Brat2Viz: a Tool and Pipeline for Visualizing Narratives from Annotated Texts

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Narratives

- **Narratives texts** are characterized by a chronological succession of **events**, **causality relations** between the events, and **actors** [Adams 92]
- Narratives are central in **many domains**:
  - Literature
  - Journalism
  - Health
  - Finance
- Automatic **Narrative Extraction from Text** is challenging and relevant
- **Huge lack** of densely **annotated data**
- Narrative **annotation effort** is **complex** and **hard to validate**
- We propose a **pipeline** for **narrative visualization** and labeling validation

Narratives

Narrative Texts

characterized by the chronological succession of events, causality relations between the events and actors

Narratives Main Domains

- Literature
- Journalism
- Health
- Finance

Automatic **Narrative Extraction from Text**

Challenging and relevant task

Huge Lack

Densely annotated data

Narrative Annotation Efforts

complex and **hard to validate**

Narrative Extraction from Text

- **Narrative Extraction from Text** - identify:
  - **Narrative elements** (actors, events, times)
  - Their **attributes**
  - **Semantic links** between them (temporal, referential, semantic roles).
- **Result**
  - **Structure** that can then be **represented** in a formal language
  - From this structure we can produce different representations such as diagrams or texts
- **Existing approaches** benefit from **annotated corpora**
  - Training
  - Validation

Narrative Extraction from Text

Identification of

- Narrative elements (actors, events, times)
- Their attributes
- Semantic links between them
  - temporal,
  - referential,
  - semantic roles

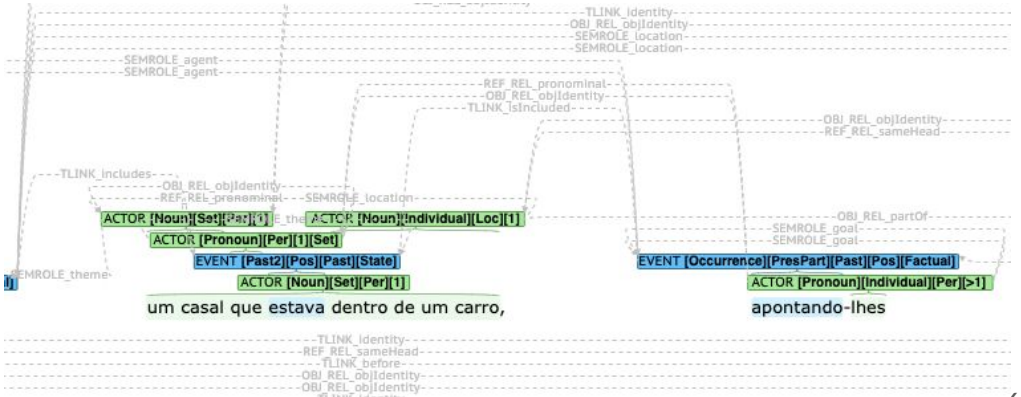
Result

Structure that can then be **represented** in a formal language

From this structure we can produce different representations such as diagrams or texts

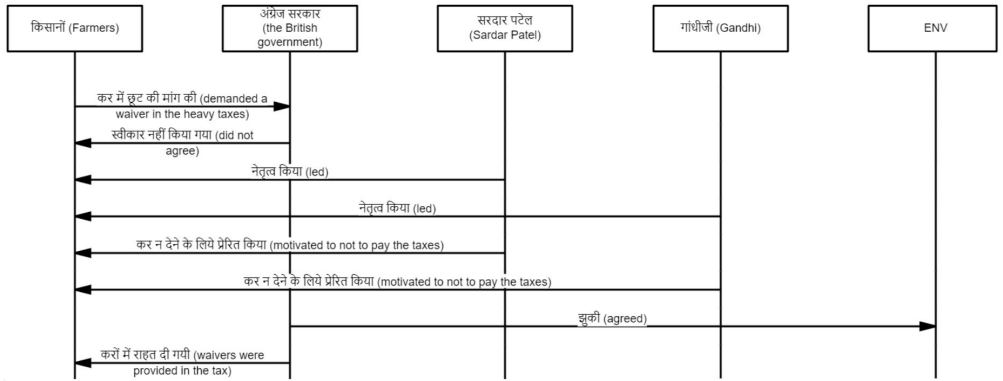
The annotation effort

- **The task of corpus annotation** is hard and **laborious**
  - Choose a **semantic annotation framework**
  - Adapt to the **target language** (e.g. Portuguese)
  - Avoid overloaded annotation
  - Check and i**nspect annotation**
- **Existing annotation tools**
  - Brat, Prodigy, etc.
  - Easy to use
  - **Do not enable easy verification**



Visualization of Narratives

- A **final product** of Narrative Extraction
- In the **annotation process**
  - Enable visualization of the result of the annotation
  - **Help** the annotator



(Bhattacharyya et al 2020)

Our Proposal: Brat2Viz

A tool and pipeline to produce a visualization of narratives from annotations, which enables the human annotator to validate the labels assigned

Brat2Viz and Text2Story

- A Narrative Annotation Visualization tool: **Brat2Viz**
  - Supports the **high level visualization** of narrative annotation done with Brat
  - Implements a **pipeline**
    - From text annotation to visualization
- **Text2Story** is a project (https://text2story.inesctec.pt/)
  - Currently annotating a corpus of news stories in **European Portuguese**

text2story

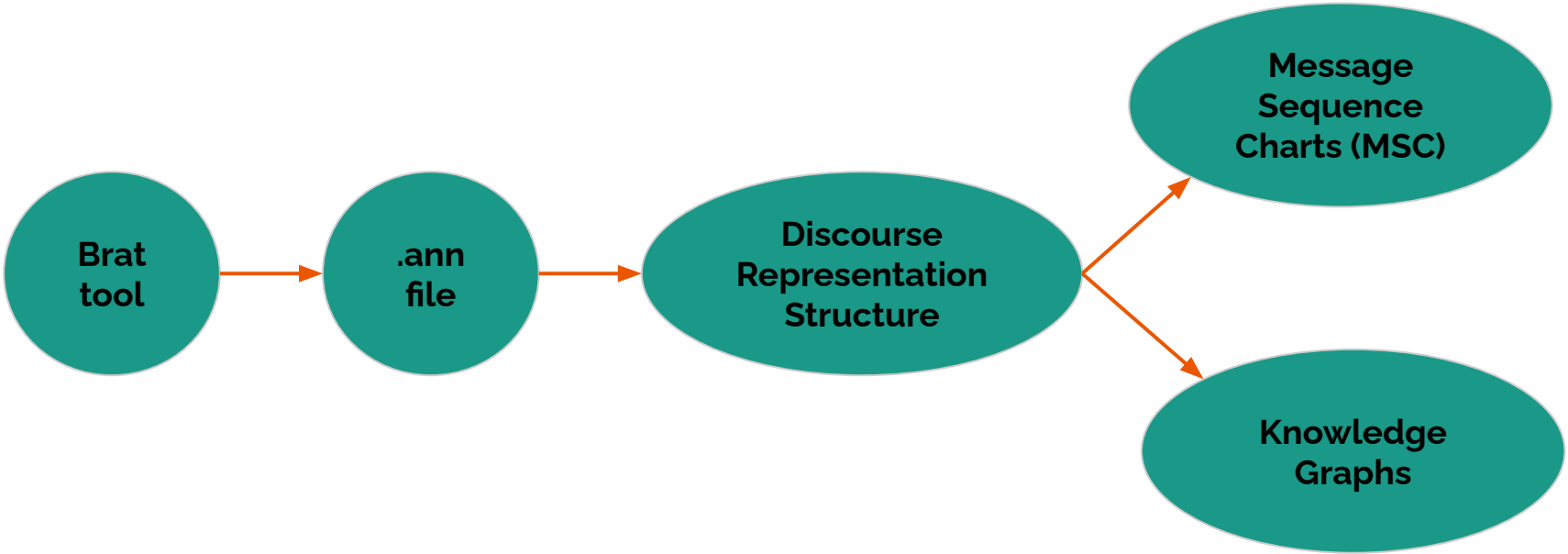
Main contributions

1. An **extensible framework** to generate visual representations of narratives from annotated texts
2. The use of a **formal logic-based language**, Discourse Representation Structure (DRS), as an intermediate language to the visual representation
3. An online interactive **demonstration** of our pipeline
4. Available **code**

Related Work

- Narrative extraction
  - ROCStories
  - Ontologies
- Narrative visualization
  - Communication Design and Journalism
  - MSC

The Narrative Annotation Visualization Pipeline



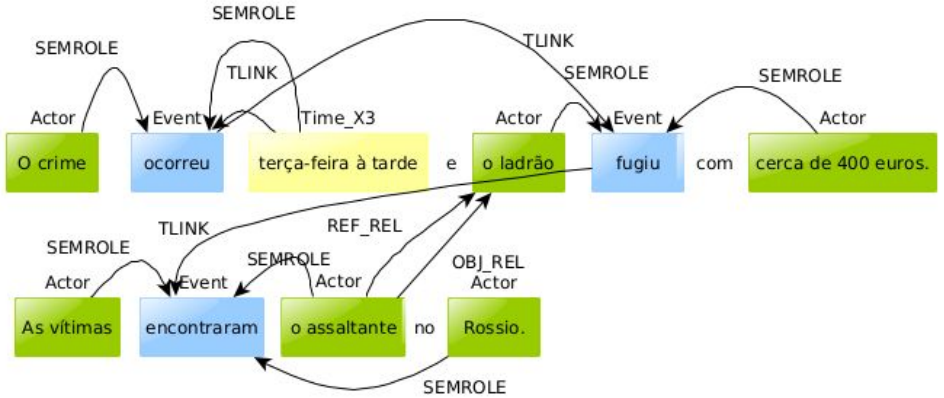
Annotation Scheme

- Annotation in **three levels**:
  - Referential
  - Temporal
  - Semantic role labeling
- **Annotation scheme** used:
  - **ISO 24617-1/9** for the first two levels
  - **L**inguistic **I**nf**R**astructure for **I**nteroperable Resour**C**es and **S**ystems (**LIRICS - ISO 24617-4**) for the third
- Adaptations of **number of tags** and **types of attributes** due to
  - Multilayer annotation
  - Properties of Portuguese
  - Genre of the corpus (news)

Annotation Scheme

- **Three types of tags**:
  - **Actors**, to annotate characters in the story
    - (e.g., “um homem” – “a man”)
  - **Events**, for events
    - (e.g., “assaltou” – “robbed”)
  - **Timex3**, for temporal expressions.
    - (e.g., “sexta-feira” - “Friday”)
- **Attributes** (with different values)

Annotation Scheme Linkage



- Between the **actors**
  - REF_REL
    - Synonymy, antonymy, hyponymy, etc.
  - OBJ_REL
    - Relations between linguistic units, from a discourse point of view
- Between **events** and **actors**
  - SEM_ROLES_LINKS
    - Semantic relations between events and actors
- Between **events**, **temporal references** or **locations**:
  - TLINKS
    - Temporal links (TLINKS) account for the **chronological ordering of the event**

Structure of Brat2Viz

- **Brat2DRS** module:
  - **From annotation files** generated by Brat
  - parses them, and creates **a DRS representation** (Kamp & Reyle 93) for each news story
- **DRS2Viz** module:
  - Then, the **DRS2Viz deploys a web application** that produces visualizations of the original newstext

Brat2DRS module

- Parse the "**.ann**" file
- Build a **dictionary**
  - with the linguistic elements found
- Assign a **symbolic variable** to each event
- **Transcribe** to
  - First Order Logic
  - DRS (**Discourse Representation Structure**)

```
T3 ACTOR 0 8 Um homem
A1 Lexical_Head T3 Noun
A2 Individuation T3 Individual
A3 Actor_Type T3 Per
A4 Involvement T3 1
T9 EVENT 9 17 assaltou
E1 EVENT:T9
A32 Class E1 Occurrence
A33 Tense E1 Past1
A34 Polarity E1 Pos
A35 Time E1 Past
```

```
event(a), eventClass(a,Occurrence), Tense(a,Past1),
Polarity(a,Pos), Time(a,Past), relationRole(agent,T3)
```

DRS - Discourse Representation Structure

- **DRS statements** are generated in a textual format declaring:
  - Events' properties
  - Actors
  - Time expressions
  - Relations between them
- High-level abstract representation of the narrative
  - Can be used by **subsequent operations**
  - **No need to go back** to the original text
  - Can be used for reasoning
- DRS declaring one event named 'a' and some attributes of the event

```
event(a), eventClass(a,Occurrence), Tense(a,Past1),
Polarity(a,Pos), Time(a,Past), relationRole(agent,T3)
```

DRS2Viz module

- **Module**:
  - **Parser** component
  - **Visualization** engine
- **Input**
  - DRS
- **Output**:
  - Visualizations in the web browser
- **Current visualizations**
  - MSC and Knowledge Graphs
- **Actors** are represented as **nodes**
- **Events** and **relations** are represented as **links** between nodes

DRS2Viz module

- The **parser** uses the DRS and extracts
  - actors
  - events
  - relations
- Into independent data structures
- **Structures** keep track of **identifiers**, and the lexical items that represent them

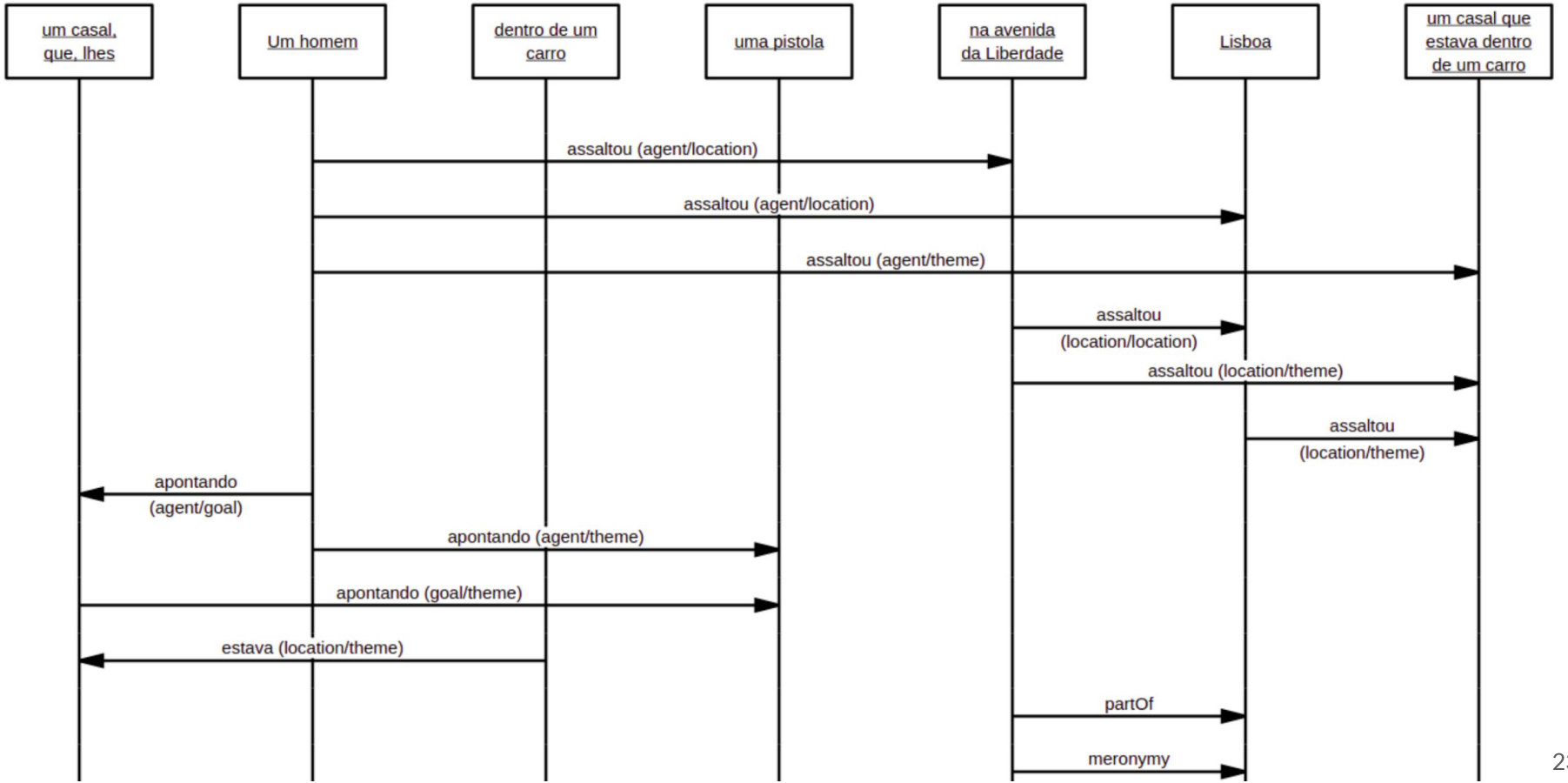
```
event(a), eventClass(a,Occurrence), Tense(a,Past1),
Polarity(a,Pos), Time(a,Past), relationRole(agent,T3)
```

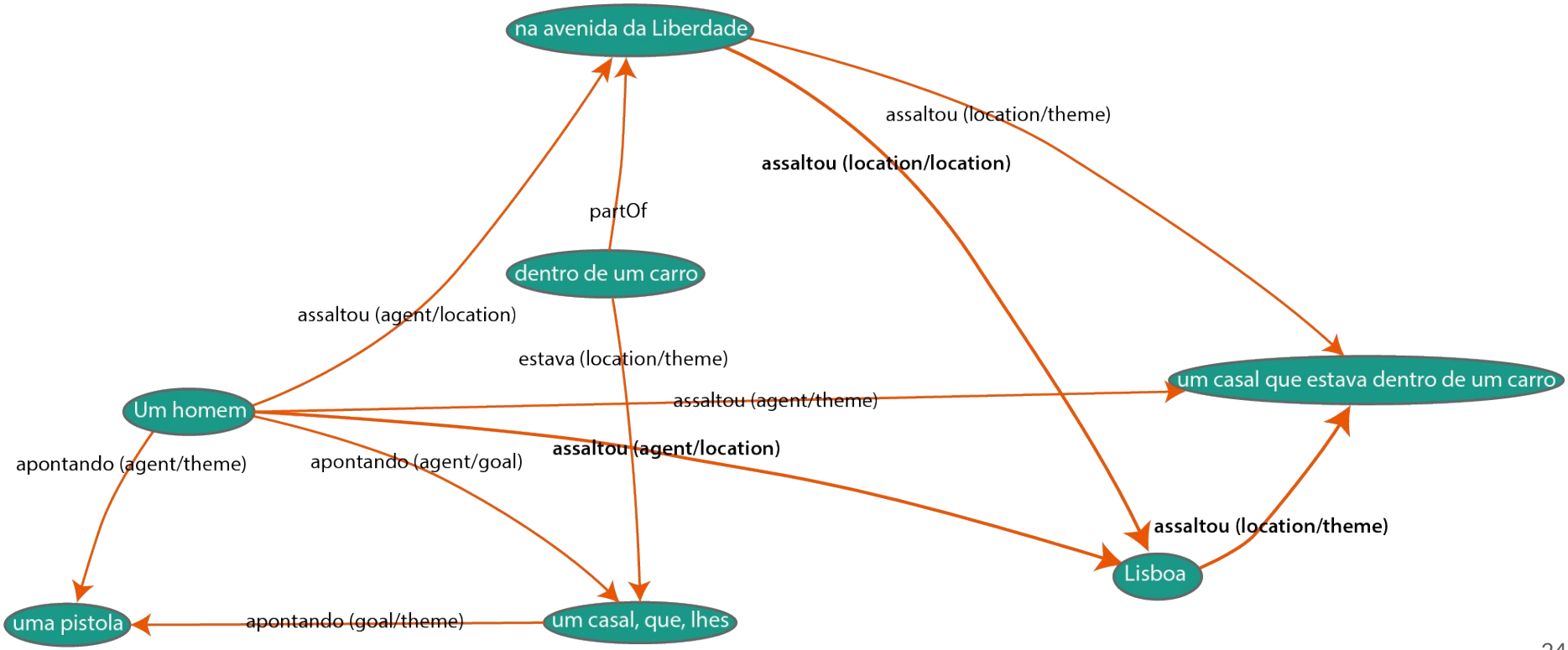
DRS2Viz module

- The **actor** is represented as T3: “Um homem”
- The **event** is: “assaltou”
- **Links** occur between actors
- Identify **pairs of actors** linked by an event
- **Group** references by actor
  - ‘Thief’, ‘man’, ‘assailant’

```
event(a), eventClass(a,Occurrence), Tense(a,Past1),
Polarity(a,Pos), Time(a,Past), relationRole(agent,T3)
```

Visualization


um casal, que, lhes
Um homem
dentro de um carro
uma pistola
na avenida da Liberdade
Lisboa
um casal que estava dentro de um carro
assaltou (agent/location)
assaltou (agent/location)
assaltou (agent/theme)
assaltou (location/location)
assaltou (location/theme)
assaltou (location/theme)
apontando (agent/goal)
apontando (agent/theme)
apontando (goal/theme)
estava (location/theme)
partOf
meronymy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apontando (agent/goal)
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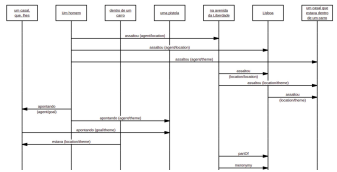
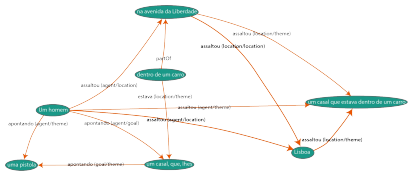
Lisboa
uma pistola
apontando (goal/theme)
um casal, que, lhes

Conclusion / Summary

- **Brat2Viz** tool and pipeline
  - Visualize narratives from annotations produced in Brat
- Two-step **modular pipeline**
  - Narrative **annotations** to the **DRS formal language**
  - **DRS** to **visual** representations
- Currently, we **visualize** the narratives as
  - **Message Sequence Charts**
  - **Knowledge Graphs**





If you want to try or extend Brat2Viz

- Online **demo**
  - https://nabu.dcc.fc.up.pt/brat2viz
- Check out our **project** web page and get in touch
  - https://text2story.inesctec.pt/
- Github **repo**
  - https://github.com/LIAAD/brat2viz

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Future Work

- **Modular** pipeline enables
  - **Extension** and adaptation to other scenarios
  - **Other visualization**s from DRS, such as **timelines**, **story trees** and **icon-strips**
  - Other types of representations (e.g., simplified **textual narratives**)
  - **The annotation scheme** can also be adapted to other needs
  - **Narrative extraction algorithms** may also be plugged as automatic annotators
    - **Narrative Extraction Visualization Pipeline**

Thank You!

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