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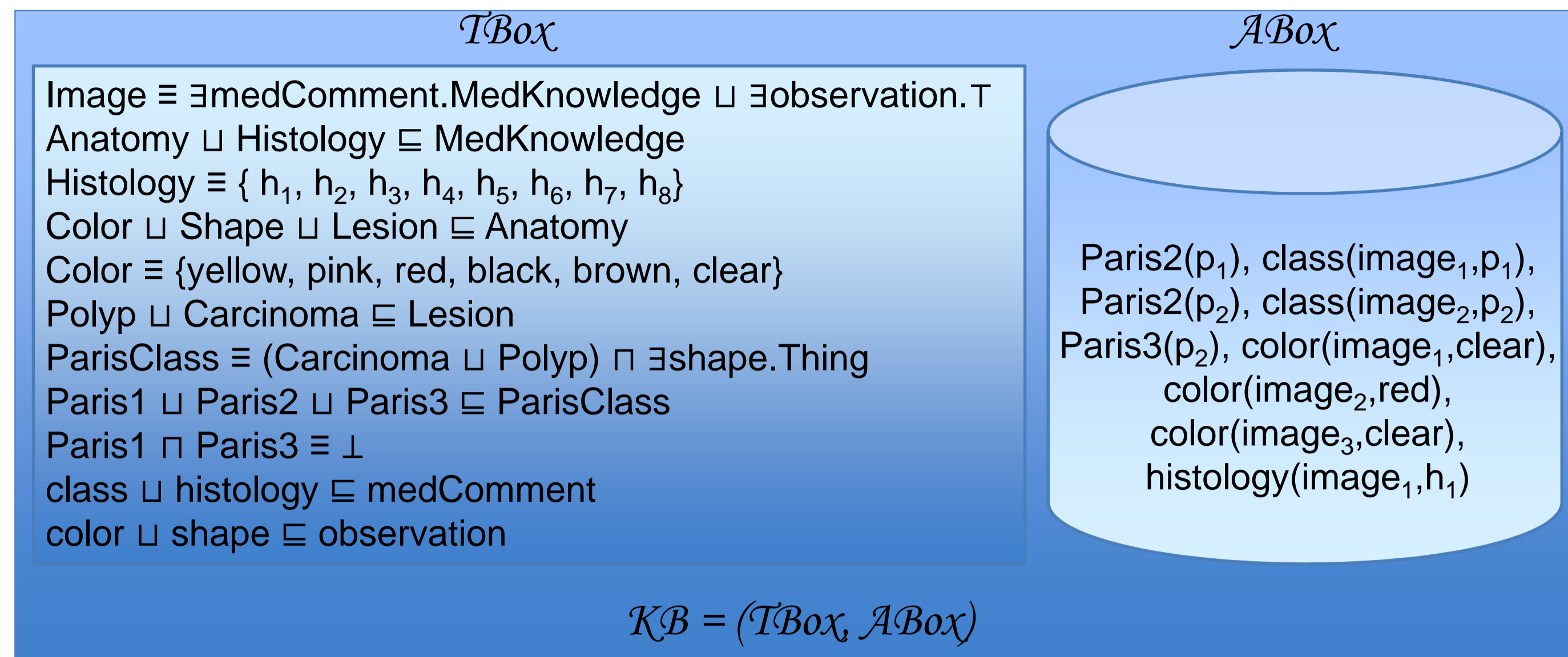


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WApproximation: computing approximate answers for ontological queries

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PROBLEMATIC



New flexible reasoning for ontological queries

- Exploit the knowledge available in the database
- Define the distance of a given individual w.r.t. a given query

Why OWA and GCWA ?

- OWA is the standard for DL
- Application context for GCWA
 - Decision is based on image
 - Accurate annotation of images is essential
 - Validation of images annotation



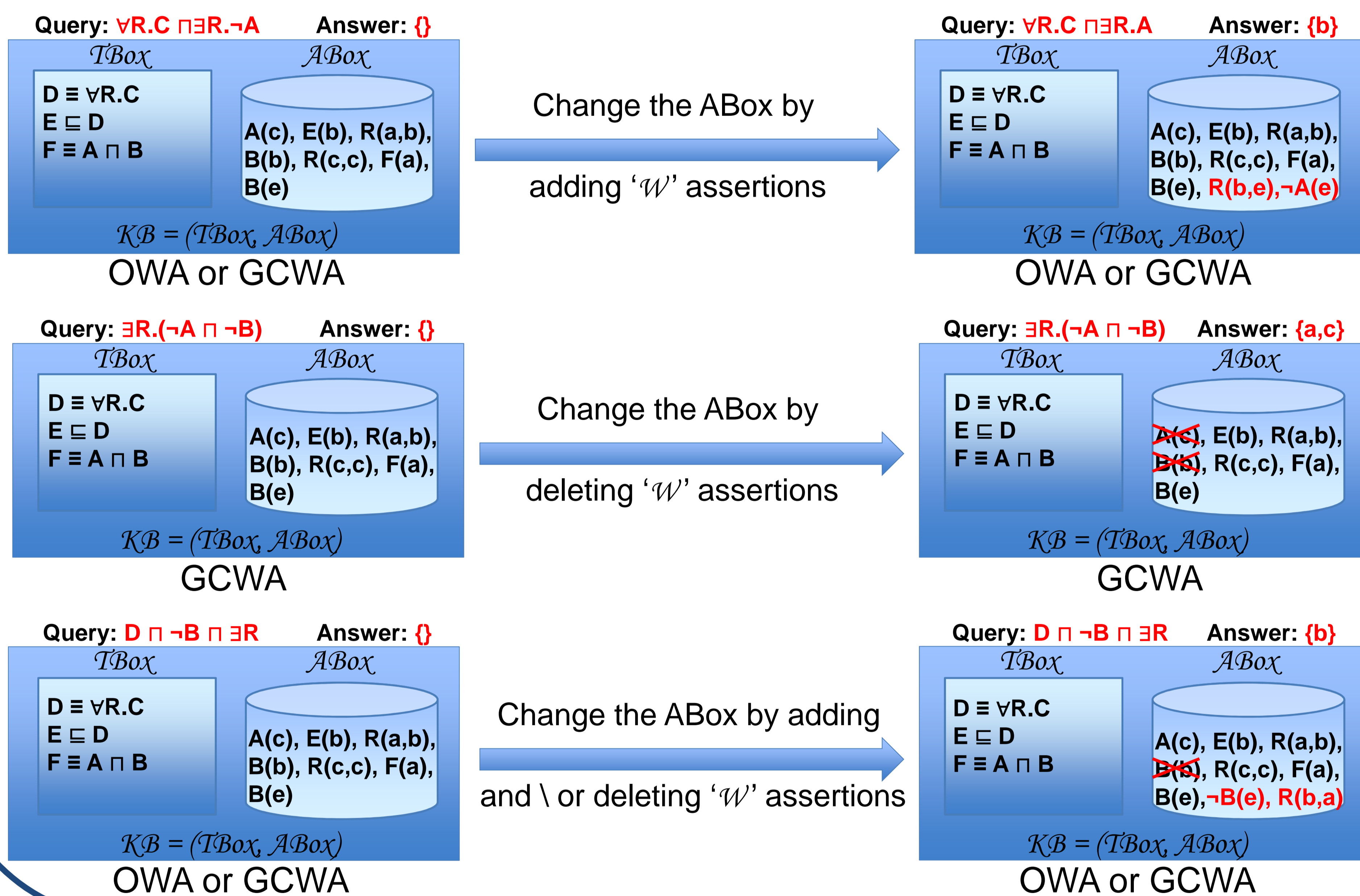
Query₁: $\exists \text{class.Paris1} \sqcap \geq 1 \text{ class.Thing}$
Query₂: $\exists \text{color.}\{\text{pink, red}\} \sqcap \exists \text{class.Paris3} \sqcap \exists \text{histology.}\{h_6\}$

Instance retrieval reasoning is used for semantic gastroenterological images retrieval

No image for these two queries

CONTRIBUTION

Principle of the WApproximation: add and/or remove \mathcal{W} (i.e. an arbitrary number of) assertions so that an individual become instance of a concept description (while not belonging to it before)



Three approaches

- \mathcal{W}^+ Approximation (add assertions)
- \mathcal{W}^- Approximation (remove assertions)
- \mathcal{W} Approximation (add and remove assertions)

Common objectives

- Minimize \mathcal{W}
- Find new query instances
- Preserving consistency of KB

Three main problems

- Deciding if ' \mathcal{W} ' assertions exist
- Computing ' \mathcal{W} ' assertions
- Computing approximate answers

DEFINITIONS

$InsR_{\mathcal{W}}^+(C, \mathcal{KB}) = \{a \in Ind(\mathcal{A}) \mid \exists \mathcal{A}' \text{ that satisfies :}$

\mathcal{W}^+ Approximation

- $\mathcal{A}' \subseteq \mathcal{A}$
- $\mathcal{A}' \setminus \mathcal{A} = \bigcup_{i=1}^{\mathcal{W}} \{p_i \mid p_i \text{ is an assertion of an atomic concept, a negation of an atomic concept or an atomic role}\}$
- $\mathcal{KB}' = (\mathcal{T}, \mathcal{A}')$ is consistent
- $a \in InsR(C, \mathcal{KB}')$
- $\nexists \mathcal{A}''$ which satisfies (i), (ii), (iii), (iv) and $|\mathcal{A}''| < |\mathcal{A}'|$

$InsR_{\mathcal{W}}^-(C, \mathcal{KB}) = \{a \in Ind(\mathcal{A}) \mid \exists \mathcal{A}' \text{ that satisfies :}$

\mathcal{W}^- Approximation

- $\mathcal{A}' \subseteq \mathcal{A}$
- $\mathcal{A} \setminus \mathcal{A}' = \bigcup_{i=1}^{\mathcal{W}} \{p_i \mid p_i \text{ is an assertion of atomic (or its negation) concept or atomic role}\}$
- $a \in InsR(C, \mathcal{KB}') \mid \mathcal{KB}' = (\mathcal{T}, \mathcal{A}')$
- $\nexists \mathcal{A}''$ that satisfies i, ii, iii and $|\mathcal{A}''| > |\mathcal{A}'|$

$InsR_{\mathcal{W}}(C, \mathcal{KB}) = \{a \in Ind(\mathcal{A}) \mid \exists \mathcal{A}' \text{ that satisfies :}$

\mathcal{W} Approximation

- $(\mathcal{A}' \setminus \mathcal{A}) \cup (\mathcal{A} \setminus \mathcal{A}') = \bigcup_{i=1}^{\mathcal{W}} \{p_i \mid p_i \text{ is an assertion of atomic (or its negation) concept or atomic role}\}$
- $\mathcal{KB}' = (\mathcal{T}, \mathcal{A}')$ is consistent
- $a \in InsR(C, \mathcal{KB}')$
- $\nexists \mathcal{A}''$ that satisfies i, ii, iii and $|\mathcal{A}'' \setminus \mathcal{A} \cup (\mathcal{A} \setminus \mathcal{A}'')| < |(\mathcal{A}' \setminus \mathcal{A}) \cup (\mathcal{A} \setminus \mathcal{A}')|$

Note that, $\mathcal{KB}=(\mathcal{T}, \mathcal{A})$ is a consistent knowledge base, C is a concept and \mathcal{W} is an integer

PERSPECTIVES

- Detailed study of some related problems, properties, algorithms and complexity
- Extend approach to assertions of defined concepts and roles and propose to normalize the computation of the distance in this context
- Use \mathcal{W} Approximation in other applications than instance retrieval