**Problem Studied**

**Goal:** Generate natural sentences to describe relationships as represented by RDF triples.

**Example:**

- **T1:** `<flinders street station, front, federation square>`
- **T2:** `<flinders street station, color, yellow>`
- **T3:** `<flinders street station, has, green dome>`

**Sent:** Flinders Street Station is a yellow building with a green dome roof located in front of Federation Square

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**Motivation: Textual Description of Geographic Entities**

Generated a sentence from knowledge graph: *"Flinders Street Station is a yellow building with a green dome roof located in front of Federation Square"*

**Motivation: Textual Description For Navigation Instructions**

- "Walk east on Flinders St/State Route 30 towards Market St; Turn right onto St Kilda Rd/Swanston St" vs.
- "Walk east on Flinders St/State Route 30 towards Market St; Turn right onto St Kilda Rd/Swanston Staler Flinders Street Station, a yellow building with a green dome."

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**Proposed Model**

**RDF Data characteristics:**
- Contains relationship triples and attribute triples
- In the form of knowledge graph:
  - Contains cycle
  - Intra-triple relationship (relationship between entities in one triple)
  - Inter-triple relationship (relationship between triples)

**Target Text**

```
Target Text Pre-processor
Sentence Normalizer De-lexicalizer
```

**Decoder**

```
Encoder
```

**RDF Triples**

We propose an encoder-decoder sentence generation model:
- We define Graph-based triple encoder (GTR-LSTM)
- Standard LSTM is used for the decoder
- Pre-processor is used to mask the entity name in the sentences and triples

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**Results**

**Automatic Evaluation**

- **Model:** GTR-LSTM
- **Metric:** BLEU↑ METEOR↑ TER↓
- **Dataset:** Seen Unseen GKB

<table>
<thead>
<tr>
<th>Model</th>
<th>BLEU</th>
<th>METEOR</th>
<th>TER</th>
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<tbody>
<tr>
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<td>28.0</td>
<td>34.8</td>
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<tr>
<td>SMT</td>
<td>46.5</td>
<td>24.8</td>
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<tr>
<td>TFF</td>
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<td>34.1</td>
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**Human Evaluation (Scored out of 3; higher scores are preferred)**

- **Model:** GTR-LSTM
- **Metric:** Correctness Grammar Fluency

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<th>Grammar</th>
<th>Fluency</th>
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<td>TFF</td>
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**Conclusions**

- Graph-based encoder
  - Captures better information of a knowledge graph
  - Maintains the structure of input RDF triples
  - Handles cycles to capture the global information of a knowledge graph

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**Graph-based Triple Encoder (GTR-LSTM)**

- Topological sort and breadth-first traversal to traverse the graph
- When a vertex \( v \) is visited, the hidden states of all adjacent vertices of \( v \) are computed (or updated)
- Attention model: to capture the global information of the graph

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**GTR-LSTM Encoder:**

- Encoder: A Triple Encoder for Sentence Generation from RDF Data

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**Existing models**

- **Model:** BLSTM
- **Metric:** BLEU METEOR TER
- **Dataset:** Seen Unseen GKB

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