DeepTutor: A State-of-The-Art Intelligent Tutoring System

Vasile Rus (PI; vrus@memphis.edu)

Team: Arthur Graesser, Mihai Lintean, Nobal Niraula, Rajendra Banjade, Mark Conley, William Baggett, Elizabeth Gire, Don Franceschetti, Anna Bargagliotti, Dan Stefanescu, Cristian Moldovan


Deep Learning of Science

Promoting deep learning of science topics through quality instruction and interaction

Quality instruction based on Learning Progressions and advanced tutoring strategies
Quality interaction through advanced dialogue and language processing methods

Learning Progressions describe students’ natural paths to mastery.

Deep Natural Language Processing

A combination of word embeddings and quadratic assignment based optimal alignment.

\[
\min QAP(F, D, B) = \sum_{i=1}^{n} \sum_{j=1}^{n} f_{i,j} d_{\pi(i) \pi(j)} + \sum_{i=1}^{n} b_{i, \pi(i)}
\]

A complex preparation phase that relies on pronoun resolution, negation scope and focus, etc., in dialogue contexts.

Experiments and Results

- Experiment 1 (lab; n=30; 1-hour of training; pre-test taken another day)
  - Significant Test * CONDITION interaction
    \(F(1,18)=6.793, p = 0.015\)
  - Paired t-test (pre-post)
    - ADAPTIVE: \(p=0.003, \text{Cohen’s } d = 0.786, r = 0.366\);
    - INTERACTIVE: \(p=0.693, \text{Cohen’s } d = 0.088, r = 0.044\);

- Experiment 2 (massive online; n-start=335, n-all=122)
  - 3 weeks of training, online, unsupervised
  - Long-term learning gains: \(d=0.432, r=0.221\)
  - Post-test was taken weeks after last day of training

Acknowledgements

This research has been sponsored by Institute for Education Sciences through grant R305A100875.

References


This research has been sponsored by Institute for Education Sciences through grant R305A100875.

Fully Online: www.deeptutor.org/demo/