



# CaTeRS: Causal and Temporal Relation Scheme for Semantic Annotation of Event Structures



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# This Talk

- 1. ROCStorie Corpus:** There existed no high quality narrative corpus to drive the narrative structure learning process.
- 2. Story Cloze Test:** There existed no systematic way for evaluating story understanding and narrative structure learning
- 3. CaTeRS:** a new semantic annotation scheme for inter-event relations



# ROCStories

(Mostafazadeh et al., 2015)



# ROCStories: Short Commonsense Stories

- **ROCStories:** A collection of ~50,000 high quality short five-sentence stories with their titles authored by hundreds of crowd workers.
  - Each story:
    - (1) Is realistic
    - (2) Has a **specific beginning and ending**, where **something happens in between**
    - (3) Has nothing irrelevant or redundant to the core story
- **Applications:**
  - (1) Story generation
  - (2) Narrative structure learning
  - Etc.

# An Example Story



Bill thought he was a great basketball player. He challenged Sam to a friendly game. Sam agreed. Sam started to practice really hard. Eventually Sam beat Bill by 40 points.

X challenges Y —enable→ Y agrees to play —before→ Y practices —before→ Y beats X

ROCStories has high quality short stories that are full of stereotypical causal and temporal relations between events.

# ROCStories Comes with “Story Cloze Test” as an Evaluation Framework

**Story Cloze Test:** Given a context of four sentences, predict the ‘right’ ending to the story by choosing from two alternatives.

## Characteristics:

- Foolproof
- Human performs 100%.
- There is a wide enough gap from the state-of-the-art to human performance (42% gap), so plenty of room for research!



# Some Example Story Cloze Tests

<b>Context</b>	<b>Right Ending</b>	<b>Wrong Ending</b>
Tom and Sheryl have been together for two years. One day, they went to a carnival together. He won her several stuffed bears, and bought her funnel cakes. When they reached the Ferris wheel, he got down on one knee.	Tom asked Sheryl to marry him.	He wiped mud off of his boot.
Karen was assigned a roommate her first year of college. Her roommate asked her to go to a nearby city for a concert. Karen agreed happily. The show was absolutely exhilarating.	Karen became good friends with her roommate.	Karen hated her roommate.
Jim got his first credit card in college. He didn't have a job so he bought everything on his card. After he graduated he amounted a \$10,000 debt. Jim realized that he was foolish to spend so much money.	Jim decided to devise a plan for repayment.	Jim decided to open another credit card.

Semantic Analysis of the Event Structures of ROCStories  
gave rise to:

**CaTeRS: Causal and Temporal Relation Scheme for  
Semantic Annotation of Event Structures**



- **TimeML**
- **Major issues we had:**
  - A **quite complex and time-consuming annotation schema**, hard to do further annotations on non-news genre.
  - It includes many unused details for the task of narrative structure learning.
  - Only captures temporal links. Causality is a crucial notion in narratives which is not captured in this schema.

# CaTeRS: Annotating Event Entities and their Pair-wise Semantic Relations

- **Entities are ‘events’:**
  - “An event is any situation (including a process or state) that happens or occurs either instantaneously (punctual) or during a period of time (durative).”
  - \* We specify events to be an entry in TRIPS’ event-hyponymy.
- **Relations are ‘temporal’ and ‘causal’:**
  - Unique in **simultaneously** capturing a comprehensive set of temporal and causal relations between events.

# Temporal Links

Temporal Histories of Your Medical Event (Styler et al., 2014): with the purpose of establishing timeline in clinical narratives

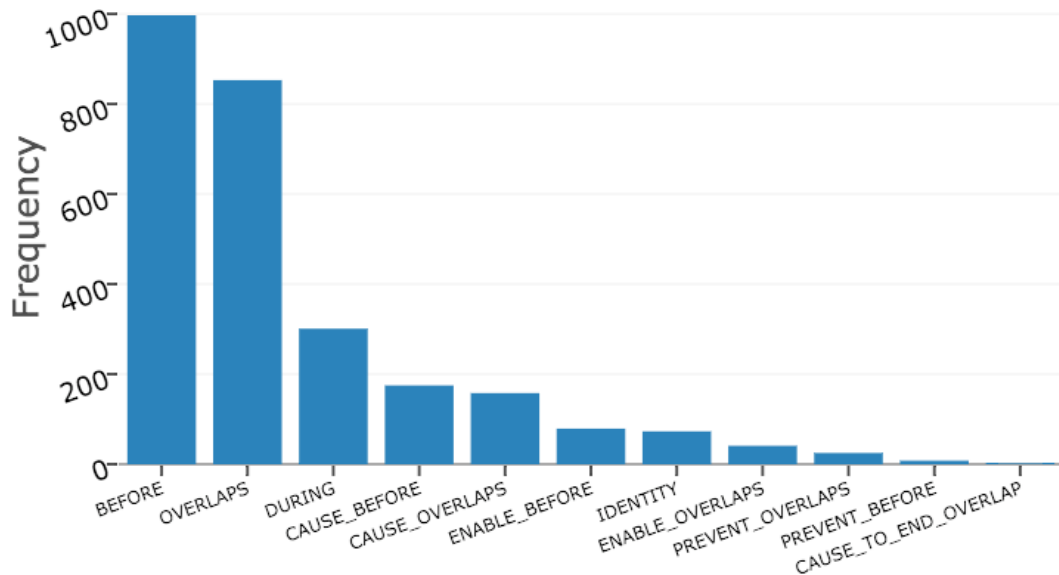
Allen	Visualization	Allen - In	THYME
X Before Y		Y After X	Before
X Meets Y		Y Is Met X	IBefore (Immediately)
X Overlaps Y		Y Is overlapped by X	-
X Finishes Y		Y Is finished by X	Ends
X Starts Y		Y Is started by X	Begins
X Contain Y		Y During X	During
X Equals Y		-	Identity
-		-	Simultaneous

# Causal Links

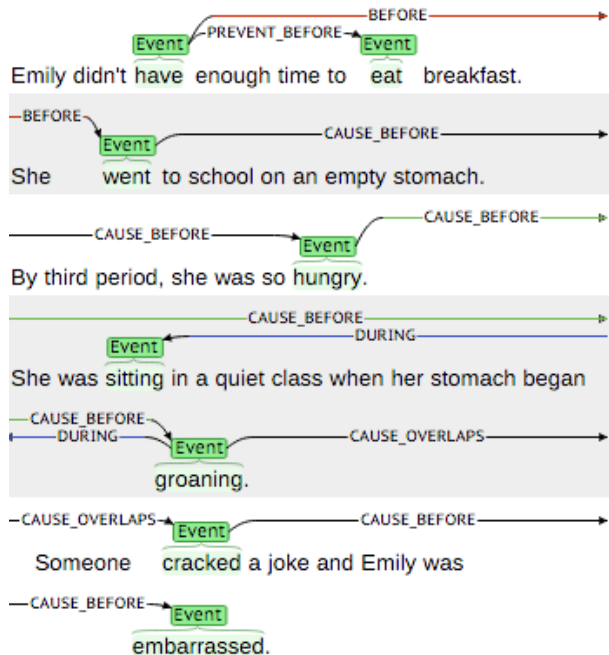
- **9 causal relations** (inspired from Talmy's Force Dynamics model):
  - **Cause** (before/overlaps): Harry [fell]e1 and [skinned]e2 his knee.
  - **Enable** (before/overlaps): Karla [earned]e1 more money and finally [bought]e2 a house.
  - **Prevent** (before/overlaps): It was [raining]e1 so hard that it prevented me from [going]e2 to the school.
  - **Cause-to-end** (before/overlaps/during): The [famine]e1 ended the [war]e2.

# Annotated Dataset

- We annotated a random sampling of 320 stories (1,600 sentences) from the ROCStories Corpus.
  - Total of 2,708 event entities and 2,715 semantic relations.



# Annotation at Story-level



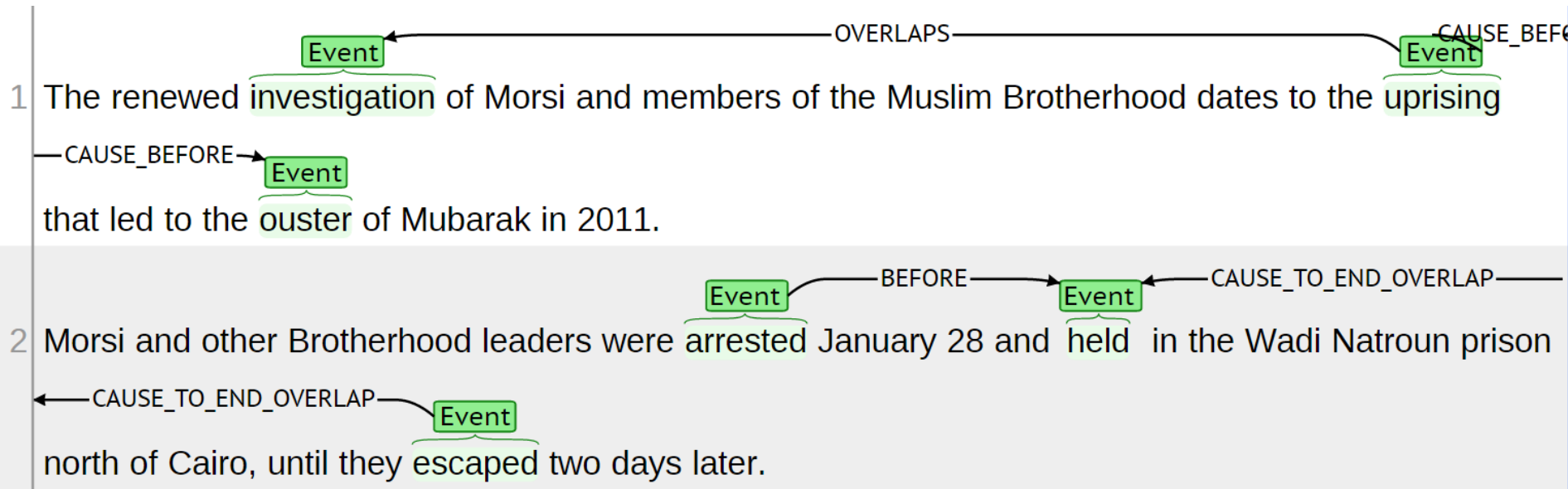
- It has been shown (Bittar et al., 2012) that temporal annotation can be most properly carried out by taking into account the full context for sentences, as opposed to TimeML, which is a surface-based annotation.
- Our semantic annotations reflect **commonsense** relation between events given the underlying story as the context.
  - The relations are not necessarily driven by explicit surface lexical signals.
- We asked four expert annotators to annotate a sample of 20 stories:
  - Inter-annotator agreement, Fleiss' Kappa:
    - Event entities 0.91 (**very high agreement**)
    - Semantic links: 0.51 (moderate agreement)

## Remember this example?

The renewed **investigation** of Morsi and members of the Muslim Brotherhood **dates** to the **uprising** that led to the **ouster** of Mubarak in 2011 .

Morsi and other Brotherhood leaders were **arrested** Jan. 28 and **held** in the Wadi Natroun prison north of Cairo, until they **escaped** two days later

# Example Annotation with CaTeRS





## Conclusion

- We introduced CaTeRS, a semantic scheme for annotating both causal and temporal relations between events, enabling very high inter-annotator agreement for event entity annotation.
- We believe that CaTeRS better suits the goals of the task of script learning and story understanding, which can potentially enable learning richer and more accurate scripts.
- Although this work focuses on stories, the CaTeRS annotation framework can be applied to any other genres for capturing inter-event relations.
- We think of this as a bootstrapping approach!

Thanks a lot for your  
Attention

Any Questions?