

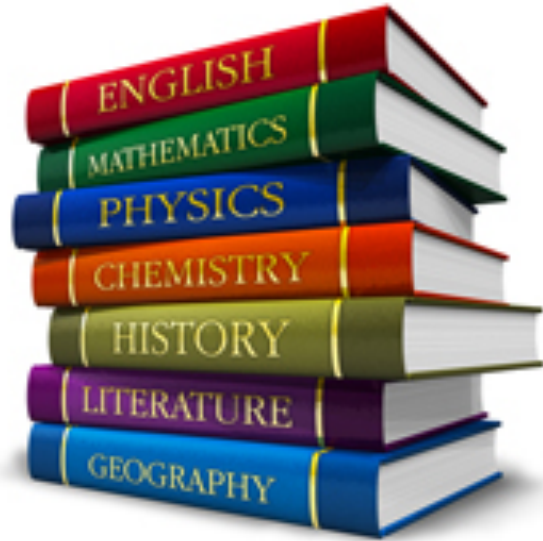
# Automatic Text Understanding for Education

Ruihong Huang, Assistant Professor

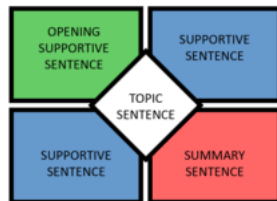
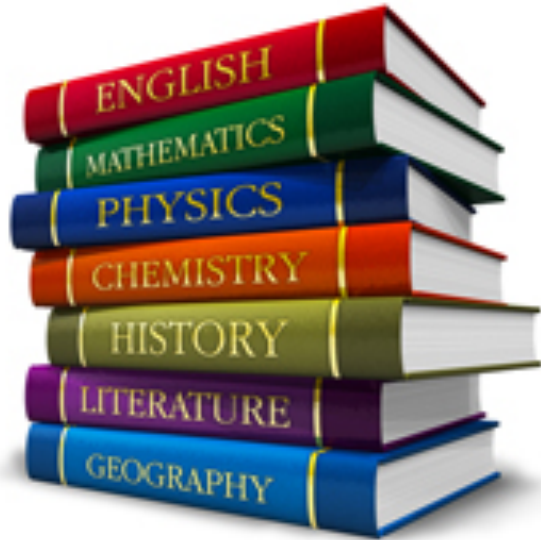
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# Text Understanding for Education



# Text Understanding for Education



## Using a Reading Method

- Why use a reading method?
  - ▣ It directs your focus
  - ▣ Efficient and Effective
  - ▣ It saves time
  - ▣ It gets what you want in the minimum time
  - ▣ It works!!



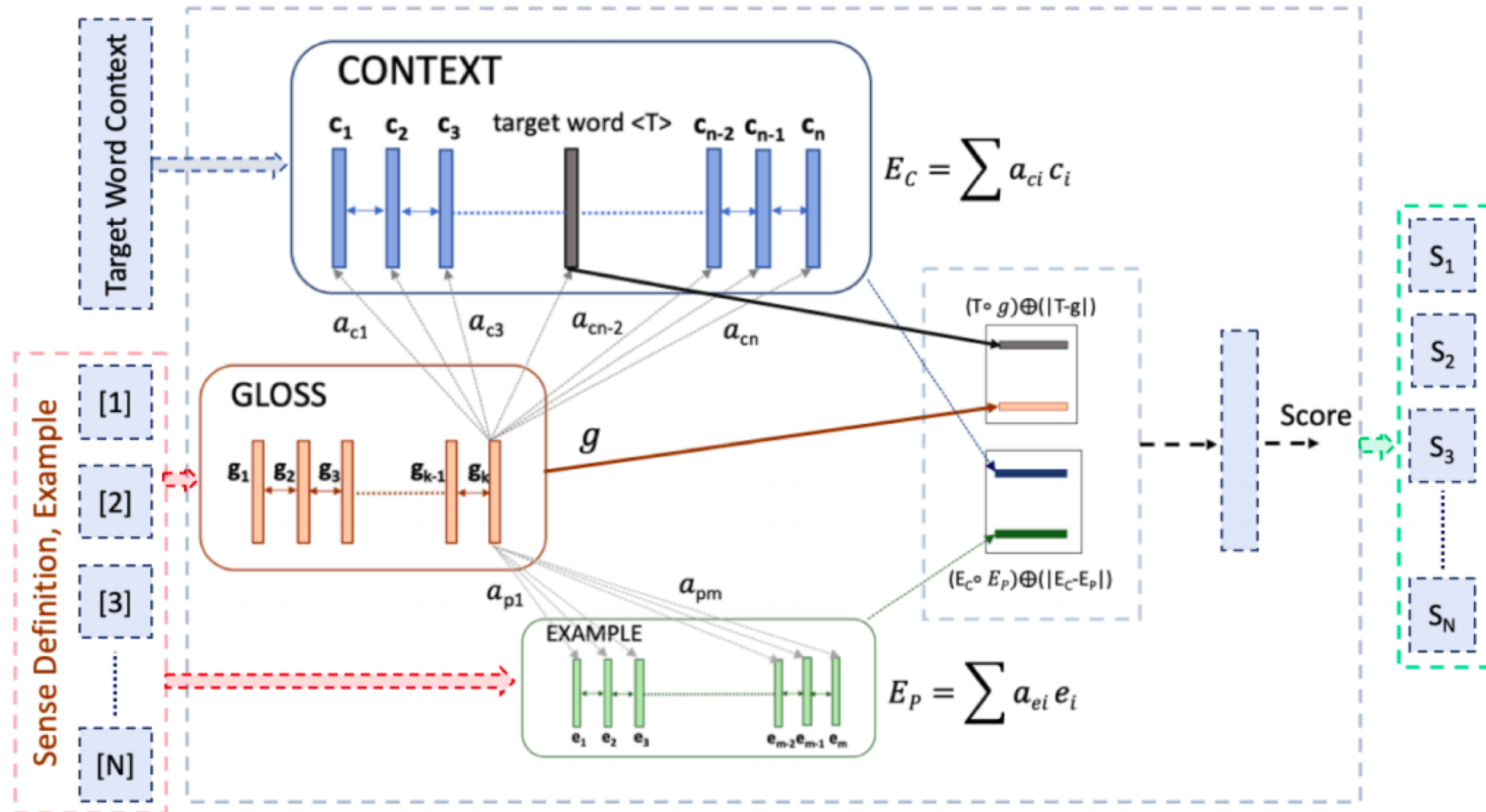
# Natural Language Processing

- Fundamental Tasks for Text Understanding
  - Understanding Word Semantics
  - Identifying Text Structures
- NLP Applications
  - Dialogue Systems
  - Argumentation Mining
  - Information Extraction
  - Sentiment/Emotion Analysis

# Semantics of words and phrases

- Word Sense Disambiguation
  - willows lined the **bank**
  - he cashed a check at the **bank**
  - the **bank** is on the corner of Nassau and Witherspoon

# Semantics of words and phrases



# Semantic Class Tagging

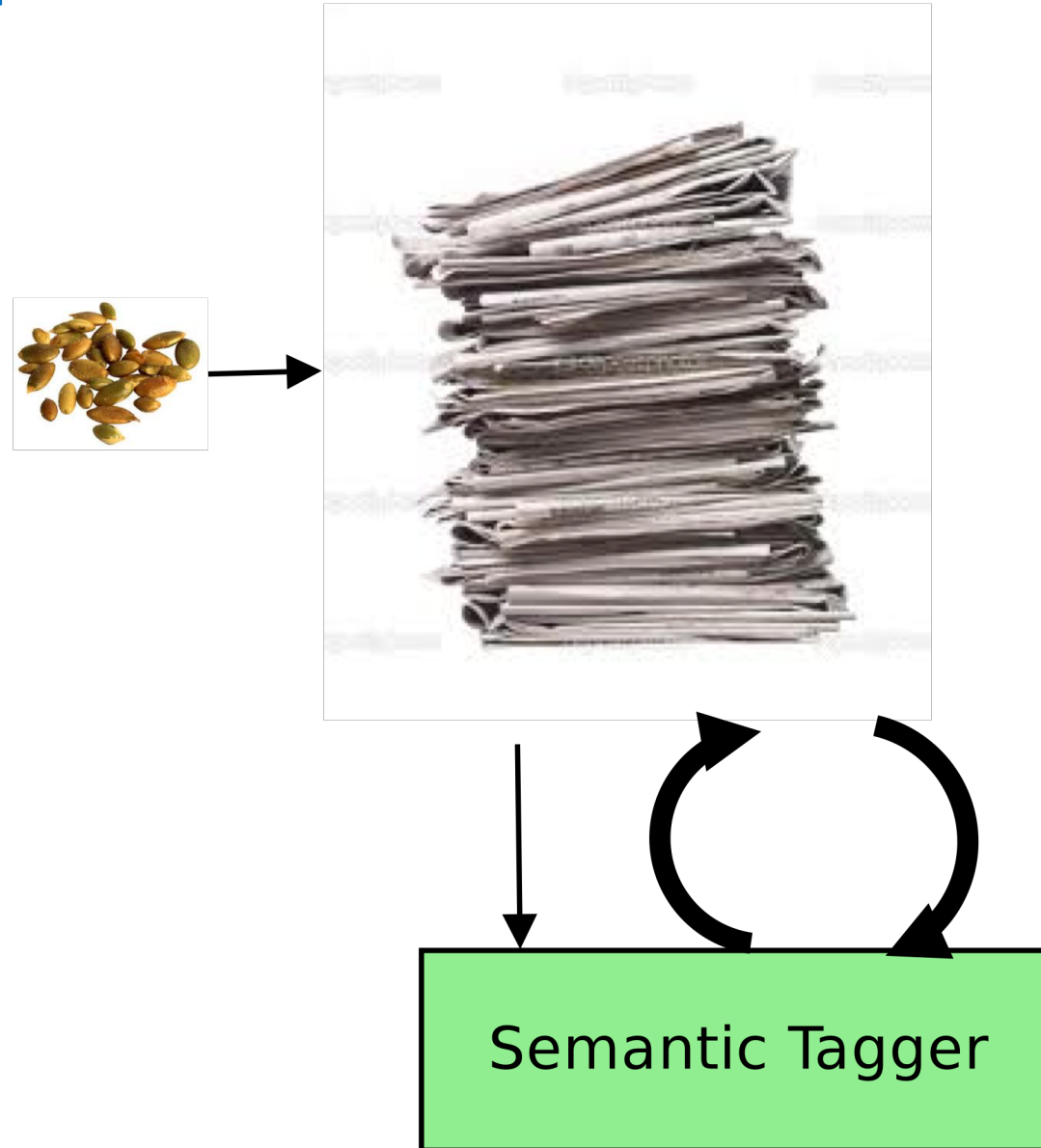
- Identifying the semantic class of each noun phrase.
  - *E.g., does a phrase refer to a disease or a drug?*

# One Specific Domain

- [A 14yo doxy] *ANIMAL* owned by [a reputable breeder] *HUMAN* is being treated for [IBD] *DISEASE* with [pred] *DRUG*. But [she] *ANIMAL* has not been improving.



# Domain-Specific Contextual Semantic Tagging



# Text Structures: Separating Eventualities from General Statives

- Today, the Amazon river is experiencing a crisis of overfishing. [STATE]
- Both subsistence fishers and their commercial rivals compete in netting large quantities of pacu, [GENERALIZING]
- [which bring good prices at markets in Brazil and abroad.  
[GENERALIZING]

# Text Structures: Identifying Rhetorical Relations

- The Butler, Wis., manufacturer went public at \$15.75 a share in August 1987,
- and Mr. Sim's goal then was a \$29 per-share price by 1992.
- Strong earnings growth helped achieve that price far ahead of schedule, in August 1988.
- The stock has since softened, trading around \$25 a share last week and closing yesterday at \$23 in national over-the-counter trading.
- But Mr. Sim has set a fresh target of \$50 a share by the end of reaching that goal.

# Text Structures: Identifying Rhetorical Relations

- The Butler, Wis., manufacturer went public at \$15.75 a share in August 1987,
  - [Expansion.Conjunction]
- and Mr. Sim's goal then was a \$29 per-share price by 1992.
  - [Expansion.Conjunction]
- Strong earnings growth helped achieve that price far ahead of schedule, in August 1988.
  - [Comparison.Concession]
- The stock has since softened, trading around \$25 a share last week and closing yesterday at \$23 in national over-the-counter trading.
  - [Comparison.Contrast]
- But Mr. Sim has set a fresh target of \$50 a share by the end of reaching that goal.

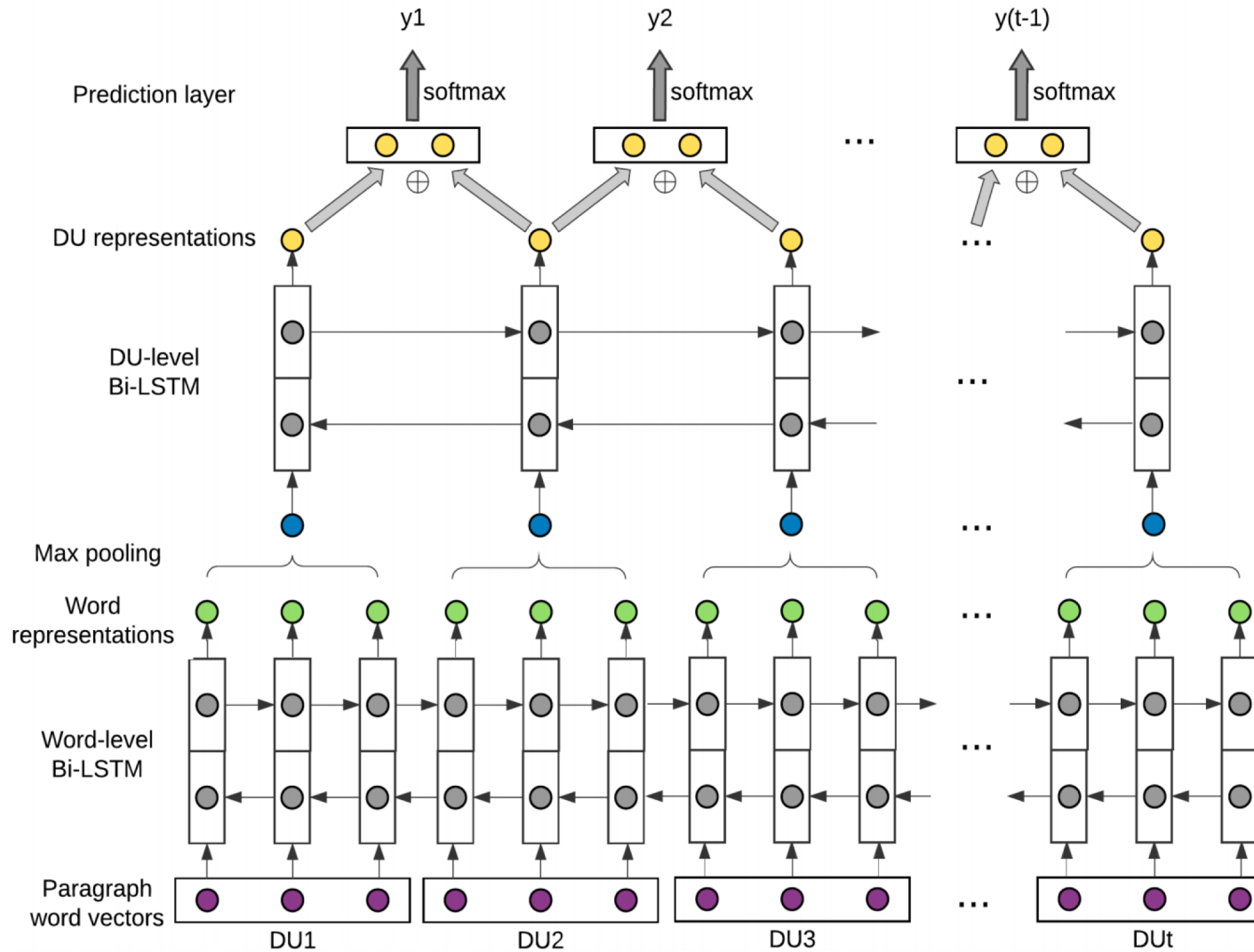
# Text Structures: Identifying Rhetorical Relations

- Could n't get the car started on a Cold Day here in Canada .
- So I went into the Canadian Tire and checked my Car Battery on their charging Station .
- It did a test to start with and said the battery was good .
- And just needed charging -
- so I charged it for 20 mins .
- Unplugged and Plugged it again to see what the test said
- and again it said good battery
- but it said it still needed charging .
- Only it would n't charge
- and instead said Battery too Hot .

# Text Structures: Identifying Rhetorical Relations

- Could n't get the car started on a Cold Day here in Canada .
  - [Contingency.Cause]
- So I went into the Canadian Tire and checked my Car Battery on their charging Station .
  - [Contingency.Cause]
- It did a test to start with and said the battery was good .
  - [Expansion.Conjunction]
- And just needed charging -
  - [Contingency.Cause]
- so I charged it for 20 mins .
  - [Expansion.Conjunction]
- Unplugged and Plugged it again to see what the test said
  - [Expansion.Conjunction]
- and again it said good battery
  - [Comparison.Contrast]
- but it said it still needed charging .
  - [Expansion.Alternative]
- Only it would n't charge
  - [Expansion.Alternative]
- and instead said Battery too Hot .

# Hierarchical Neural Networks for Inferring Text Structure

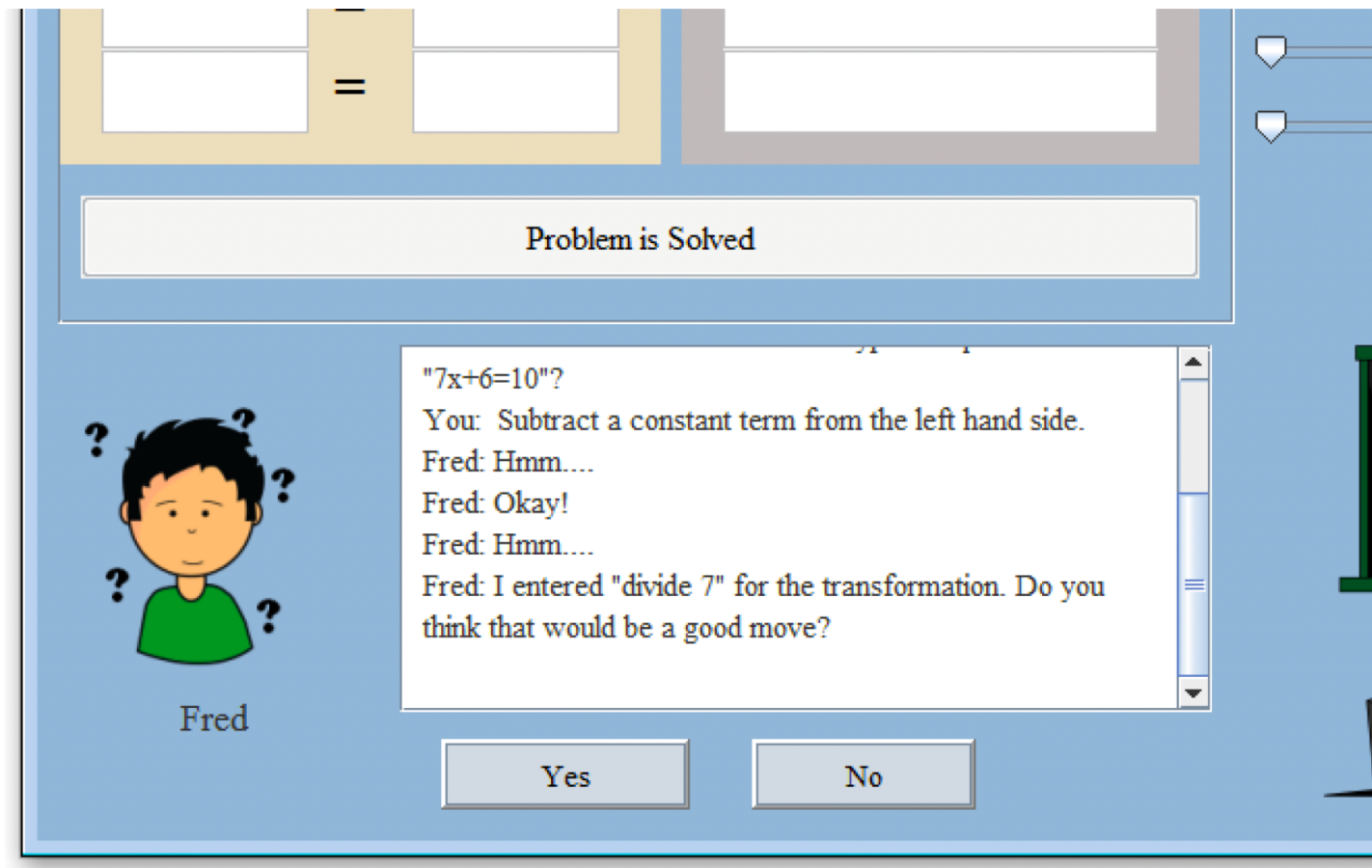


# T3 Project: machine learning to machine teaching

- Dr. Jiang's earlier talk



# Developing an Intelligent conversational Agent for assisting learning Algebra by teaching a synthetic peer



The screenshot displays a software interface for an algebra learning application. At the top, there is a workspace with a yellow background and a grey background, separated by a vertical line, with an equals sign (=) in the center. Below this workspace is a white box containing the text "Problem is Solved".

In the lower-left corner, there is a cartoon character named Fred, depicted as a boy with black hair and a green shirt, with question marks around his head. Below the character is the name "Fred".

In the center-right, there is a text area containing the following conversation:

"7x+6=10"?  
You: Subtract a constant term from the left hand side.  
Fred: Hmm....  
Fred: Okay!  
Fred: Hmm....  
Fred: I entered "divide 7" for the transformation. Do you think that would be a good move?

At the bottom of the text area, there are two buttons: "Yes" and "No".

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Thank  
you

