WHEN IS LYING THE RIGHT CHOICE?

xiv · iv · mmxv

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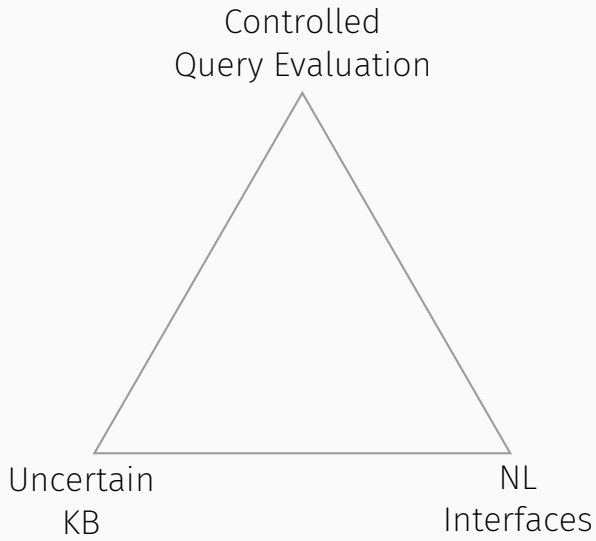
Controlled
Query Evaluation
Uncertain
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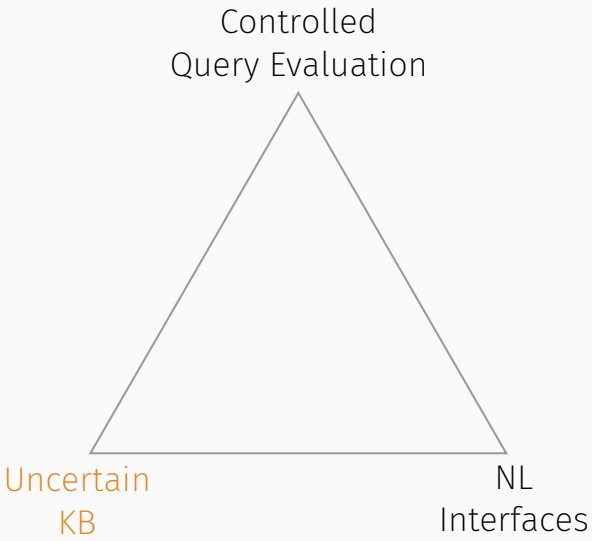
Interfaces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NL
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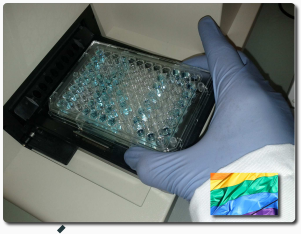
Water Contaminated
$\langle 0.9, 0.0, 0.1 \rangle$

Definition: Binomial/SL Opinion [Jøsang, 2001]

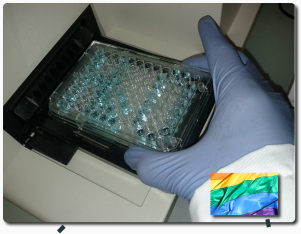
A binomial opinion — or SL opinion — about a proposition ϕ is $w_\phi = \langle b(\phi), d(\phi), u(\phi) \rangle$, where $b(\phi)$ is the belief about ϕ — the summation of the probability masses that entail ϕ; $d(\phi)$ is the disbelief about ϕ; $u(\phi)$ is the uncertainty about ϕ; and $b(\phi) + d(\phi) + u(\phi) = 1$.



⟨0.8, 0.1, 0.1⟩

Water Contaminated

⟨0.8, 0.0, 0.2⟩

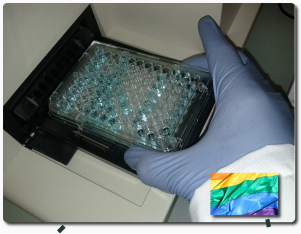


⟨0.6, 0.2, 0.2⟩

Water Contaminated

⟨0.6, 0.1, 0.3⟩

⟨0.8, 0.2, 0.0⟩



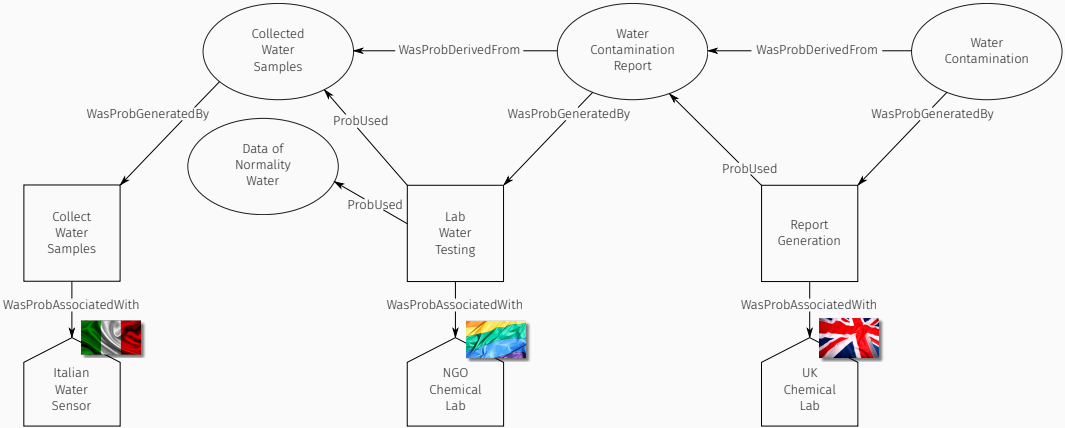
⟨0.6, 0.2, 0.2⟩

Water Contaminated
⟨0.6, 0.1, 0.3⟩

⟨0.8, 0.2, 0.0⟩

⟨1.0, 0.0, 0.0⟩

p-prov-o [Idika et al., 2013]



S-DL-LITE KB [ŞENSOY ET AL., 2013]

Definition

A DL-lite knowledge base $\mathcal{K} = \langle \mathcal{T}, \mathcal{A} \rangle$ consists of a TBox $\mathcal{T}$ and an ABox $\mathcal{A}$. Axioms are either

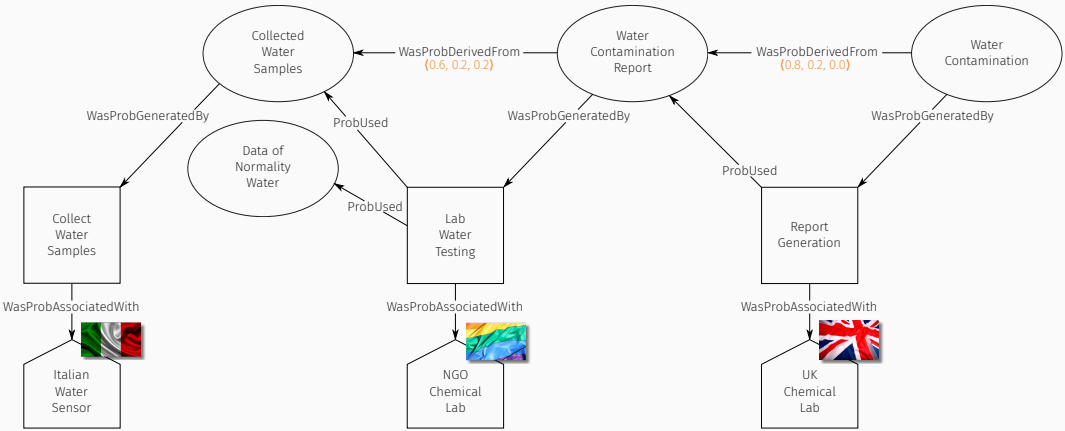
- class inclusion axioms: $B \sqsubseteq C \in \mathcal{T}$ where B is a basic class $B := A \mid \exists R \mid \exists R^-$ (A denotes a named class, R a named property, and R^- the inverse of R) and C is a general class $C := B \mid \neg B \mid C_1 \sqcap C_2$; or
- individual axioms: $B(a), R(a, b) \in \mathcal{A}$ where a and b are named individuals.

$\mathcal{S}$DL-Lite is an extension of DL-lite with subjective opinion assertions of the form $\mathcal{B} : w$ where w is an opinion and $\mathcal{B}$ is an ABox axiom.

s-DL-Lite KB [Şensoy et al., 2013]

Syntax	Semantics
$\top$	$\top^{\mathcal{I}}(o) = \langle 1, 0, 0\rangle$
$\bot$	$\bot^{\mathcal{I}}(o) = \langle 0, 1, 0\rangle$
$\exists R$	$b((\exists R)^{\mathcal{I}}(o_1)) \geq \max \bigcup_{\forall o_2} \{b(R^{\mathcal{I}}(o_1, o_2))\}$ and $d((\exists R)^{\mathcal{I}}(o_1)) \leq \min \bigcup_{\forall o_2} \{d(R^{\mathcal{I}}(o_1, o_2))\}$
$\neg B$	$(\neg B)^{\mathcal{I}}(o) = \neg B^{\mathcal{I}}(o)$
R^-	$(R^-)^{\mathcal{I}}(o_2, o_1) = R^{\mathcal{I}}(o_1, o_2)$
$B_1 \sqsubseteq B_2$	$\forall o \in \Delta^{\mathcal{I}}, b({B_1}^{\mathcal{I}}(o)) \leq b({B_2}^{\mathcal{I}}(o))$ and $d({B_2}^{\mathcal{I}}(o)) \leq d({B_1}^{\mathcal{I}}(o))$
$B_1 \sqsubseteq \neg B_2$	$\forall o \in \Delta^{\mathcal{I}}, b({B_1}^{\mathcal{I}}(o)) \leq d({B_2}^{\mathcal{I}}(o))$ and $b({B_2}^{\mathcal{I}}(o)) \leq d({B_1}^{\mathcal{I}}(o))$
$B(a) : w$	$b(w) \leq b(B^{\mathcal{I}}(a^{\mathcal{I}}))$ and $d(w) \leq d(B^{\mathcal{I}}(a^{\mathcal{I}}))$
$R(a, b) : w$	$b(w) \leq b(R^{\mathcal{I}}(a^{\mathcal{I}}, b^{\mathcal{I}}))$ and $d(w) \leq d(R^{\mathcal{I}}(a^{\mathcal{I}}, b^{\mathcal{I}}))$

PROPOSAL: S-DL-LITE PROVENANCE



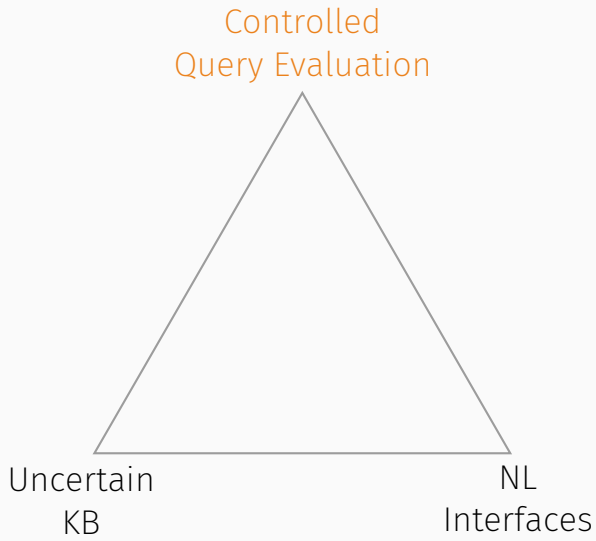
...

$E(\text{Collected Water Samples}) : \langle 1.0, 0.0, 0.0 \rangle$

$E(\text{Water Contamination Report}) : \langle 1.0, 0.0, 0.0 \rangle$

$R_{Der}(\text{Water Contamination Report}, \text{Collected Water Samples}) : \langle 0.6, 0.2, 0.2 \rangle$

...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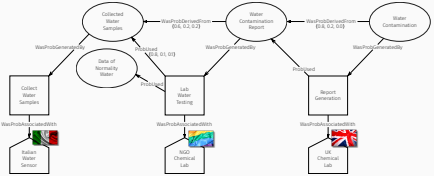
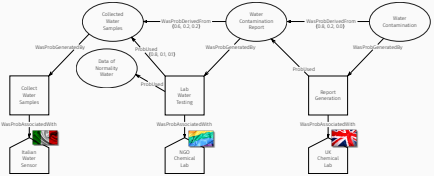
Query Evaluation
Uncertain
KB
NL
Interfaces

Water Contaminated : $\langle 0.6, 0.1, 0.3 \rangle$



Water Contaminated : $\langle 0.6, 0.1, 0.3 \rangle$

why Water Contaminated : $\langle 0.6, 0.1, 0.3 \rangle$?

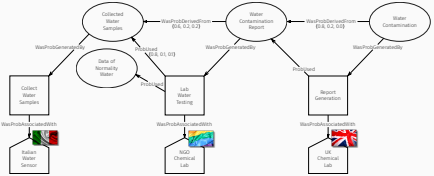


Water Contaminated : $\langle 0.6, 0.1, 0.3 \rangle$

...

why Water Contaminated : $\langle 0.6, 0.1, 0.3 \rangle$?

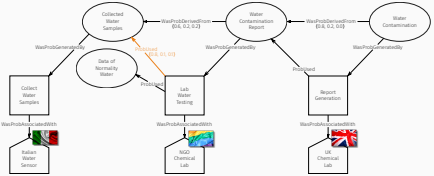
...



Water Contaminated : $\langle 0.6, 0.1, 0.3 \rangle$

...

R_U(Collected Water Samples, NGO Lab Water Testing) : $\langle 0.8, 0.1, 0.1 \rangle$



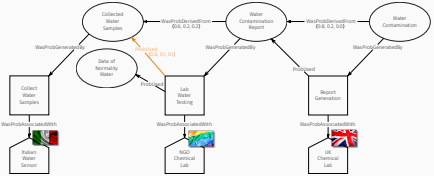
why Water Contaminated : $\langle 0.6, 0.1, 0.3 \rangle$?

...

Water Contaminated : $\langle 0.6, 0.1, 0.3 \rangle$

...

R_U(Collected Water Samples, NGO Lab Water Testing) : $\langle 0.8, 0.1, 0.1 \rangle$



why Water Contaminated : $\langle 0.6, 0.1, 0.3 \rangle$?

...

$\exists Y, R_U(\text{Collected Water Samples}, Y) : w \wedge Y \neq Ag(\text{NGO Lab Water Testing}) \wedge b(w) > 0.5$?

$$\exists Y, R_U(\text{Collected Water Samples}, Y) : w \wedge Y \neq Ag(\text{NGO Lab Water Testing}) \wedge b(w) > 0.5?$$

What if:

$$R.(\cdot, \text{NGO Lab Water Testing}) : \langle 0.0, 0.8, 0.2 \rangle$$

CONTROLLED QUERY EVALUATION [BISKUP ET AL., 2014]

(Postulated) World View: $\langle \Gamma; \phi_1, \ldots, \phi_n \rangle$

$\Gamma \in 2^{\mathcal{L}_\Gamma}$ background/collateral knowledge, biases, ...

$\phi_i \in \mathcal{L}$ information exchanged

Belief operator: $\text{Bel} : 2^{\mathcal{L}_\Gamma} \times \mathcal{L}^* \mapsto 2^{\mathcal{L}}$

$\mathcal{L}_\Gamma$ extends the propositional language $\mathcal{L}$ with rules

$\psi \in \text{Bel}(\langle \Gamma; \phi_1, \ldots, \phi_n \rangle)$ ▶ is assumed that ψ can be believed

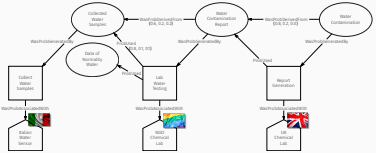
Secrecy policy: $\langle \psi, \text{Bel} \rangle$

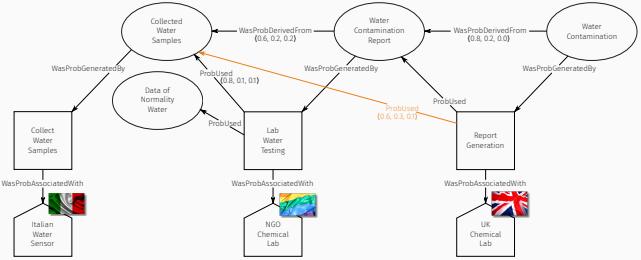
Desire to avoid that an agent believes ψ using the operator Bel

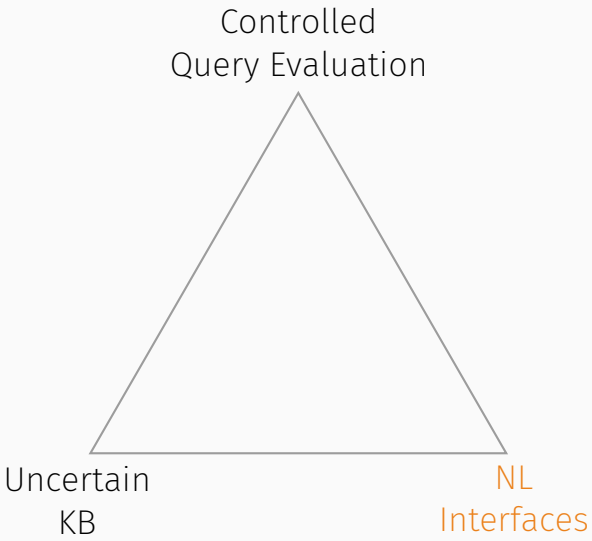
PROPOSAL: SUBJECTIVE LOGIC BASED CEQ

1. From propositional language to S-DL-Lite KBs

2. Strategies for CEQ (including white lies)



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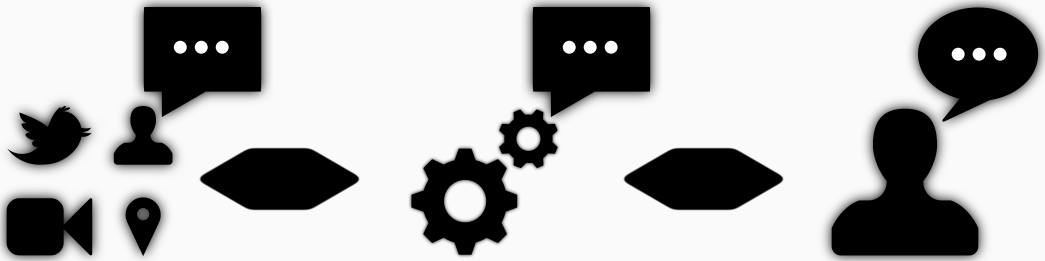
CONVERSATIONAL SENSING WITH CNL [BRAINES ET AL., 2014, PREECE ET AL., 2014]



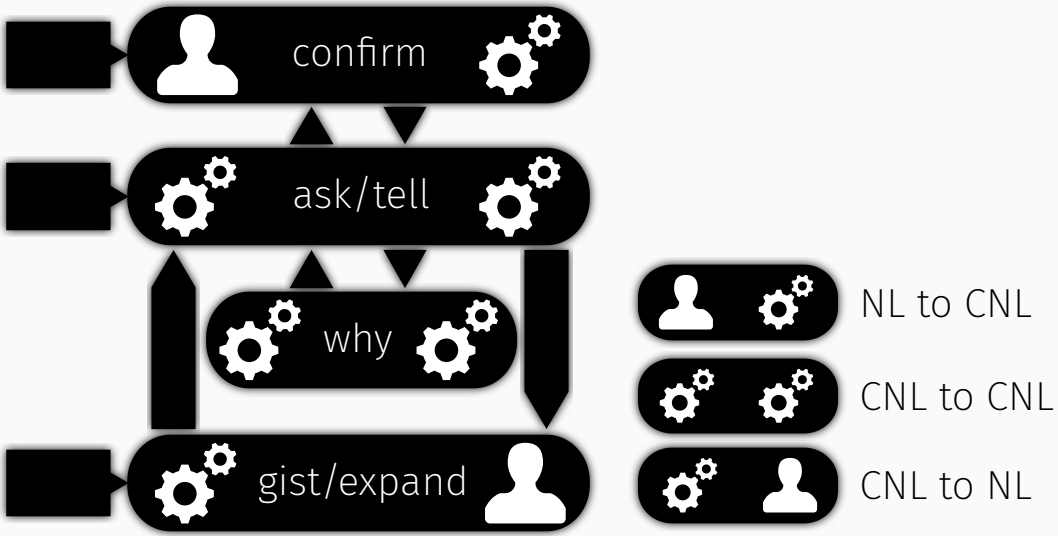
Data sources

Analytic services

Decision maker

Courtesy of Alun Preece and Dave Braines

CONVERSATIONAL SENSING WITH CNL [BRAINES ET AL., 2014, PREECE ET AL., 2014]



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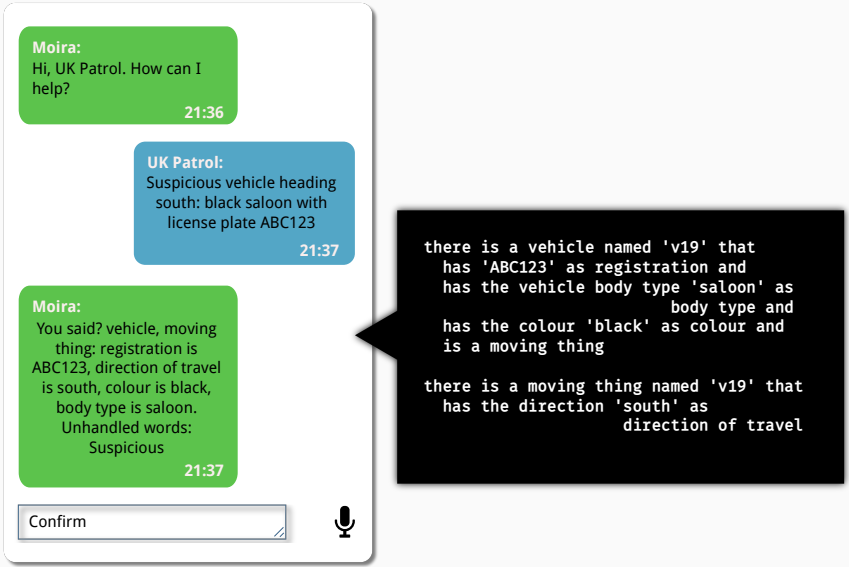
CONVERSATIONAL SENSING WITH CNL [BRAINES ET AL., 2014, PREECE ET AL., 2014]



Courtesy of Alun Preece and Dave Braines

OPEN QUESTIONS

- suitable fuzzy categories for representing uncertainty in a machine-to-human dialogue?
  - $\langle 0.70, 0.01, 0.29 \rangle \blacktriangleright$ `possibly true` (cf. Admiralty code)?
  - `possibly true` $\blacktriangleright \langle 0.70, 0.01, 0.29 \rangle$?
- under which circumstances “quantities” can be translated into either assumptions or facts ?
- plausibility metrics in interacting with human users?
- how to support querying provenance data?

OPEN QUESTIONS

- suitable fuzzy categories for representing uncertainty in a machine-to-human dialogue?

- under which circumstances “quantities” can be translated into either assumptions or facts ?
  - water contaminated $\langle 0.x, 0.y, 0.z \rangle$ ▶ `possible that water contaminated`
  - water contaminated $\langle 1.0, 0.0, 0.0 \rangle$ ▶ `water contaminated`
- plausibility metrics in interacting with human users?

- how to support querying provenance data?

OPEN QUESTIONS

- suitable fuzzy categories for representing uncertainty in a machine-to-human dialogue?

- under which circumstances “quantities” can be translated into either assumptions or facts ?

- plausibility metrics in interacting with human users?

  white lies require coherence, but maybe up to a certain level?

- how to support querying provenance data?

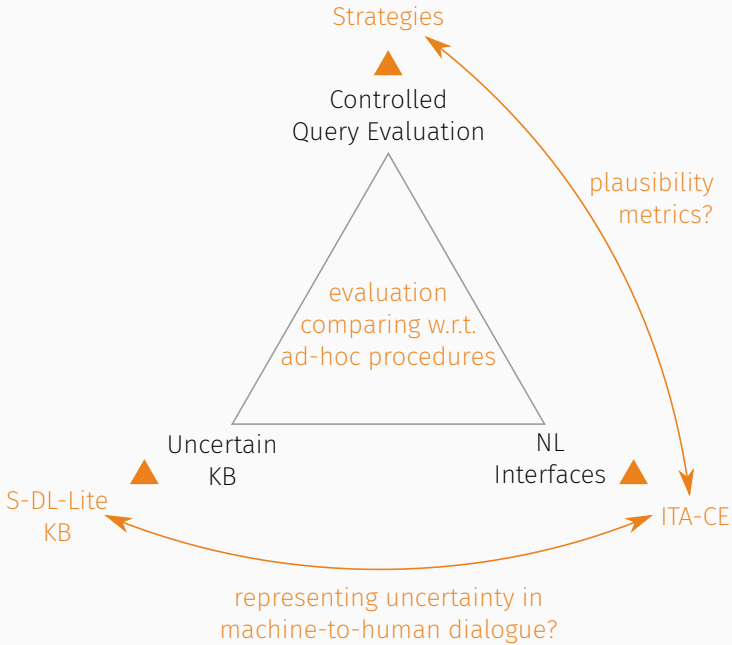
OPEN QUESTIONS

- suitable fuzzy categories for representing uncertainty in a machine-to-human dialogue?

- under which circumstances “quantities” can be translated into either assumptions or facts ?

- plausibility metrics in interacting with human users?

- how to support querying provenance data?
  - provenance is important enough to justify ad-hoc procedures
  - comparison with querying procedures for general S-DL-Lite KBs


Strategies
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evaluation
comparing w.r.t.
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Uncertain
KB
NL
Interfaces
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representing uncertainty in
machine-to-human dialogue?

ACKNOWLEDGEMENT

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CREDITS

Template

adapted from mtheme `https://github.com/matze/mtheme`

Images

Lake: `http://www.morguefile.com/archive/display/941263`

Miles: `http://www.morguefile.com/archive/display/657820`

Ella: `http://www.morguefile.com/archive/display/33277`

Sensor: `http://www.morguefile.com/archive/display/632281`

NGO Laboratory: `http://www.morguefile.com/archive/display/824850`

UK Laboratory: `http://www.morguefile.com/archive/display/636935`