

# Comparing Neural Meaning-to-Text Approaches for Dutch

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## Overview

- This work focuses on DRS-to-Text generation for Dutch.
- We compare different types of Graph2Seq models.
- We add sequential information in the Graph2Seq models, and compare with the method of Seq2Seq models.

## Discourse Representation Structures

**EN/IT:**  
person.n.01 EQU speaker  
order.v.02 Agent -1 Time +1 Theme +3  
time.n.08 TPR now  
quantity.n.01 EQU 2  
hamburger.n.01 Quantity -1

**DE/NL:**  
person.n.01 EQU speaker  
quantity.n.01 EQU 2  
hamburger.n.01 Quantity -1  
order.v.02 Agent -3 Theme -1 Time +1  
time.n.08 TPR now

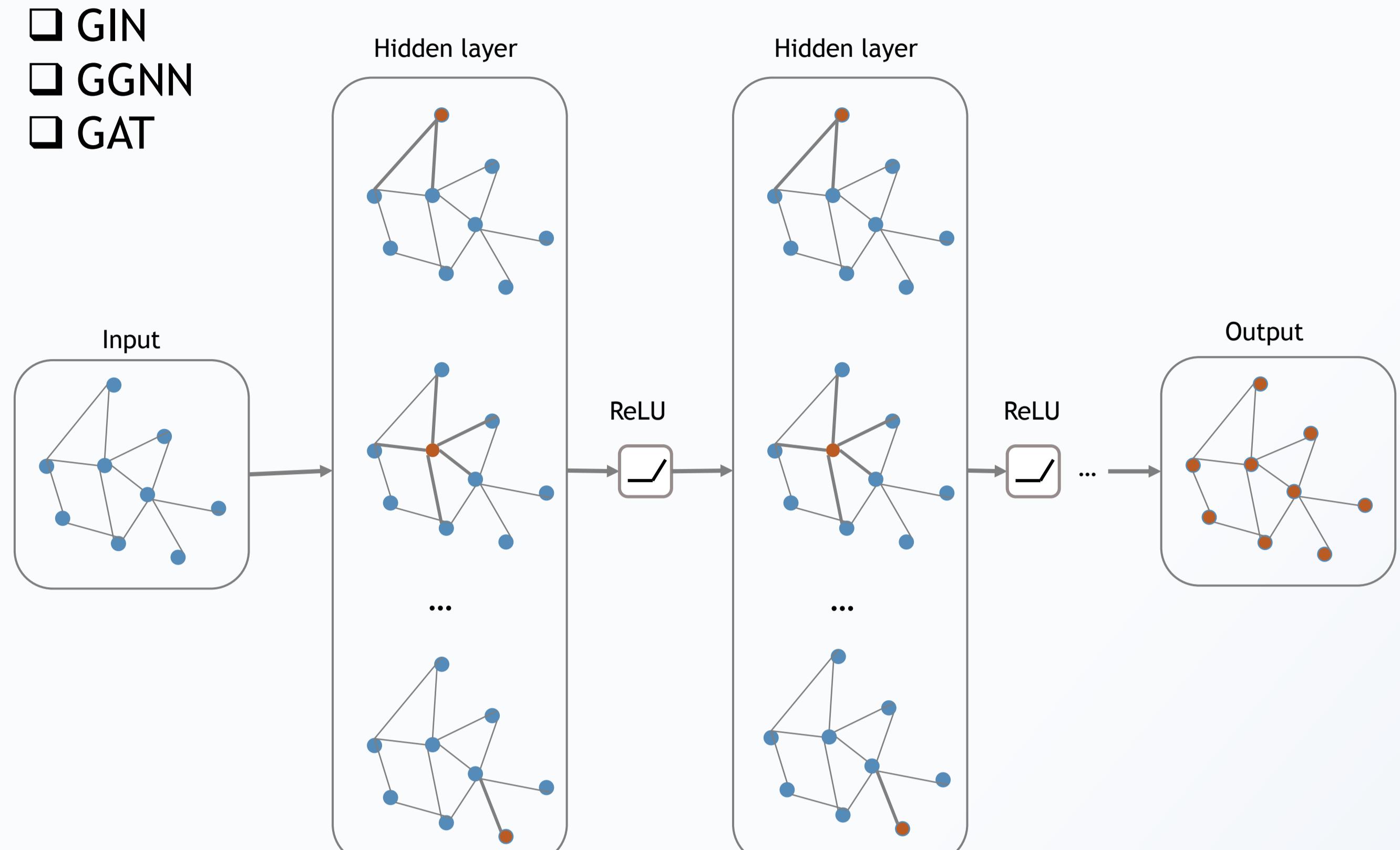
**x e t y z**  
person.n.01(x)  $x = \text{speaker}$   
time.n.08(t)  $t < \text{now}$   
order.v.02(e)  $\text{Agent}(e, x) \text{Time}(e, t) \text{Theme}(e, z)$   
quantity.n.01(y)  $y = 2$   
hamburger.n.01(z)  $\text{Quantity}(z, y)$

- **EN:** I ordered two hamburgers.  
 • **IT:** Ho ordinato due hamburger.  
 • **DE:** Ich habe zwei Hamburger bestellt.  
 • **NL:** Ik heb twee hamburgers besteld.

DRS-to-Text

## Methods

- GCN
- GIN
- GGNN
- GAT

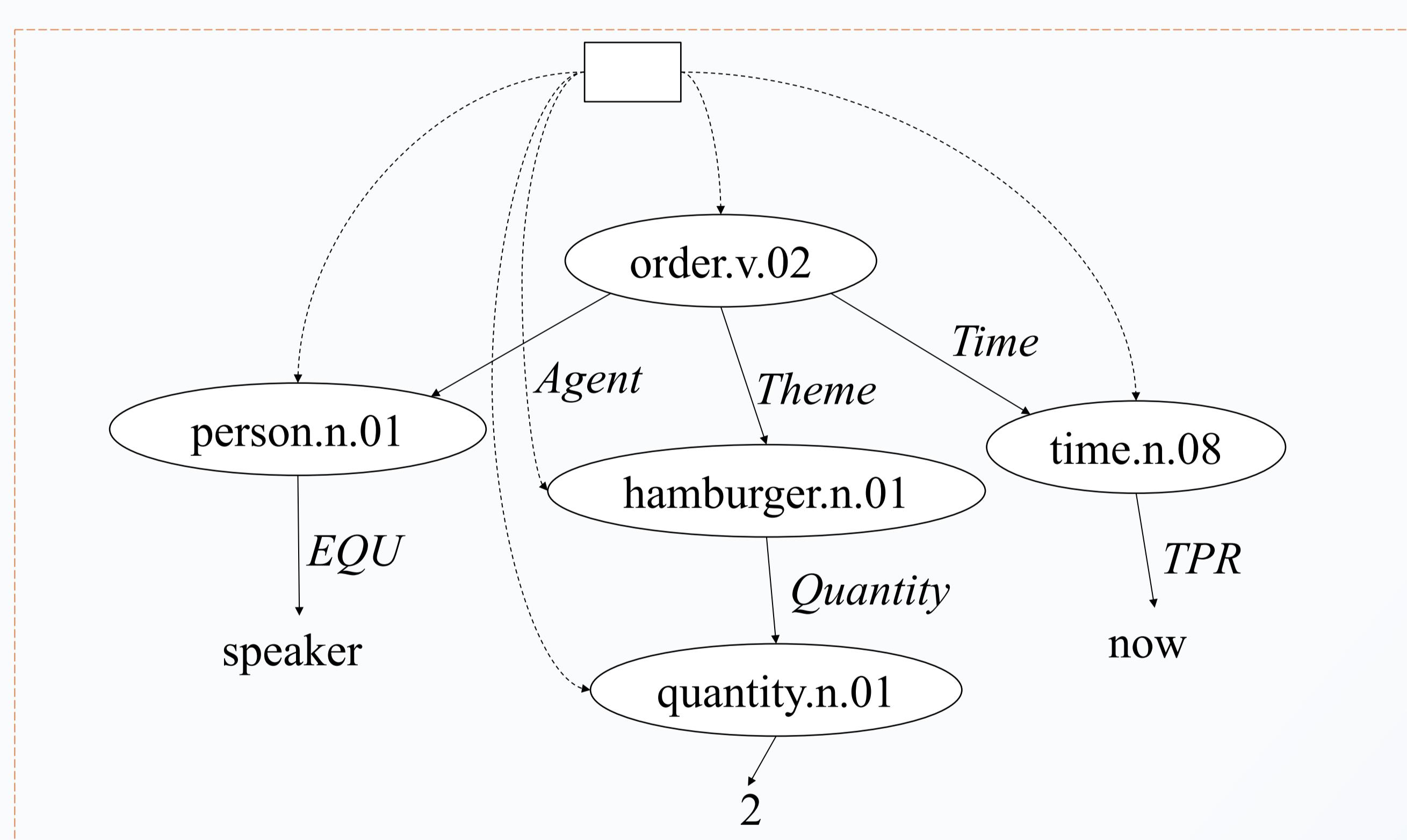


Multi-layer Graph Neural Networks as Encoder  
Figure ref: <https://tkipf.github.io/graph-convolutional-networks/>

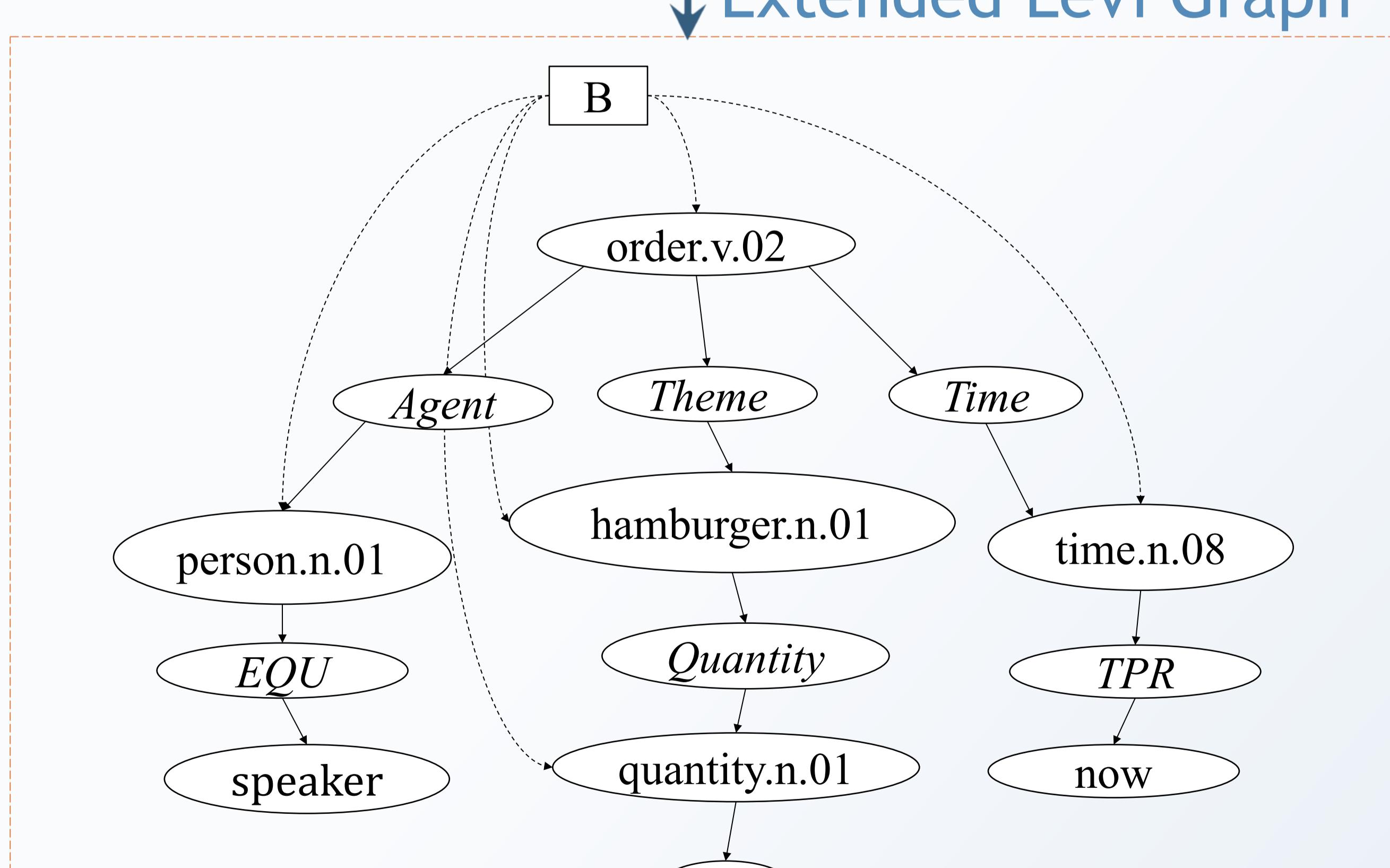
- comparing with LSTM (Seq2Seq)
- adding sequential graph
- stacking LSTM

## Representing a DRS as a Graph

- Concept : node
  - Role : edge
  - Constant : node
  - Comparison operator : edge
  - Discourse relation: edge
- |                     |                     |
|---------------------|---------------------|
| % e.g. order.v.02   | % e.g. Agent, Theme |
| % e.g. speaker, now | % e.g. EQU, TPR     |
| % e.g. NEGATION     |                     |



Extended Levi Graph



## Experiments (Dutch)

Model	BLEU	METEOR	ROUGE
GCN	34.7	30.5	61.0
GCN+seq (✓)	39.9	33.3	66.1
LSTM	38.0	31.5	63.5
GCN+LSTM (✓)	42.2	34.7	67.9
LSTM+GCN	38.8	32.7	65.2

Model	BLEU	METEOR	ROUGE
GCN+LSTM	42.2	34.7	67.9
GIN+LSTM	42.7	34.6	68.7
GAT+LSTM (✓)	43.0	35.2	69.5
GGNN+LSTM	41.7	33.9	69.0

## Examples

Reference	Output	Judgement
Mr. Smith kwam.	Meneer Smith is vanmorgen gekomen.	😊
Deze kaas heeft een scherpe smaak.	Kaas heeft een bittere smaak.	😊
Je mag mijn pen niet gebruiken.	Je kan mijn pen niet gebruiken.	😊
Hij leert Chinees.	Hij studeert Chinees.	😊
Tom is groter dan zijn moeder.	Tom is langer dan zijn moeder.	😊
Ik ken niemand van hen.	Ik ken geen van hen.	😊
Het meer is heel diep.	Het meer is heel romantisch.	😊
Mijn oom is boos.	Mijn oom is kwaad.	😊
Een bijen zoemt.	Een bijen wandelt alle vreemdelingen.	😊

## Conclusion

- Seq2Seq models outperform Graph2Seq models.
- Adding sequential information in Graph2Seq models can improve generation performance.
- Stacking models will significantly improve generation performance.

