Inferential Approach to Mining Surprising Patterns in Hypergraphs

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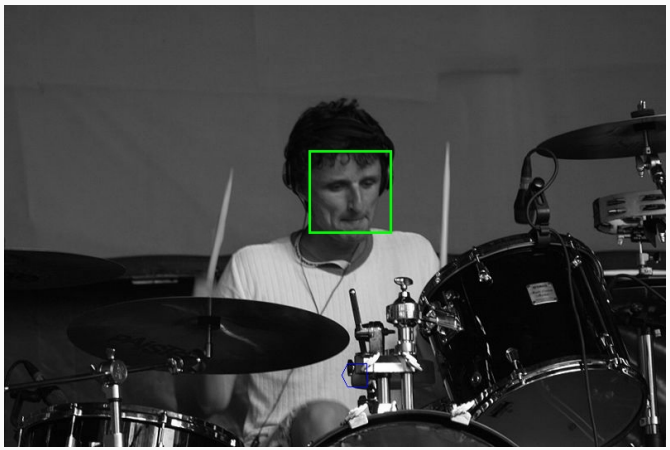
Reframing learning as reasoning



$\Rightarrow$

$\mathcal{T} \vdash \mathcal{F}$

Reframing mining surprising patterns as reasoning

1. Learning frequent patterns
2. Assessing their surprisingness

Inference Control Meta-learning

Learning how to reason efficiently.

- Unified Rule Engine
  - Evolves Inference Trees TODO: add pic
  - Control Rules to select premises and rules

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  - Control Rules to select premises and rules
- Learn Control Rules for efficient reasoning TODO: diagram with learning control rules controlling inference.

Mining Frequent Patterns

Greedy algorithm:

- S: minimum support
- P, Q: patterns
- $\mathcal{C}$: pattern pool
- $\mathcal{D}$: database

1. Select P from $\mathcal{C}$
2. Select *specialization* Q of P such that $S \leq \texttt{support}(Q, \mathcal{D})$
3. Add Q to $\mathcal{C}$
4. Repeat

Mining Frequent Patterns as Reasoning

$$\frac{S \leq \texttt{support}(Q, \mathcal{D}) \qquad \texttt{spec}(Q, P)}{S \leq \texttt{support}(P, \mathcal{D})} \text{ (AP)}$$

TODO: make mini inference tree expansion example.

Mining Surprising Patterns

TODO: show example of empirical and estimate probability distributions (multi-modal estimate for the multi-world aspect).

Definition

surprise: contrary to expectation

Mining Surprising Patterns as Reasoning

TODO

Examples