Conversational Search and its Applications

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September 23, 2020

Outline

Background → Research → Future Work

Education

- **2005-2009** BSc Intelligent Systems

Education

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  - Systemic approach

Education

- **2005-2009** BSc Intelligent Systems
  - Systemic approach
  - Questioning the assumptions

Education

- **2005-2009** BSc Intelligent Systems
- **2009-2011** MSc Software Engineering

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  - Encapsulation/Abstraction/Inheritance

Education

- **2005-2009** BSc Intelligent Systems

- **2009-2011** MSc Software Engineering
  - Encapsulation/Abstraction/Inheritance
  - Affordances

Education

- **2005-2009** BSc Intelligent Systems
- **2009-2011** MSc Software Engineering
- **2015-2019** PhD Information Retrieval/Semantic Web

Research Work

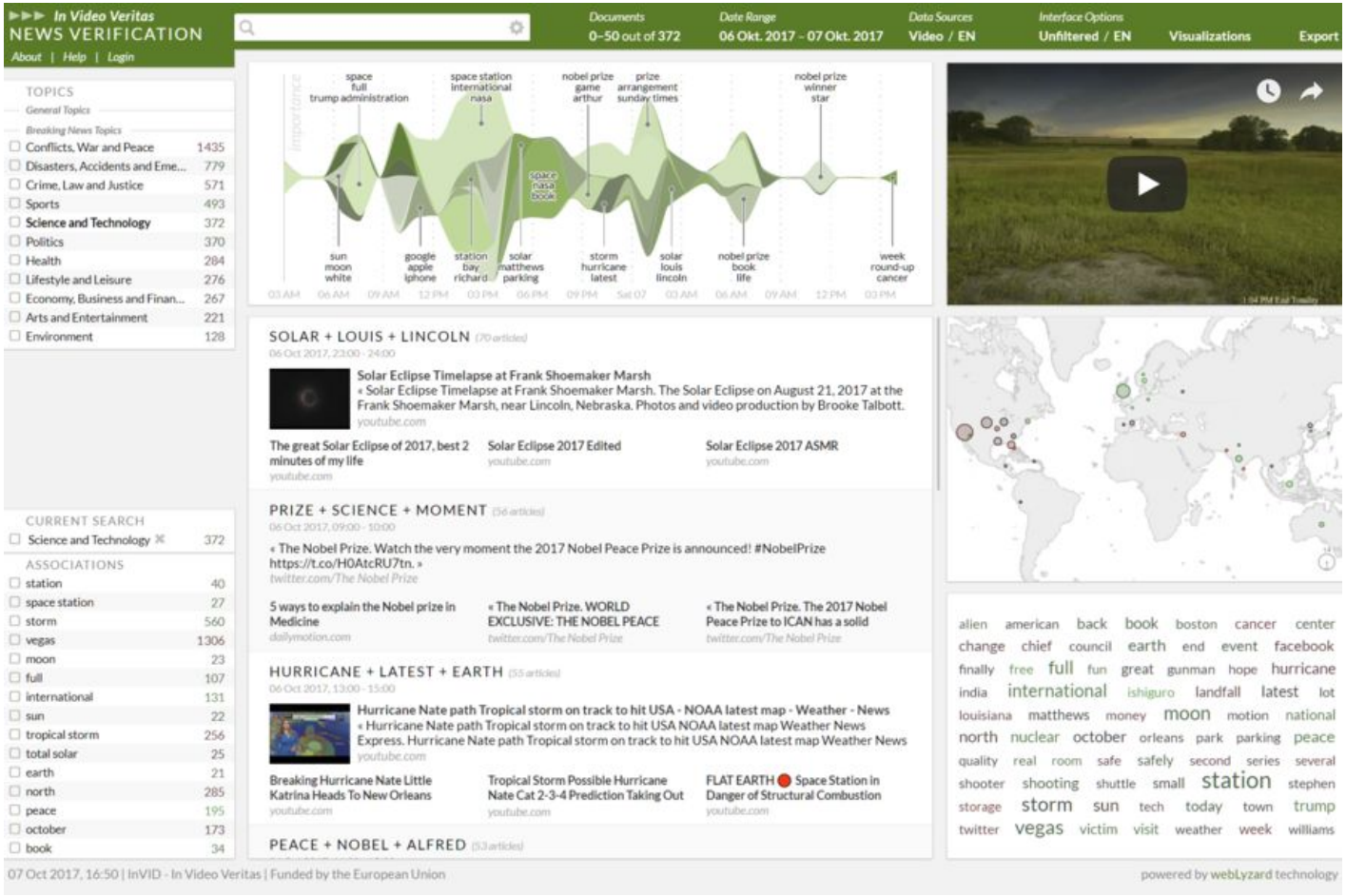
- **2011-2012** Knowledge Representation
- **2013-2014** Topic Modeling
- **2014-2017** Information Extraction

CommuniData
Open Data for local communities

LiquidPub

InVID

PHEME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sun 22
tropical storm 256
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book 34
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solar louis lincoln
nobel prize book life
week round-up cancer
SOLAR + LOUIS + LINCOLN (70 articles)
06 Oct 2017, 23:00 - 24:00
Solar Eclipse Timelapse at Frank Shoemaker Marsh
« Solar Eclipse Timelapse at Frank Shoemaker Marsh. The Solar Eclipse on August 21, 2017 at the Frank Shoemaker Marsh, near Lincoln, Nebraska. Photos and video production by Brooke Talbott.
youtube.com
The great Solar Eclipse of 2017, best 2 minutes of my life
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Solar Eclipse 2017 Edited
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PRIZE + SCIENCE + MOMENT (56 articles)
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« The Nobel Prize. Watch the very moment the 2017 Nobel Peace Prize is announced! #NobelPrize https://t.co/H0AtcRU7tn. »
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« The Nobel Prize. The 2017 Nobel Peace Prize to ICAN has a solid
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HURRICANE + LATEST + EARTH (55 articles)
06 Oct 2017, 13:00 - 15:00
Hurricane Nate path Tropical storm on track to hit USA - NOAA latest map - Weather - News
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youtube.com
Breaking Hurricane Nate Little Katrina Heads To New Orleans
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Tropical Storm Possible Hurricane Nate Cat 2-3-4 Prediction Taking Out
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FLAT EARTH Space Station in Danger of Structural Combustion
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PEACE + NOBEL + ALFRED (53 articles)
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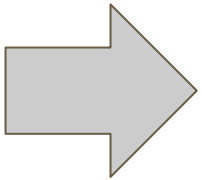
Communication

Centralised Communication

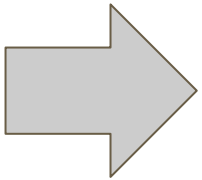
Distributed Communication

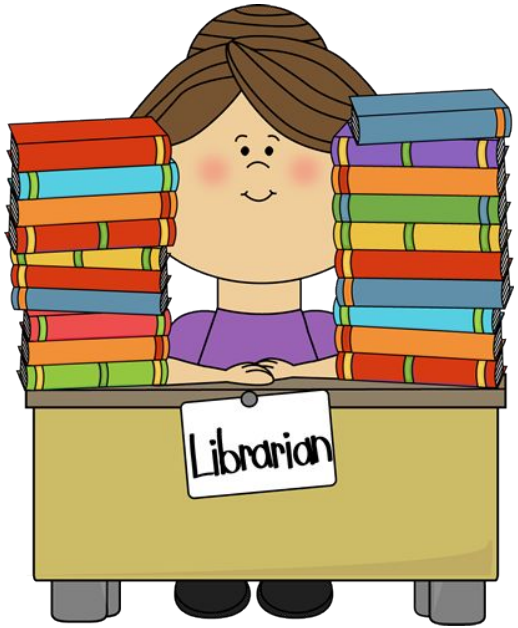
Computer-Mediated Communication

Search



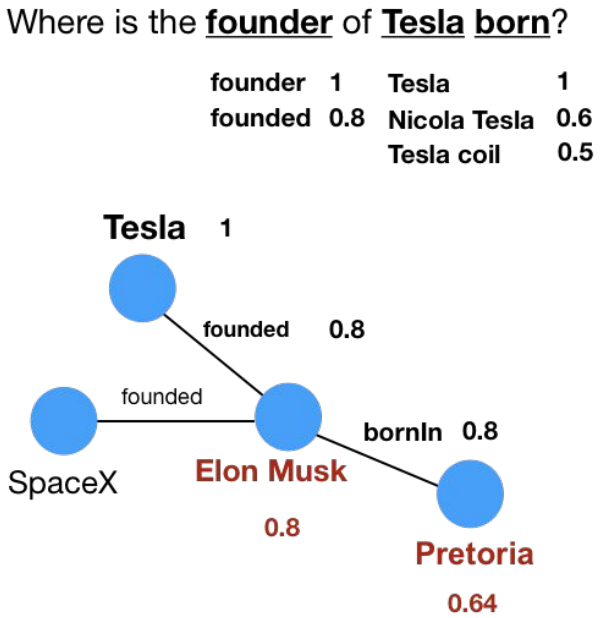
Conversational Search





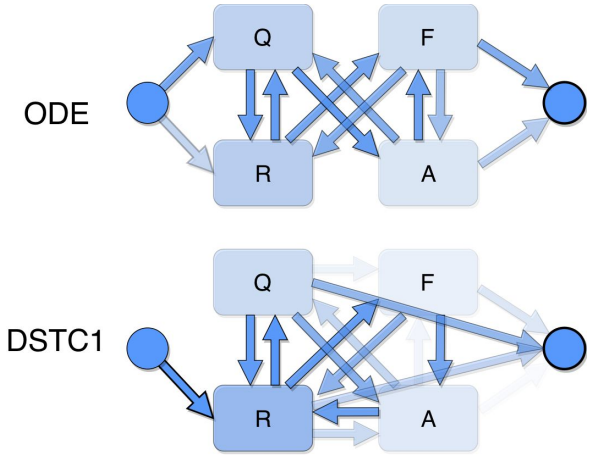
Question Answering

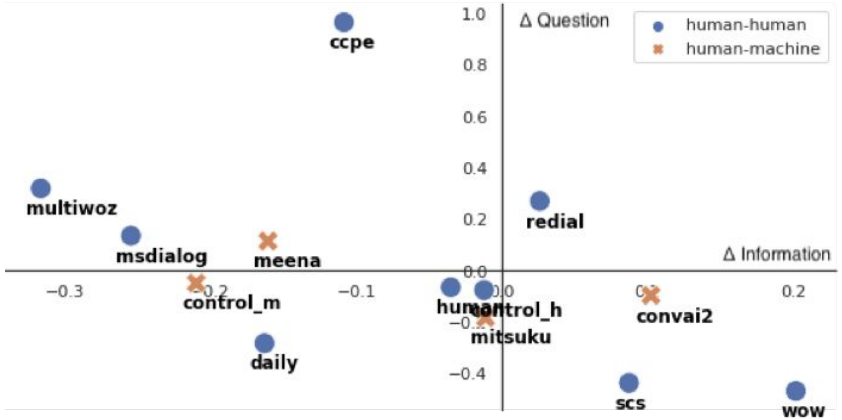
- Question interpretation
  - Parsing
  - Matching
- Answer extraction
  - Message Passing
  - Aggregation



- **Vakulenko**, S., Fernandez Garcia, J. D., Polleres, A., de Rijke, M., & Cochez, M. (2019). Message passing for complex question answering over knowledge graphs. In *Proceedings of the 28th ACM International Conference on Information and Knowledge Management* (pp. 1431-1440).

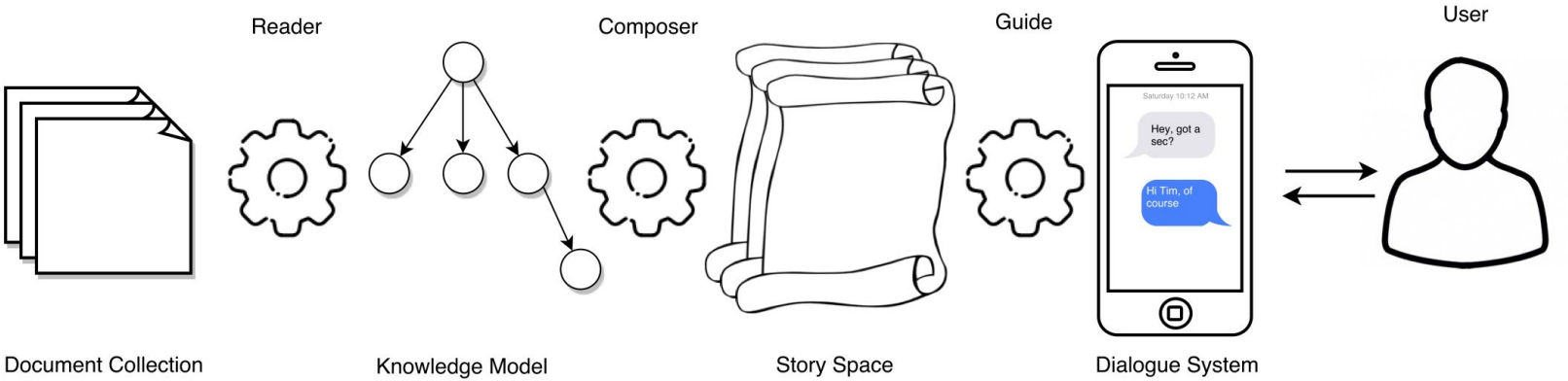
Conversation Mining





- **Vakulenko**, S., Revoredo, K., Di Ciccio, C., & de Rijke, M. (2019). QRFA: A data-driven model of information-seeking dialogues. In *European Conference on Information Retrieval* (pp. 541-557).
- **Vakulenko**, S., Kanoulas, E., & de Rijke, M. (2020). An Analysis of Mixed Initiative and Collaboration in Information-Seeking Dialogues. In *International ACM SIGIR conference on research and development in Information Retrieval* (pp. 2085-2088).

Interactive Storytelling



- **Vakulenko**, S., Markov, I., & de Rijke, M. (2017). Conversational Exploratory Search via Interactive Storytelling. SCAI (ICTIR).

Applications

- Reference
  - Customer Support
  - Troubleshooting
- Discovery
  - Science
  - Education
  - Cultural heritage
  - News/Entertainment

Applications

- Reference
  - Customer Support
  - Troubleshooting
- Discovery
  - Science
  - **Education**
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Outline

AI2Learn

- Science Education and Communication
  - Student Success
  - Learning Analytics

- **van den Bogaard**, M. E. D. (2015). Towards an action-oriented model for first year engineering student success: A mixed methods approach.
- **van den Bogaard**, M. E. D., Howlin, C., Lindsay, E., & Morgan, J. R. (2018). Patterns of student's curriculum engagement in an on-demand online curriculum: An exploratory study at Charles Sturt University. In 46th SEFI Annual Conference 2018: Creativity, Innovation and Entrepreneurship for Engineering Education Excellence (pp. 487-494).
- Morgan, J. R., Lindsay, E., Howlin, C., & **van den Bogaard**, M. E. D. (2019). Pathways of students' progress through an on-demand online curriculum. In 2019 ASEE (American Society for Engineering Education) Annual Conference and Exposition (p. 26149).

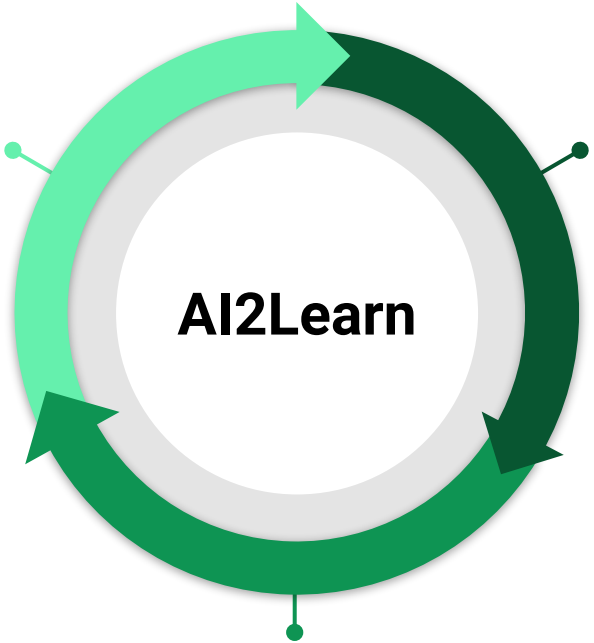
Intelligent Lecturing System (ILS)

- Self-regulated learning
  - Personalisation ->
    - On-demand Online Curriculum
  - Active Engagement ->
    - Interaction

DAI-lab

Signal Processing

Speech Recognition
Multimodal Interaction



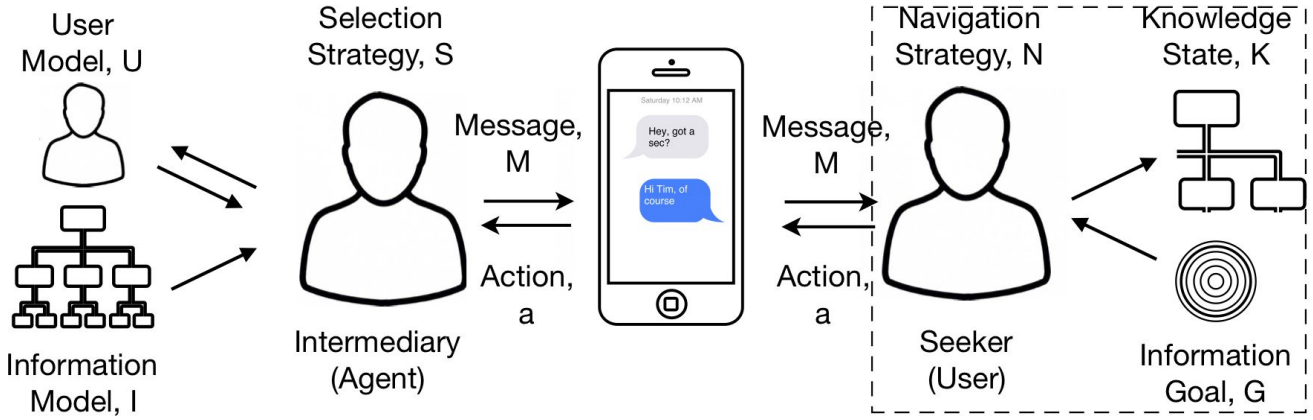
Information Access

Knowledge Representation
Conversational Search

Learning Gains

Learning Analytics
User Modeling

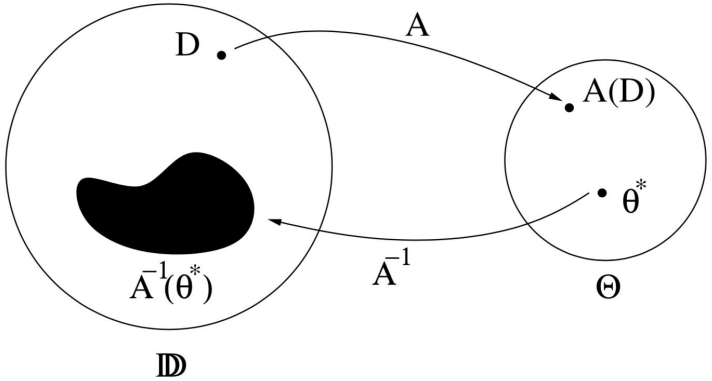
User Modeling



- **Vakulenko**, S., Savenkov, V. and & de Rijke, M. Conversational browsing: Dialog-based Access to Structured Information Sources.
- **Vakulenko**, S. Knowledge-based Conversational Search (2019). PhD thesis. Technical University of Vienna.

Machine Teaching

- focuses on the efficacy of the teachers



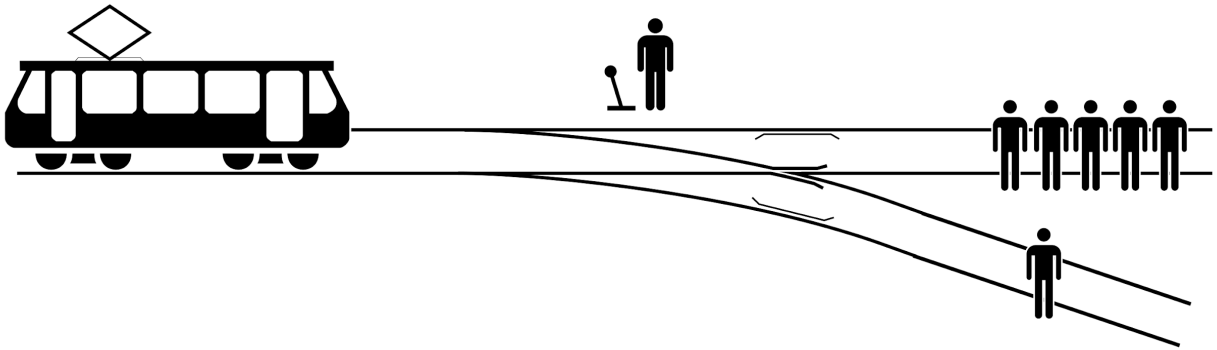
- Zhu, X. Machine teaching: An inverse problem to machine learning and an approach toward optimal education. In *AAAI Conference on Artificial Intelligence*, 2015.

Research Questions

- How to design ILS?
  - How to **structure** information?
  - How to map **speech** to relevant information?
  - How to **select** information to communicate?
- How to evaluate ILS?
  - How to **measure** learning gains?
  - How to design a **user simulator**?
  - How to **evaluate** a user simulator?

Ethics

- Is it ethical to experiment on students?
- Is it ethical **not** to experiment on students?



We can only determine the full limits of what the student can and will learn ***when we have provided qualities of instruction which are optimal for the individual learner****.*