Analogies: from Theory to Applications (ATA)

AR & CBR Tools for Metric and Representation Learning

F. Badra, M. Couceiro, **E. Marquer**, **P. Monnin**

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Organizers

Fadi Badra

badra@univ-paris13.fr

Miguel Couceiro

miguel.couceiro@loria.fr

Esteban Marquer

esteban.marquer@loria.fr

Pierre Monnin

pierre.monnin@inria.fr

Analogies & analogical reasoning (AR)

3 key cognitive processes: Abstraction, Inference and Creativity

Detecting/mining analogies: Given a, b, c, and d,

is $(a; b; c; d)$ a valid analogy?

Solving analogies: Given $a; b; c$

find x **s.t.** $(a; b; c; x)$ a valid analogy

Integrating analogical reasoning and transfer

Depending on the concrete application and ML&AI task

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Different views on AR and ATA goals

Axiomatic: As 4-ary relations satisfying certain postulates
Examples: reflexivity, (certain) permutations, etc.

Relational: $R(a; b; c; d)$ $P(P_1(a; b); P_1(c; d))$, for $P; P_1$ predicates
Example: $R(wine; France; beer; Germany)$

Functional: $R(a; b; c; d)$ if $b = T(a)$ and $d = T(c)$, for some T
Example: $R(go; went; make; made)$

Model Theoretic: Relying on structural transformations and "rewriting"
Examples: *Structure mapping theory* and *Justi cations*

General Goals: ATA seeks to explore both **foundational aspects and applications** of AR in ML & AI, NLP & NLU, KDD & KRR, and real-world applications, **as well as** bridge gaps with other reasoning frameworks, **especially**, CBR

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More precisely...

AR and CBR are closely related and complementary:

AR: leverages analogies to model human cognitive processes and developing computational theories for inference and transfer

CBR: focuses on conception and knowledge engineering issues when implementing machine reasoning

Following the main theme of ICCBR 2023: this 2nd ATA@ICCBR seeks to exploit new computational theories of AR to *help CBR revisit its foundations and to enhance its role in \modern AI"*.

In particular, it aims to address the following challenges:

how to represent and learn similarity metrics for specific tasks,

how to represent and learn adaptation knowledge, and

how to represent and maintain cases.

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Program

11h30-12h: Welcome and opening presentation (M.Couceiro)

12h-13h: Plenary Talk by **David B. Leake** (Chair: M.Couceiro)

Contributed talks (Chair: E.Marquer)
14h-14h30: Embedding-to-embedding method based on autoencoder for solving sentence analogies (W.Mao & Y.Lepage)
14h30-15h: Improving sentence embedding with sentence relationships from word analogies (Q.Zhang & Y.Lepage)
15h-15h30: Resolution of analogies between strings in the case of multiple solutions (X.Deng & Y.Lepage)

After coffee Break: (Chair: F.Badra)
16h-16h30: Less is Better: An Energy-Based Approach to Case Base Competence (E.Marquer, F.Badra, M.-J.Lesot, M.Couceiro & D.Leake)
16h30-17h30: Plenary Talk by **Jean Lieber**
17h30-18h: Closing Discussions

We hope for a productive and enjoyable ATA@ICCBR...

...and let us stay in contact!

News: 2nd issue in *Annals of Mathematics and Arti cial Intelligence* (Elsevier)

Please: send us your slides to add to our page
URL: `https://iccbr-ata2023.loria.fr/`

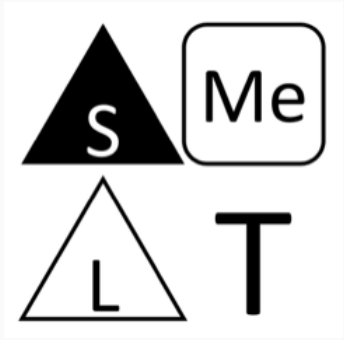
Published Papers: `https://ceur-ws.org/Vol-3438/`

Acknowledgements

ANR-22-CE23-0023: Analogies: from theory to tools and applications (2023-2026), **PI:** M.Couceiro

https://at2ta.loria.fr/

ANR-22-CE23-0032: Similarity Measure Learning for Analogical Transfer (2023-2026), **PI:** F.Badra



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