Exploring the One-brain Barrier: a Manual Contribution to the NTCIR-12 MathIR Task

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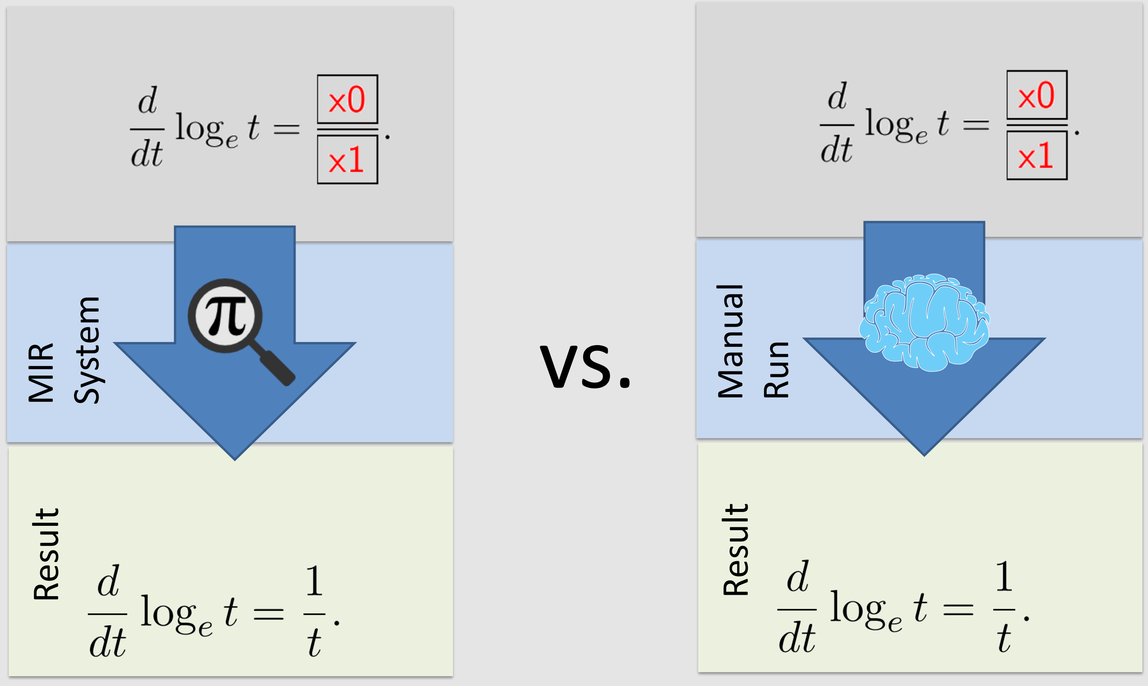
Motivation



Math Information Retrieval

- Formulae: integral part of language in STEM
- Information Retrieval
  - Today: Textual content
  - Recently: Image and Video
- Exponential growth in #publications
- Applications
  - Applicable Theorem Search
  - Plagiarism Detection
  - Related work search
- Math IR needs
  - Datasets with structured mathematical formulae
  - Topics
  - Evaluation methods

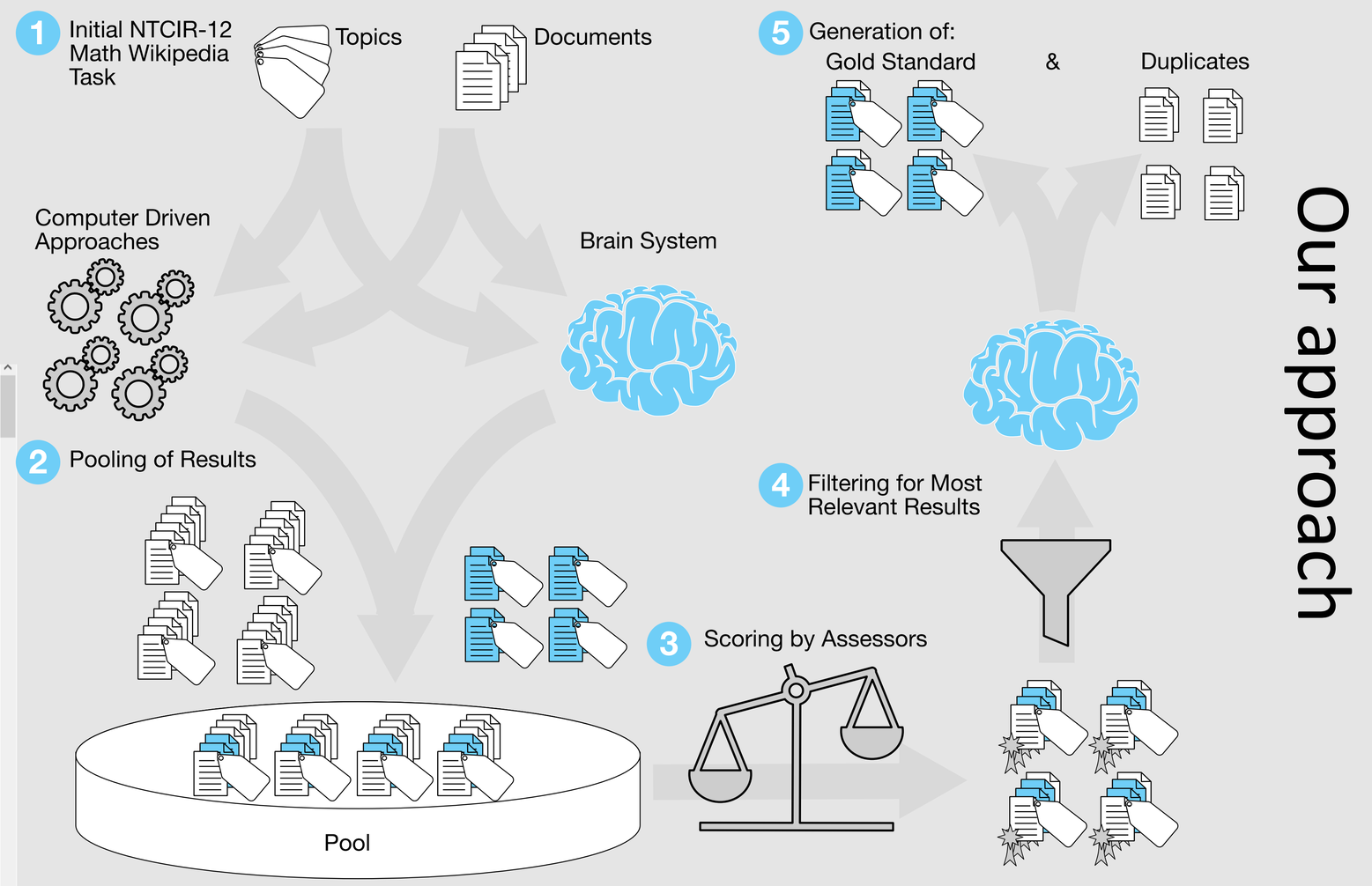
"If $\boldsymbol{v}$ is a vector which is not zero, then it is an eigenvector of a square matrix A if $A\boldsymbol{v}$ is a scalar multiple of $\boldsymbol{v}$."

Fig. 2 Math as integral part of text

Example result

Query

Difference between Log x_1 and log x_1



Our approach

Conclusion

- Gold standard dataset as big step forward to develop a math aware search engine for Wikipedia
- System strengths:
  - Definition lookup queries
  - Applications lookup
- System weaknesses
  - Low precision
  - No standard interface to specify query type

Future work

Improve description of information need
- taking into account our focussed mir task categories
  1. Definition look-up
  2. Explanation look-up
  3. Proof look-up
  4. Application look-up
  5. Computation assistance
  6. Gernal formula search

- Improve query syntax for similarity search

Develop a math search engine for wikipedia with the help of the gold standard dataset and new Mathematical Language Processing Technology

Conclusion & Outlook

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