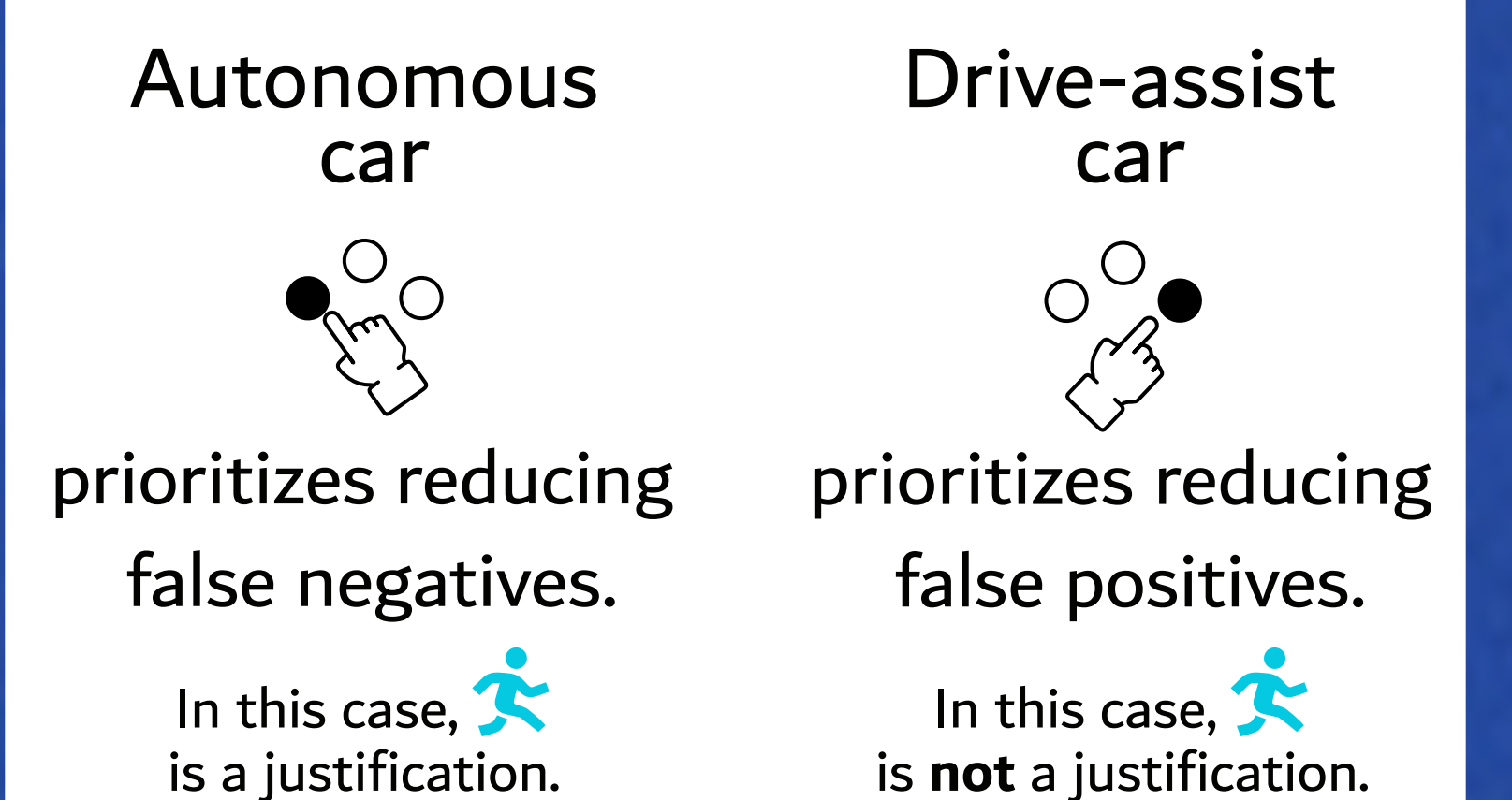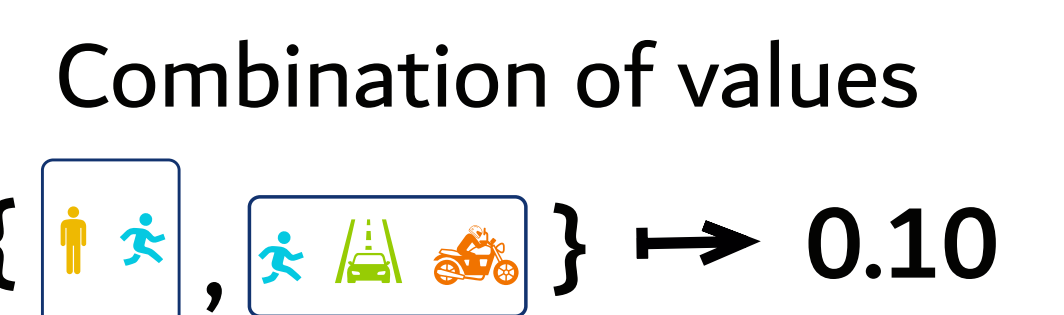
OUTPUT

The autonomous car believes the object is a person ( ) with degree 0.16.   The drive-assist car does not believe the object is a person ( ).

A NEW MODEL
TO MERGE UNCERTAIN EVIDENCE
AND COMPUTE JUSTIFIED BELIEF

If you are conducting data experiments with potentially

contradictory, incomplete, and **uncertain** pieces of evidence,

we invite you to explore our **belief model** for a potential solution.

It will also enable you to leverage this evidence across **different contexts**.

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