

Leveraging Structured Representations for Narratives

Workshop on Ontologies for Narrative and Fiction

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1.

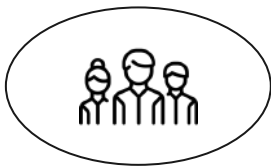
INTRODUCTION

Broader context of my research



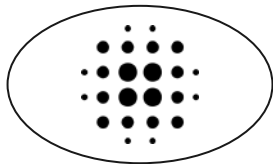
Photo generated on Hotpot.ai

Narratives for sense-making



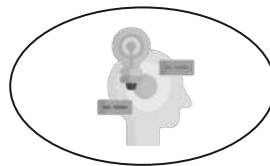
HUMAN CAPABILITY

- Related: stories, explanations
- We constantly use them to explain what happens around us
- Requires: understanding, representing, reasoning



A FUZZY DEFINITION

- A series of events or experiences, with *something that happens*
- In practice, more complex objects: granularity, perspective, which features for an event



FROM DATA TO INSIGHTS

- Can be seen as a two-step process:
1. Identify content that is relevant for a narrative
 2. Shape that content into a coherent narrative



IMPROVE AI SYSTEMS

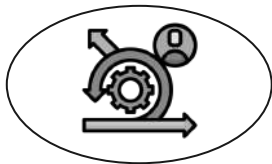
- Better human-centric systems
- AI not as a replacement but as an improvement of humans
- Push AI systems to assist humans in scientific research

Scope of my research



DEFINITIONS

- Narrative as a sequence of events, encoded as a knowledge graph
- Event-level description ~ who did what when and where
- Narrative-level description ~ causal and temporal links



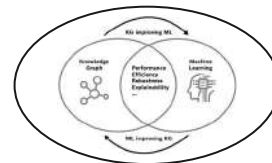
BUILD NARRATIVES FROM KGs

- Input = KG, Output = KG
- Ontologies, explainability
- Narrative graph to overcome limitations of current generic KGs



RESEARCH QUESTIONS

1. Representation. *Which structured representation for my narrative?*
2. Building. *How to select relevant entities for the narrative? How to map it to the output narrative format?*
3. Completion. *How can graph completion and reasoning improve the narrative? How to predict meaningful links between events?*
4. Evaluation. *Which metrics to assess the quality of the narrative?*



SYMBOLIC & SUB-SYMBOLIC

- Better human-centric systems
- AI not as a replacement but as an improvement of humans
- Push AI systems to assist humans in scientific research

2.

PREVIOUS WORK

First prototype and improvements



Photo generated on Hotpot.ai

CONTENT



PROTOTYPE

First Prototype on the French Revolution



GRAPH SEARCH

Automating the search of relevant content to build a narrative



MULTIMODALITY

Combining text input and knowledge graphs

Prototype

- Aim = build a narrative graph of the French Revolution from Wikidata and Wikipedia
- Manual exploration and rule design, automatic data extraction

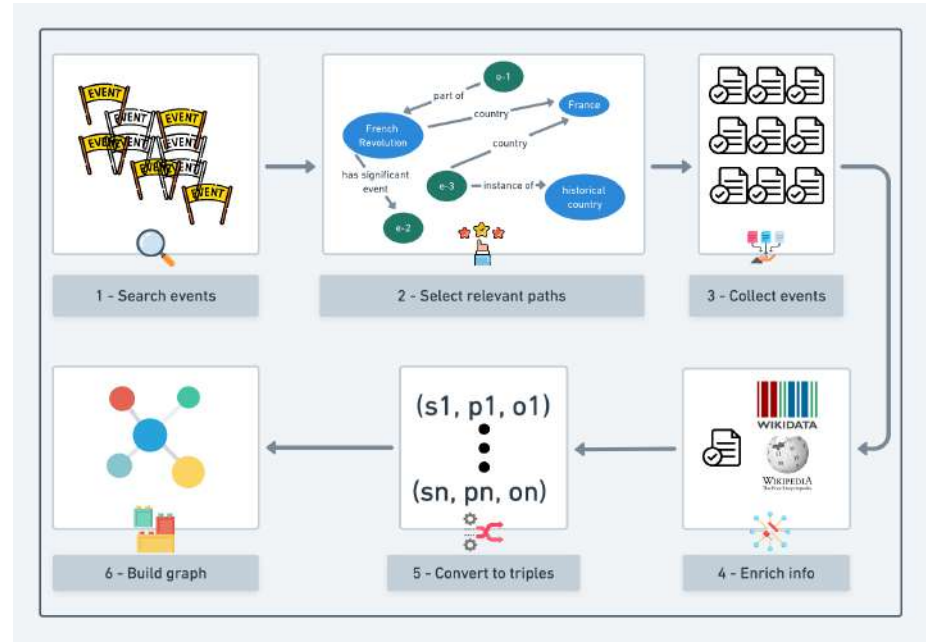
Language	Label	Description	Also known as
English	Storming of the Bastille	part of the French Revolution	
French	Prise de la Bastille	indépendance de la Révolution française	14 juillet 1789
Spanish	Toma de la Bastilla	toma en 1789 de una cárcel parisina por parte de los revolucionarios, hecho simbólico del final del Antiguo Régimen francés	
German	Sturm auf die Bastille	Aufbruch der Französischen Revolution	

Statements
instance of 1 storming ✓ edit
−0 reference + add reference − add value
part of 1 French Revolution ✓ edit
−0 reference + add reference − add value
image 1 Storming of the Bastille (1789) ✓ edit
−0 reference + add reference − add value
country 1 France ✓ edit
−0 reference + add reference − add value
location 1 Paris ✓ edit
−0 reference + add reference − add value

Wikidata

Storming of the Bastille	
Part of the French Revolution	
	
Storming of The Bastille, Jean-Pierre Houllé	
Date	14 July 1789; 232 years ago
Location	Paris, Île-de-France, France 48°51'11"N 2°22'09"E
Result	Insurgent victory <ul style="list-style-type: none"> Bastille captured
Belligerents	
Civilian insurgents	✎ Royal government
French Guards mutineers	
Commanders and leaders	
Pierre-Henri ^[1]	✎ Bernard-René
Stanislas Maillard	Jourdan de Launay ✎
Jacob Elie ^[citation needed]	
Strength	
Between 688 to 1,000 armed civilian insurgents; 61 French Guards; at least five artillery pieces	114 soldiers (82 Invalides (veterans), 32 Swiss soldiers of the Salis-Samade Regiment); 30 artillery pieces
Casualties and losses	
98 killed, 73 wounded	1 killed in fighting; 113 captured (six or possibly

Wikipedia



Method

Prototype

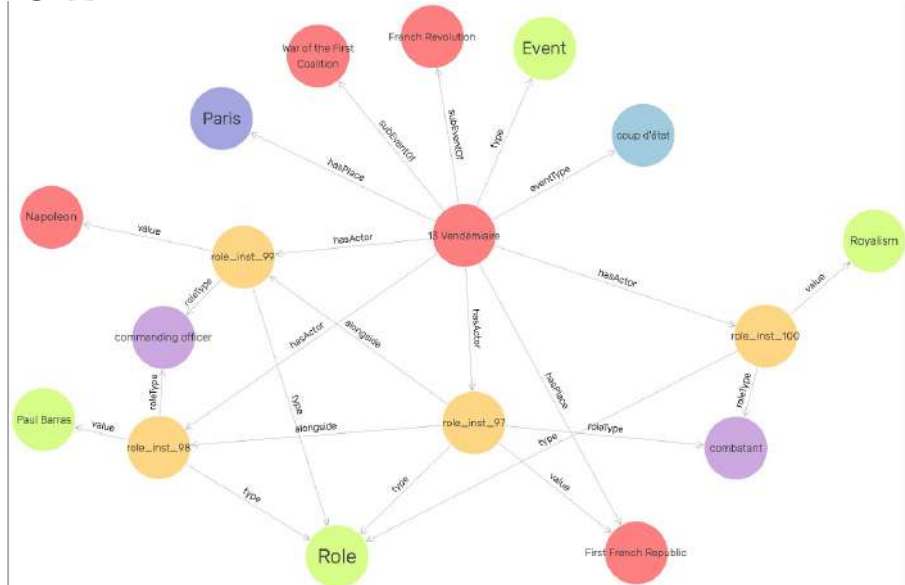
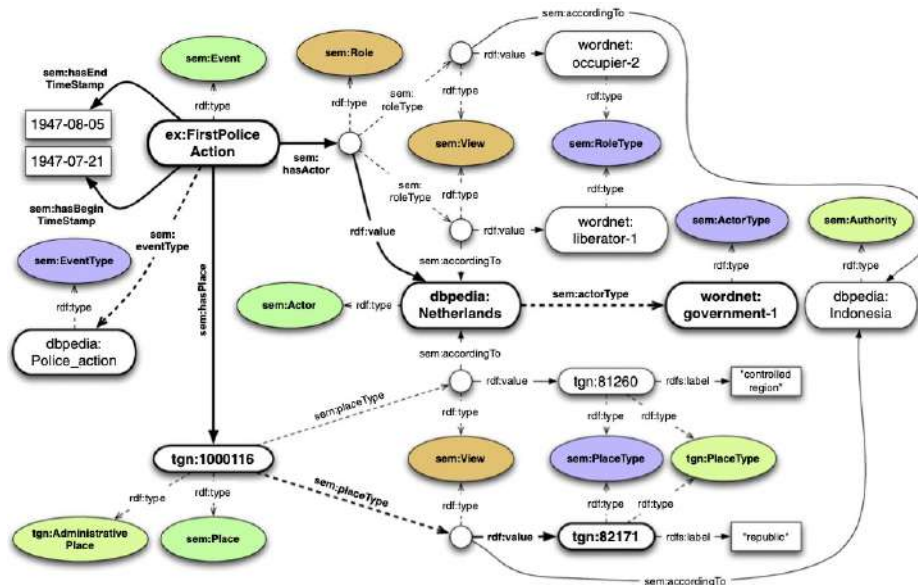


Fig. 4. A more elaborate representation, including Role and View property constraints of the historical example event in SEM.

Design and use of the Simple Event Model (SEM) – van Hage et al. - 2011

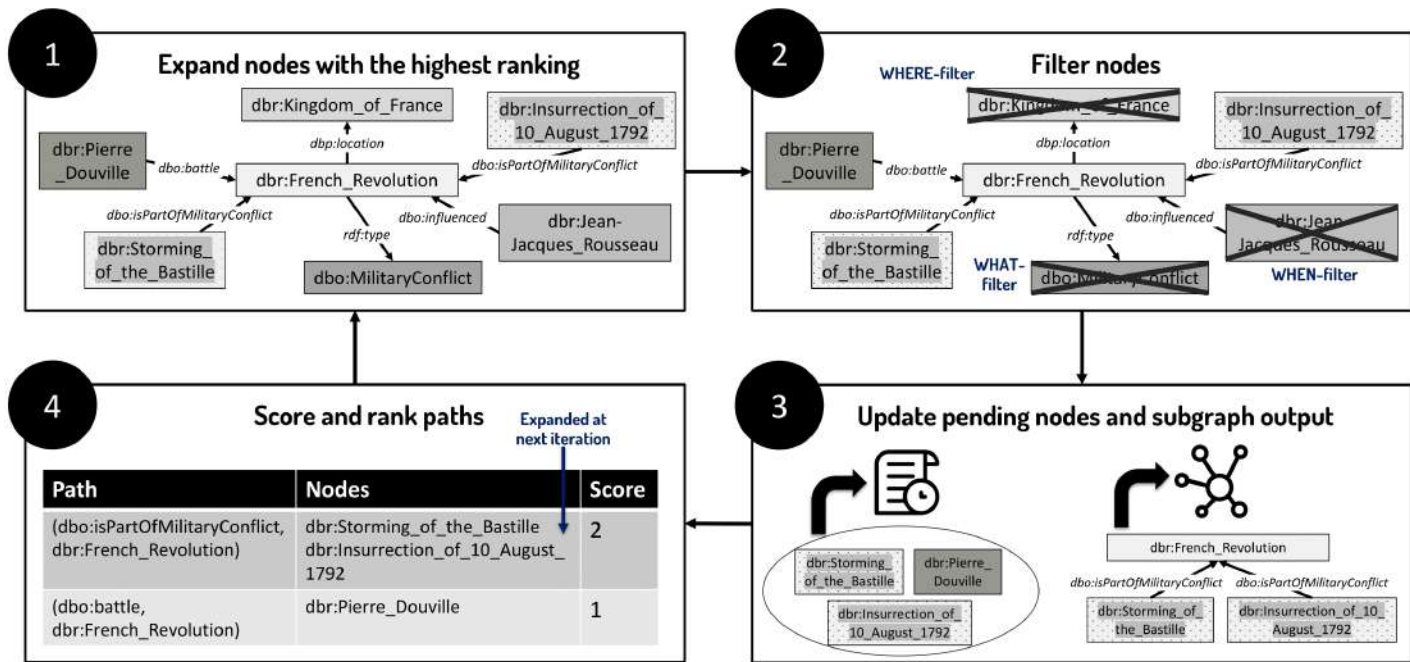
13 Vendémiaire event from the French Revolution, represented with SEM

- Focus on the ontology used for narrative representation: Simple Event Model
- Identification of limitations and next steps: representation, completeness, automation, evaluation
- More events, better representation, integrate multiple inputs

Graph Search



- Identifying good heuristics to extract events to build a narrative automatically
- Defining and comparing diverse graph traversal strategies
- Comparison with baselines: achieves better scores while exploring less

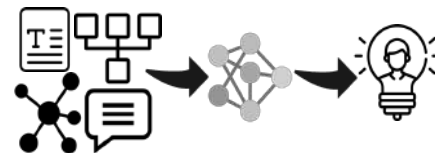


Multimodality



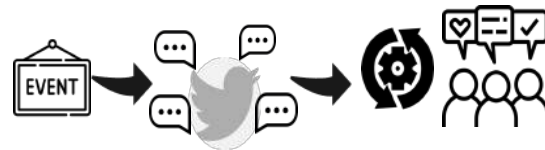
Common Methodology

Integrating KGs with other input resources
Build a KG out of other KGs and text data
Extract narrative for enhanced understanding



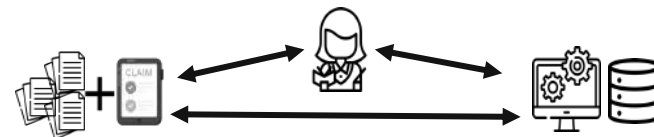
Case Study 1: Narratives from tweets

Building an observatory from social media data, and identify different narratives
Ontology design, entity path linking in the graph



Case Study 2: MIR-KG

Using LLM for annotation, mapping to a domain-specific thesaurus with economic concepts



Case Study 3: Concepts Maps Generation

Generate a summary of a text in the form of a graph



3.

IMPROVING NARRATIVE REPRESENTATIONS

Bridging conceptions on narratives

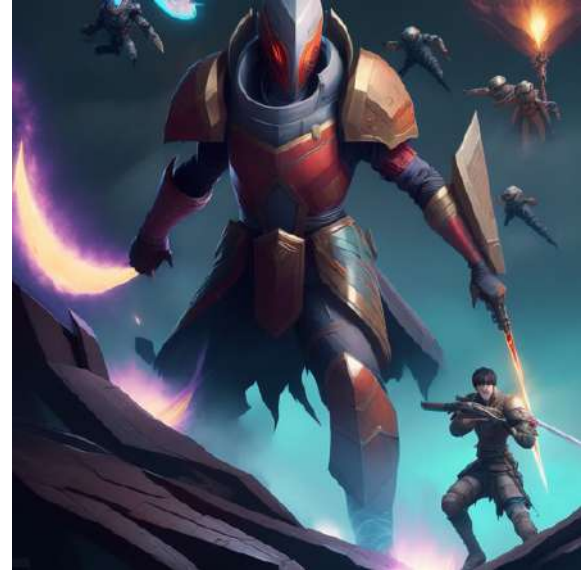


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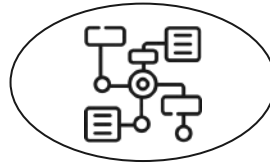


CONTENT



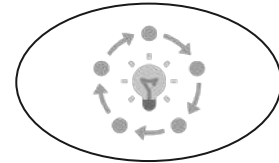
CONCEPTS

Identifying common narrative concepts



ONTOLOGY & EXAMPLE

Combining ontologies and building one example



SCALING

Automating the construction



Identifying concepts



Findings and aim

- Different expectations when building narratives
- In literature: lot of event-centric resources, harder to find narrative layers
- Aim: Providing a generic, reusable framework to represent narratives, to enhance understanding of sequences of events



Common narrative concepts

- Simple: Events/Actions (+types), Participants (+types/hierarchy), Location (+relations), Objects (+types).
- Middle: Roles, Provenance, Causal Links/Outcome, Time calculus.
- Harder: Conditions on events, State, Goal, Perspective, Storyline ~ Interpretations.

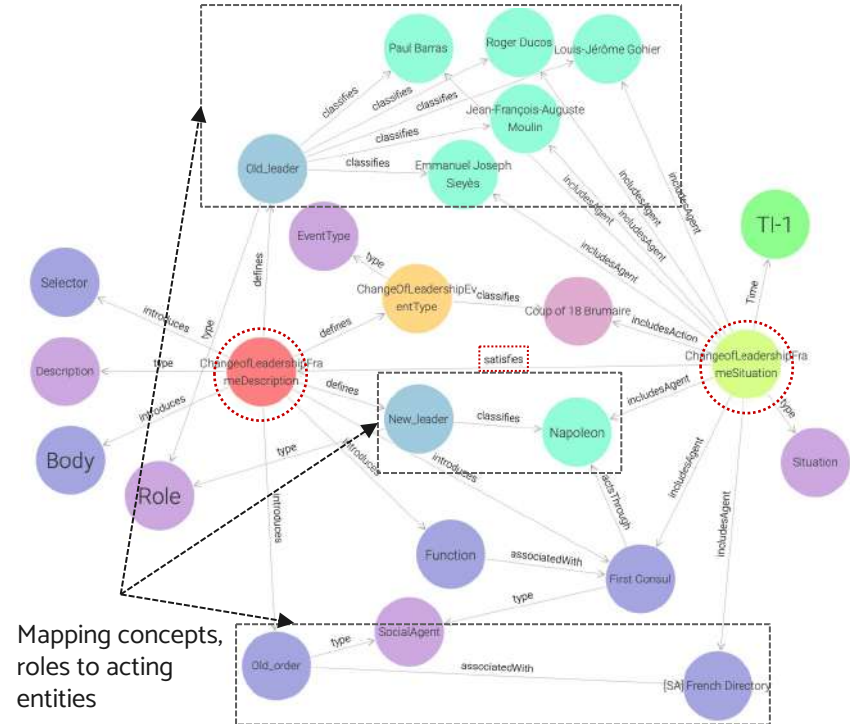
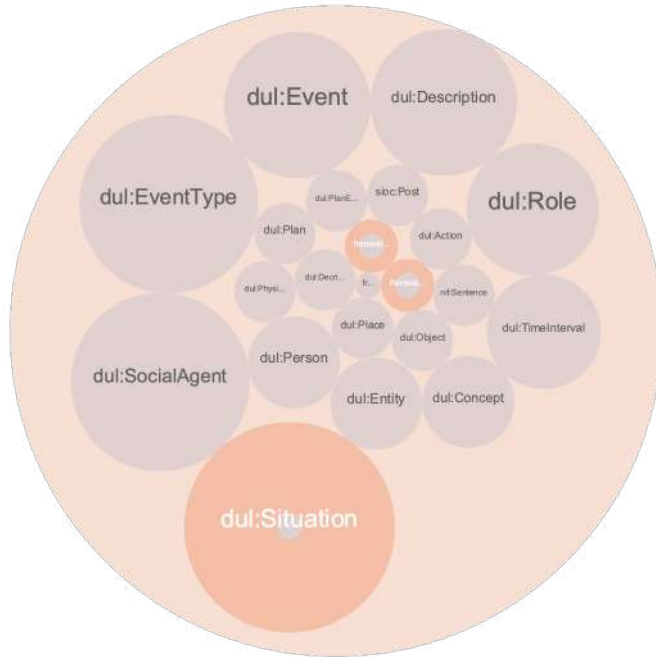
Comparing ontologies

	o1	o2	o3
c1		1	
c2	1		1

- M1-M11 from the survey paper “Models for Narrative Information – A survey - Varadarajan and Dutta – 2020”
- Added event-centric ontologies: CIDOC-CRM, DUL, EC, EO, F, SEM, ABC, LOD, E, FARO



Combining ontologies



Mapping concepts, roles to acting entities

- DUL at the core: generic classes for objects and concepts, Situations and Descriptions to link entities (and reification)
- Plugged in other ontologies for additional links: FARO, F, PROV, NIF



Scaling: Existing KGs

Coup of 18 Fructidor
Part of the French Revolution



Acting for the coup's leaders, General Pierre Augereau stormed the Tuileries Palace to arrest Charles Pichegru and others accused of plotting a counter-revolution.

Date 4 September 1797

Location Paris, France

Result Republican victory:

- End of the monarchist majority in the legislative chambers
- Suppression of the *Clichy Club*
- Exile, deportation or imprisonment of several monarchists

Belligerents

French Directory	Royalists in the Council of Ancients and the Council of Five Hundred
------------------	--

Commanders and leaders

Political: Jean-François Reubell Louis Marie de La Révellière-Lépeaux Paul Barras	François-Marie Barthélemy Charles Pichegru François Barbé-Marbois ^[1]
---	--

Military:
Pierre Augereau
Lazare Hoche

Strength

30,000 soldiers ^[1]	216 royalist deputies ^[citation needed]
--------------------------------	--

Casualties and losses

- 65 deputies deported to French Guiana
- 18 imprisoned
- 3 runaways

Wikipedia

About: [Coup of 18 Fructidor](#)

An Entity of Type: [societal event](#), from Named Graph: <http://dbpedia.org>, within Data Space: [dbpedia.org](#)

Property	Value
dbo:abstract	<ul style="list-style-type: none"> The Coup of 18 Fructidor, Year V (4 September 1797 in the French Republican Calendar), was a seizure of power in France by members of the Directory, the government of the French First Republic, with support from the French military. The coup was provoked by the results of elections held months earlier, which had given the majority of seats in the country's Corps législatif (Legislative body) to royalist candidates, threatening a restoration of the monarchy and a return to the ancien régime. Three of the five members of the Directory, Paul Barras, Jean-François Rewbell and Louis Marie de La Révellière-Lépeaux, with support of foreign minister Charles Maurice de Talleyrand-Périgord, staged the coup d'état that annulled many of the previous election's results and ousted the monarchists from the legislature. (en)
dbo:combatant	<ul style="list-style-type: none"> French Directory Council of Ancients Council of Five Hundred Royalists in the and the
dbo:commander	<ul style="list-style-type: none"> dbr:Paul_Barras dbr:Louis_Marie_de_La_Révellière-Lépeaux dbr:François_Barbé-Marbois dbr:Lazare_Hoche dbr:Pierre_Augereau dbr:Charles_Pichegru dbr:François-Marie_Barthélemy dbr:Jean-François_Reubell

DBpedia

Coup of 18 Fructidor (Q481632)

Language	Label	Description	Also known as
English	Coup of 18 Fructidor	09091797	
French	coup d'état du 18 fructidor an V	opération politique menée sous le Directoire par trois des cinq directeurs soutenus par l'armée contre les royalistes et les Jacobins	Coup d'État du 18 fructidor an V 18 fructidor Coup d'État du 18 fructidor Fructidor an V Coup d'état de fructidor
Spanish	Golpe de Estado del 18 de fructidor del año V	golpe de estado en los tiempos de la Revolución Francesa	18 de fructidor Golpe de Estado del 18 de fructi... Golpe de Fructidor
German	Staatsstreich des 18. Fructidor V	No description defined	

All entered languages

Statements

instance of	<div style="border: 1px solid #ccc; padding: 2px;"> Q481632 coup d'état </div> <p style="text-align: right; margin-top: 5px;"> edit - 0 references + add reference + add value </p>
part of	<div style="border: 1px solid #ccc; padding: 2px;"> Q105584 French Revolution </div> <p style="text-align: right; margin-top: 5px;"> edit - 0 references + add reference + add value </p>
country	<div style="border: 1px solid #ccc; padding: 2px;"> Q1839 French First Republic </div> <p style="text-align: right; margin-top: 5px;"> edit - 0 references + add reference + add value </p>
location	<div style="border: 1px solid #ccc; padding: 2px;"> Q105584 Paris </div> <p style="text-align: right; margin-top: 5px;"> edit - 1 reference + add value </p>
point in time	<div style="border: 1px solid #ccc; padding: 2px;"> Q1839 4 September 1797 Gregorian </div> <p style="text-align: right; margin-top: 5px;"> edit - 0 references + add reference + add value </p>

Wikidata



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Loss of information compared to Wikipedia

DBpedia

Semi-structured information

No participants

Coup of 18 Fructidor (Q481633)

Language	Label	Description	Also known as
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French	coup d'état du 18 fructidor an V	opération politique menée sous le Directoire par trois des cinq directeurs soutenus par l'armée contre les royalistes et les Jacobins	Coup d'État du 18 fructidor an V 18 fructidor Coup d'État du 18 fructidor an V Coup d'État de fructidor
Spanish	Golpe de Estado del 18 de fructidor del año V	golpe de estado en los tiempos de la Revolución Francesa	18 de fructidor Golpe de Estado del 18 de fructidor Golpe de Fructidor
German	Staatsstreich des 18. Fructidor V	No description defined	

All entered languages

Statements

instance of	Q coup d'état	edit
	0 references	+ add reference
		+ add value
part of	Q French Revolution	edit
	0 references	+ add reference
		+ add value
country	Q French First Republic	edit
	0 references	+ add reference
		+ add value
location	Q Paris	edit
	1 reference	+ add value
point in time	Q 4 September 1797 Gregorian	edit
	0 references	+ add reference
		+ add value

Wikipedia

Wikidata

Scaling: From event types to frames

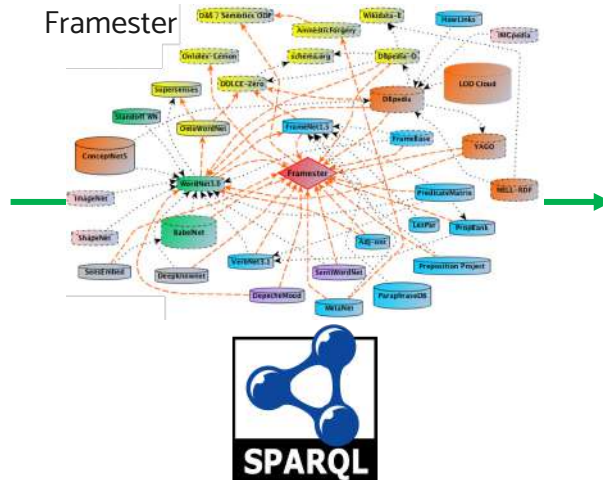


About: [Coup of 18 Fructidor](#)

rdf:type

- owl:Thing
- schema:Event
- dul:Event
- dbo:SocietalEvent
- wikidata:Q1656682
- yago:WikicatMilitaryCoupsInFrance
- yago:Abstraction10002137
- yago:Act100030358
- yago:CoupD'etat101145015
- yago:Event100029378
- yago:GroupAction101080366
- yago:PsychologicalFeature100023100
- yago:YagoPermanentlyLocatedEntity
- dbo:Disease
- dbo:Event
- dbo:MilitaryConflict
- yago:Wikicat1797EventsOfTheFrenchRevolution

DBpedia



https://w3id.org/framester/framenet/abox/frame/Intentionally_act
<https://w3id.org/framester/framenet/abox/frame/Event>
https://w3id.org/framester/framenet/abox/frame/Change_of_leadership
<https://w3id.org/framester/framenet/abox/frame/Commonality>

Extracted automatically

- Automatically retrieving frames from events types using SPARQL queries
- Exploiting links between generic and linguistic KGs

Scaling: from meaningful frame to KG



https://w3id.org/framester/framenet/abox/frame/Intentionally_act
<https://w3id.org/framester/framenet/abox/frame/Event>
https://w3id.org/framester/framenet/abox/frame/Change_of_leadership
<https://w3id.org/framester/framenet/abox/frame/Commonality>

Change_of_leadership
https://w3id.org/framester/framenet/abox/frame/Change_of_leadership

Framester

rdf:s comment

This frame concerns the appointment of a New_Leader or removal from office of an Old_Leader. The Selector brings about the change in leadership, for example, by electing or overthrowing a leader. Some words in the frame describe the successful removal from office of a leader (e.g. deposed, ousted), others simply the attempt (e.g. usurping, rebellion). On March 17, Mameoov appointed Rashim Gasyev as Defence Minister. [gen]

<https://w3id.org/framester/framenet/abox/hasFrameElementhttps://w3id.org/framester/framenet/abox/fe/Means.change_of_leadership>

<https://w3id.org/framester/framenet/abox/fe/New_Leader.change_of_leadership>

<https://w3id.org/framester/framenet/abox/fe/Old_leader.change_of_leadership>

<https://w3id.org/framester/framenet/abox/fe/Old_order.change_of_leadership>

<https://w3id.org/framester/framenet/abox/fe/Place.change_of_leadership>

<https://w3id.org/framester/framenet/abox/fe/Role.change_of_leadership>

<https://w3id.org/framester/framenet/abox/fe/Time.change_of_leadership>

<https://w3id.org/framester/framenet/abox/fe/Body.change_of_leadership>

<https://w3id.org/framester/framenet/abox/fe/Circumstances.change_of_leadership>

<https://w3id.org/framester/framenet/abox/fe/Degree.change_of_leadership>

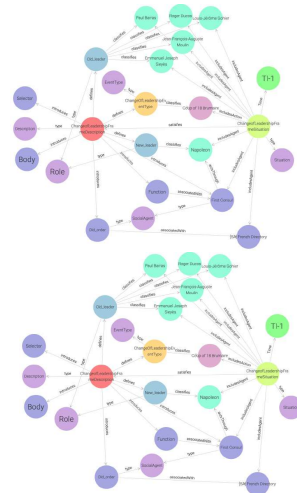
<https://w3id.org/framester/framenet/abox/fe/Deictive.change_of_leadership>

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<https://w3id.org/framester/framenet/abox/fe/Result.change_of_leadership>

<https://w3id.org/framester/framenet/abox/fe/Selector.change_of_leadership>

<https://w3id.org/framester/framenet/abox/fe/Manner.change_of_leadership>



- Using embeddings to retrieve the most relevant frame for one event
- Several embeddings: IRI label, text description, graph embedding
- Complete the graph with additional information

Takeaways and Challenges

Main Recap



- Many existing event-centric representations, harder to find generic narrative representations (linking events, interpreting them)
- Leveraging knowledge graphs, ontologies and NLP methods to enrich current narratives with more fine-grained information

Challenges



- Evaluation, especially on the content itself
- Countless existing ontologies
- Scalability

4.

CONCLUSION AND FUTURE WORK

Prospective for future work



Photo generated on Hotpot.ai

Future Work

Continue on the scaling to build better narrative representations

Reasoning with narratives



- Pattern detection and applications, e.g. predicting future events and helping in decision-making processes, mining temporal rules
- Generating explanations (especially why questions, question-answering downstream task)
- Collaborating with domain experts for competency questions



Combining structured narratives and LLMs

- Usually more coherent results when injecting structured knowledge into a LLM
- Understanding which concepts are the most important to create good narratives

Conclusion

Enriching AI systems with narrative capabilities



- Narratives are innate human objects for sense-making
- Building better, human-centric AI systems

Multiple components to make this possible



- Retrieving relevant content in the data
- Finding a representation to represent all complex aspects of narratives
- Integrating multiple input resources (graph, text)
- Implementing reasoning capabilities

THANKS!

Joint Effort



Do you have any questions?

ines.blin@sony.com

<https://csl.sony.fr>



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MUHA I

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 951846.

AI Images generated on Hotpot.ai

Flaticon: group, blur, think, human&robot, definition, methodology, questions, creation, magnifying glass, multi, metro, text, comment, networking, network&page, organization, understand, event, twitter, opinion, paper, claim, computer, storage, teacher, update, network, concept, flow, method, work in progress, start, common, nugget&page, challenge, reasoning, storytelling, sense, components, submit

Symbolic & Sub-Symbolic: <https://www.bosch.com/stories/neuro-symbolic-ai-for-scene-understanding/>

Bert: https://www.google.com/url?sa=i&url=https%3A%2F%2Fmuppet.fandom.com%2Fwiki%2FBert&psig=AOvVaw3kS1nrD2yldquZF6_qe4D&ust=1686407932377000&source=images&cd=vfe&ved=OCBEQjRqgFwoTCMCeh6C1tv8CFQAAAAAdAAAAABAE

Spotlight: https://www.google.com/url?sa=i&url=https%3A%2F%2Ffr.wikipedia.org%2F&psig=AOvVaw32vz4JkTT6ZRPB3AFBe8L_&ust=1686408371122000&source=images&cd=vfe&ved=OCBEQjRqgFwoTCMifig2tv8CFQAAAAAdAAAAABAJS

Sparql: <https://cygri.github.io/rdfl-ogos/>

Framester: http://etna.istc.cnr.it/framester_web/