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A Matter of Perspective – Disentangling Narrative Structures in Event-Centric Knowledge Repositories

PhD Defense @ TU Braunschweig, July 18, 2025

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Basic Motivation

Iranian missiles strike Haifa as Israeli air force attacks Tehran

Trump and Harris Neck and Neck After Summer Upheaval, Times/Siena Poll Finds
The New York Times

In war-battered Gaza, residents grow angry with Hamas

Russia’s war on Ukraine grinds into second year as Putin gambles on the long game
Los Angeles Times

The Dimming Light of Democracy
Trump's Army and the Attack on America
SPIEGEL International

Russian Invasion of Ukraine
Russia Steps Up Attacks on Ukrainian Fortifications in the East
The New York Times

Road to war: U.S. struggled to convince allies, and Zelensky, of risk of invasion
The Washington Post
Democracy Dies in Darkness

US election results 2020: Joe Biden win Donald Trump for US presidential election - See di votes here
BBC NEWS

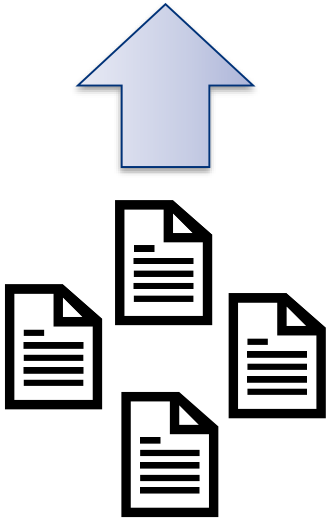
POLITICS | UNITED STATES OF AMERICA
DW
Trump 'gleefully watched' while riots unfolded

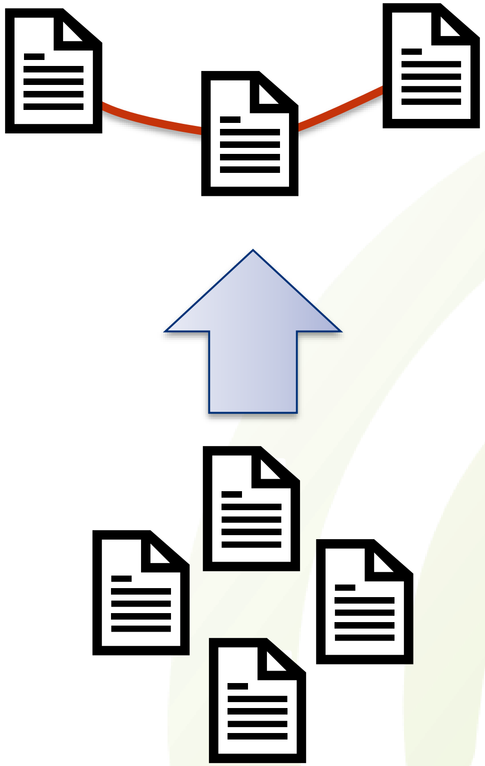
Two Women Fell Sick From the Coronavirus. One Survived.
The New York Times

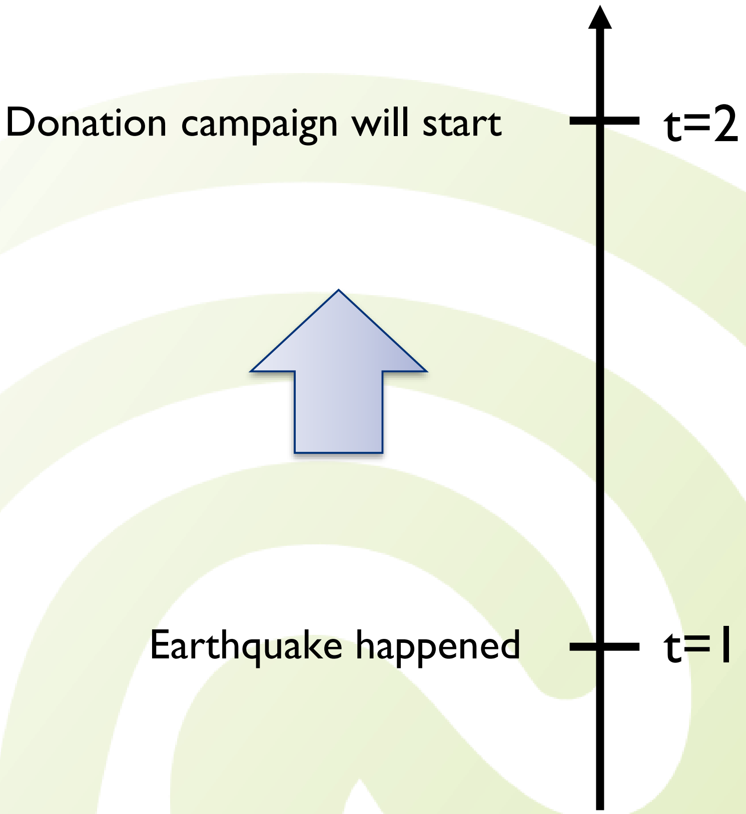
Ukrainian team blew up Nord Stream pipeline, claims report
The Guardian

Event Extraction and Analytics

Event	
Role 1	Slot 1
Role 2	Slot 2
Role 3	Slot 3

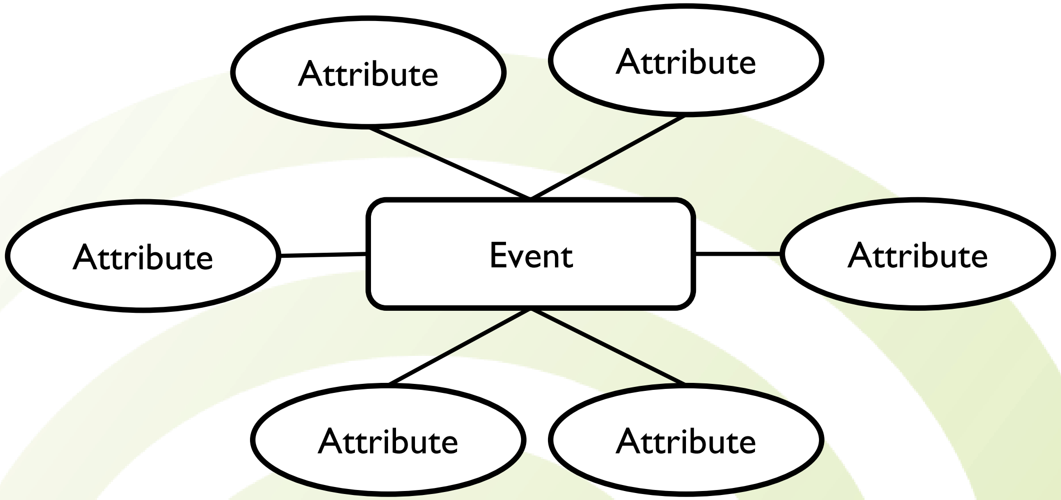






Event Extraction | Event Threading | Event Prediction

Event-Centric Knowledge Repositories



MEDIA CLOUD

INTERNET ARCHIVE

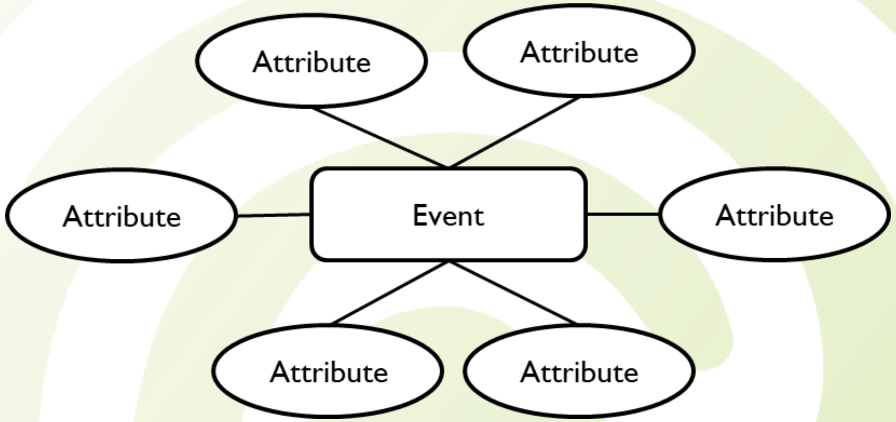
eventregistry

GDELT Project

EventKG

The Fundamental Concept

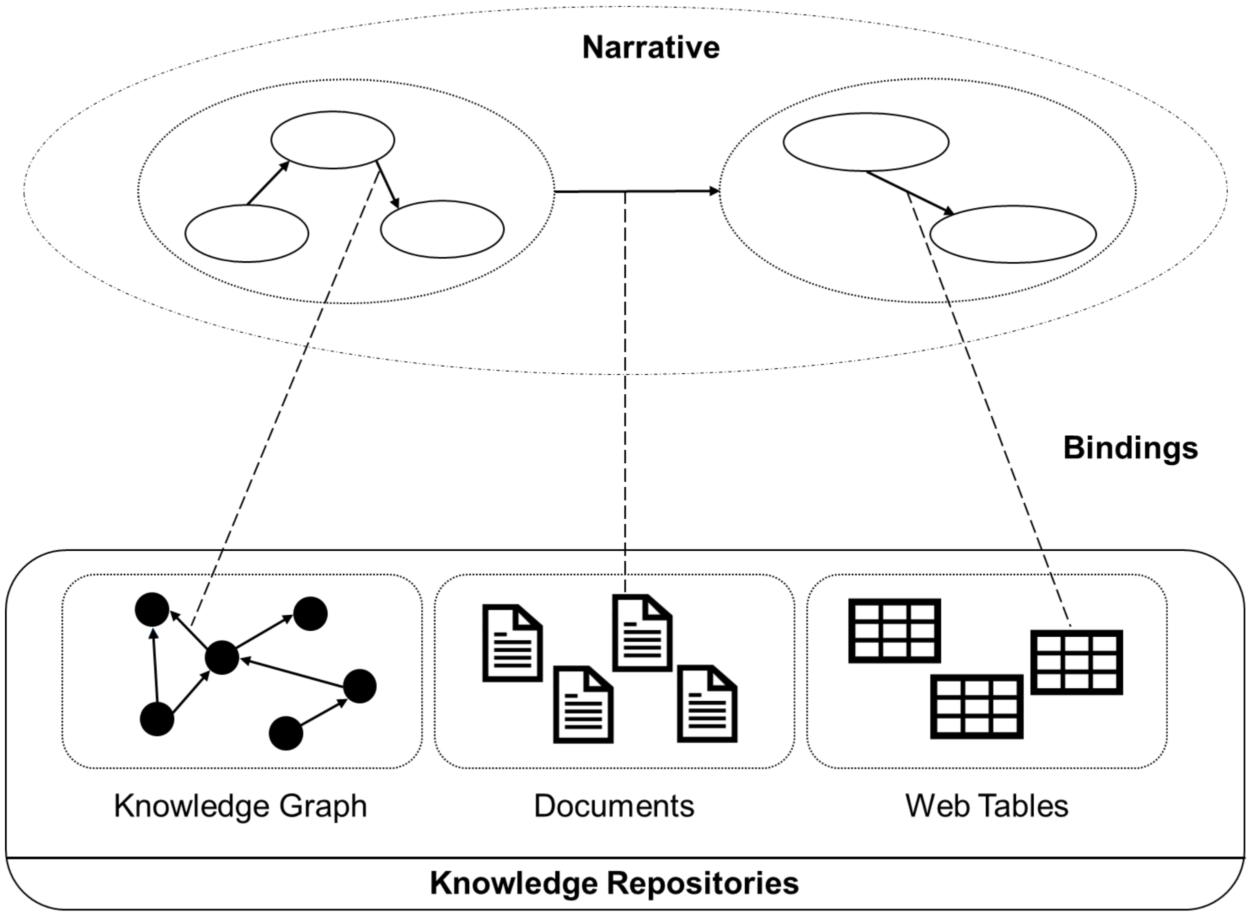
- We are typically <u>not</u> observing **events** directly but **narratives** sparked by it – each of them providing a different **viewpoint**



Narratives as Overlays

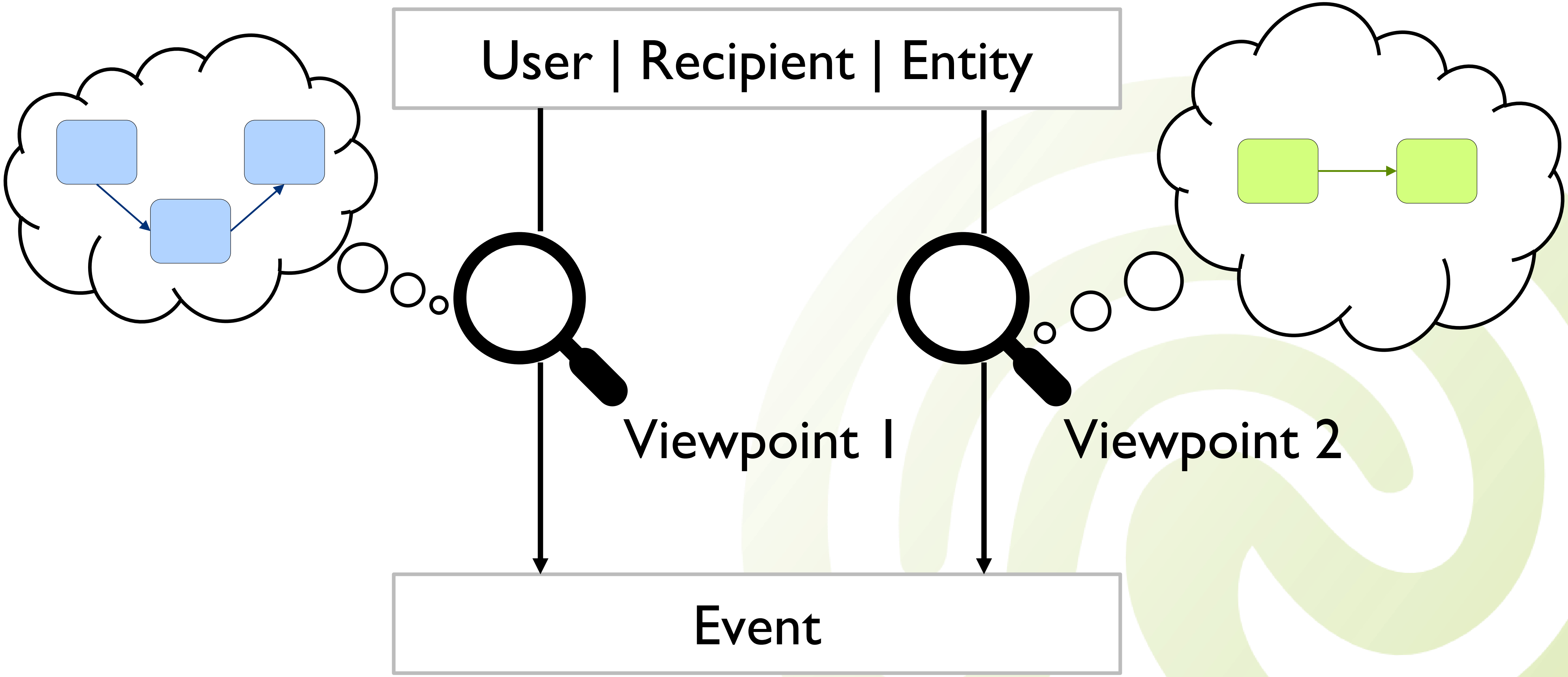
- **Graph structures** consisting with node types:
  - Entities
  - Events
  - Literals

- Can be *bound* to underlying knowledge repositories



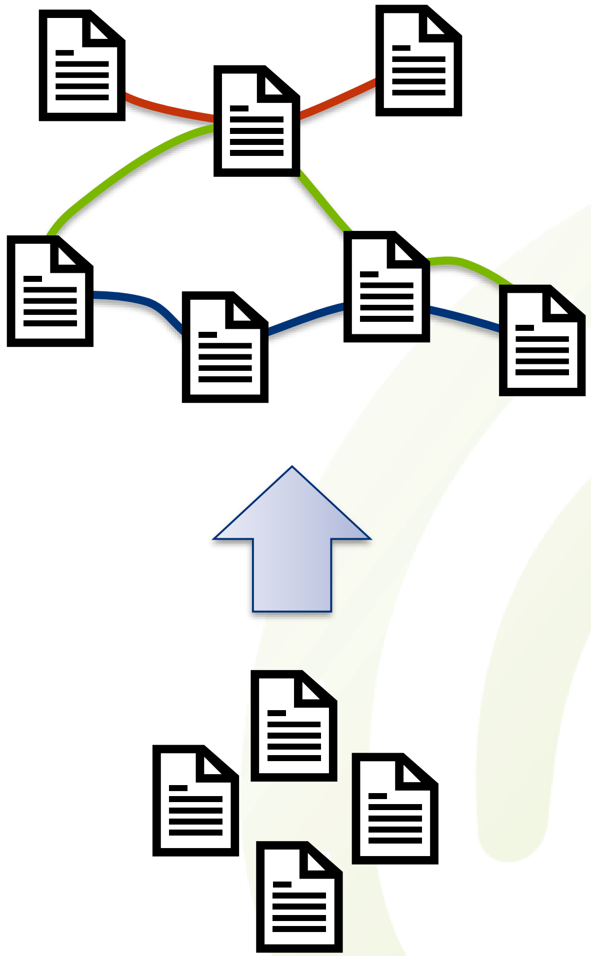
[Kroll et al.]

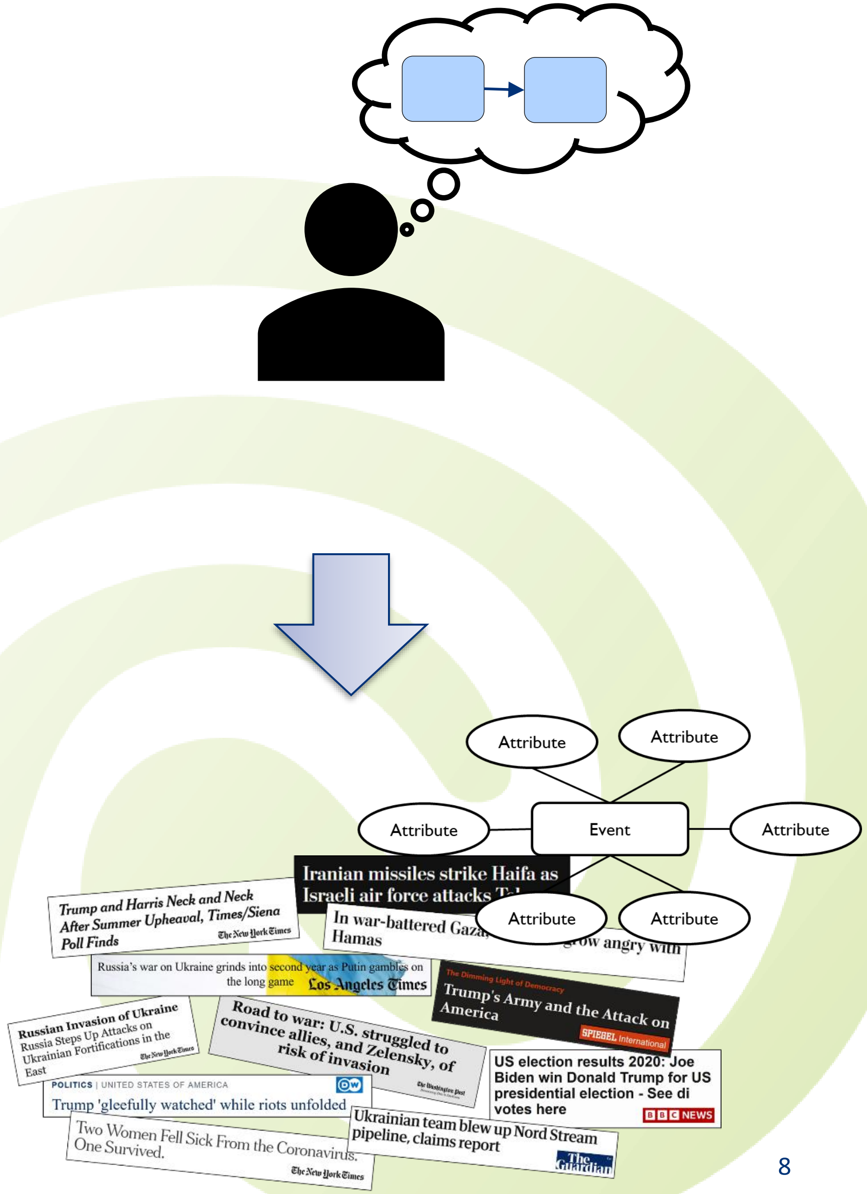
Disentangling the Concepts …



… and implications

Event	
Role 1	Slot 1
~~Role 2~~	~~Slot 2~~
Role 3	Slot 3
Role 4	Slot 4





Objective of this Thesis

Disentangle Events, Narratives, and Viewpoints.

Create a conceptual model concerning the integration of events, narratives, and viewpoints; analyze the effects on event-centric knowledge repositories, and create downstream tasks.

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Part I

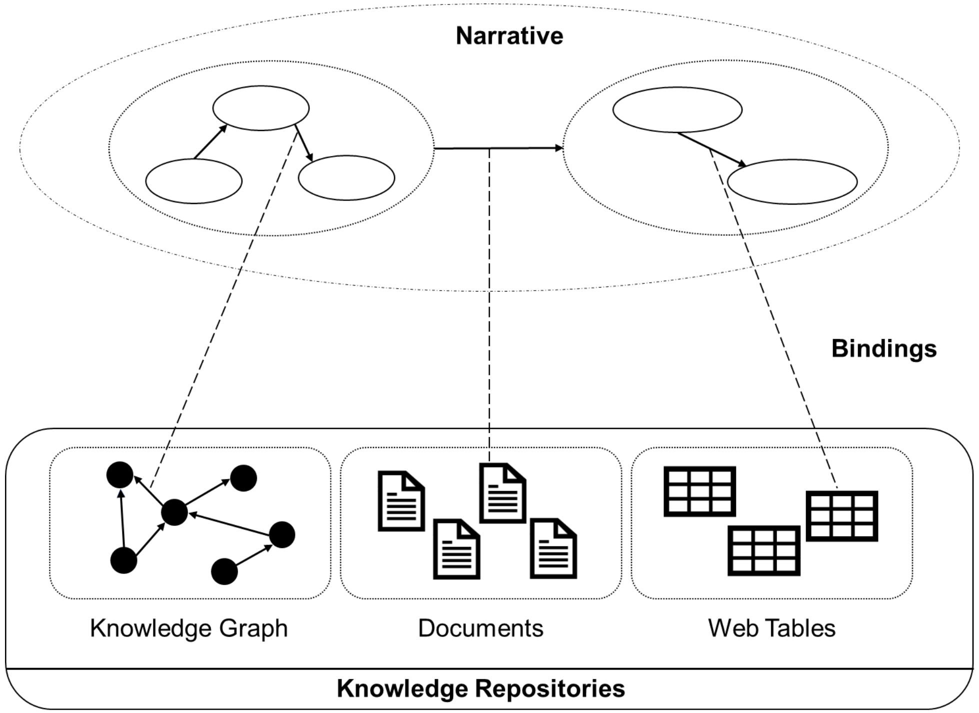
Narrative Aspects of Events

Motivation: NIA for Event-Centric Repos.

- **Narrative Information Access** has recently been proposed
  - Could this work also for repositories that contain real-world event data, e.g., news archives and knowledge graphs?

RQ1

How can we describe and retrieve real-world events from knowledge repositories based on narrative aspects?



The Case for David vs. Goliath

- Think about “archetypical narratives” like David vs. Goliath

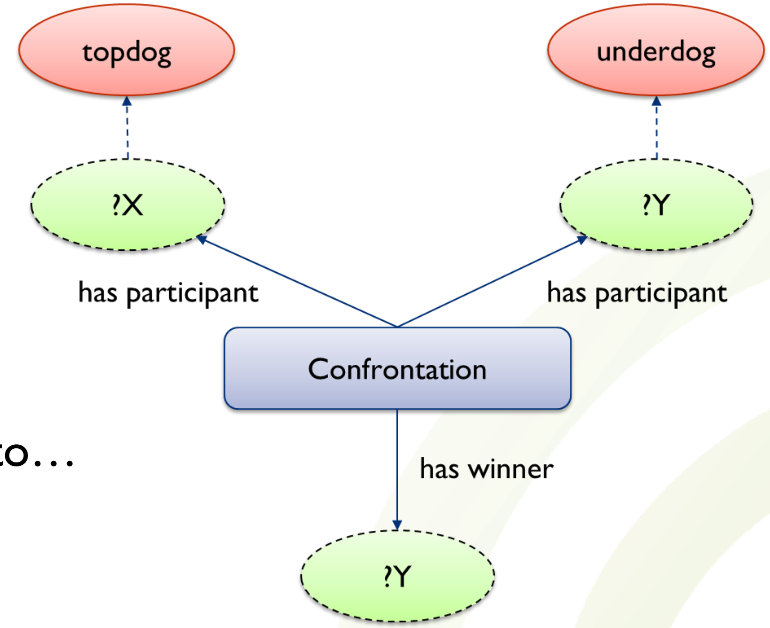
David takes on Goliath in a one-on-one **battle**. Beside being the **underdog** in the fight, he **achieves a victory** over Goliath.

Narrative Aspects:

- narrative roles for event participants, e.g., hero, underdog, threat
- later: choice/sequence of events

Narrative Prototypes

What it boils down to…
(abstraction)



It‘s the same old story
(instantiation)

F. Plötzky & W.-T. Balke (2021): What it Boils Down to... The Case for Event Analogies to Combat Complexity in Digital Libraries. In: DISCO@JCDL

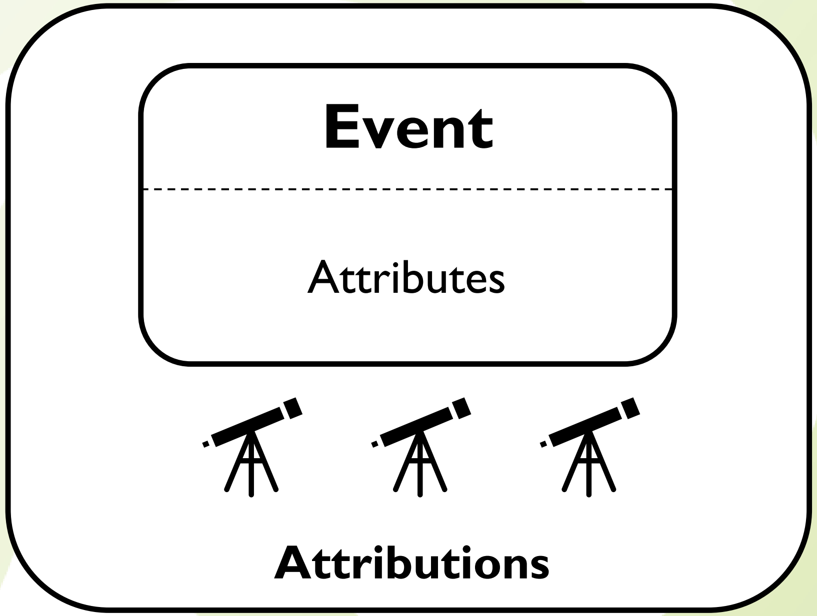
F. Plötzky & W.-T. Balke (2022): It’s the Same Old Story! Enriching Event-Centric Knowledge Graphs by Narrative Aspects. In: Proc. of the 14th ACM Web Science Conference (WebSci)

image: Flaticon.com

Formalization

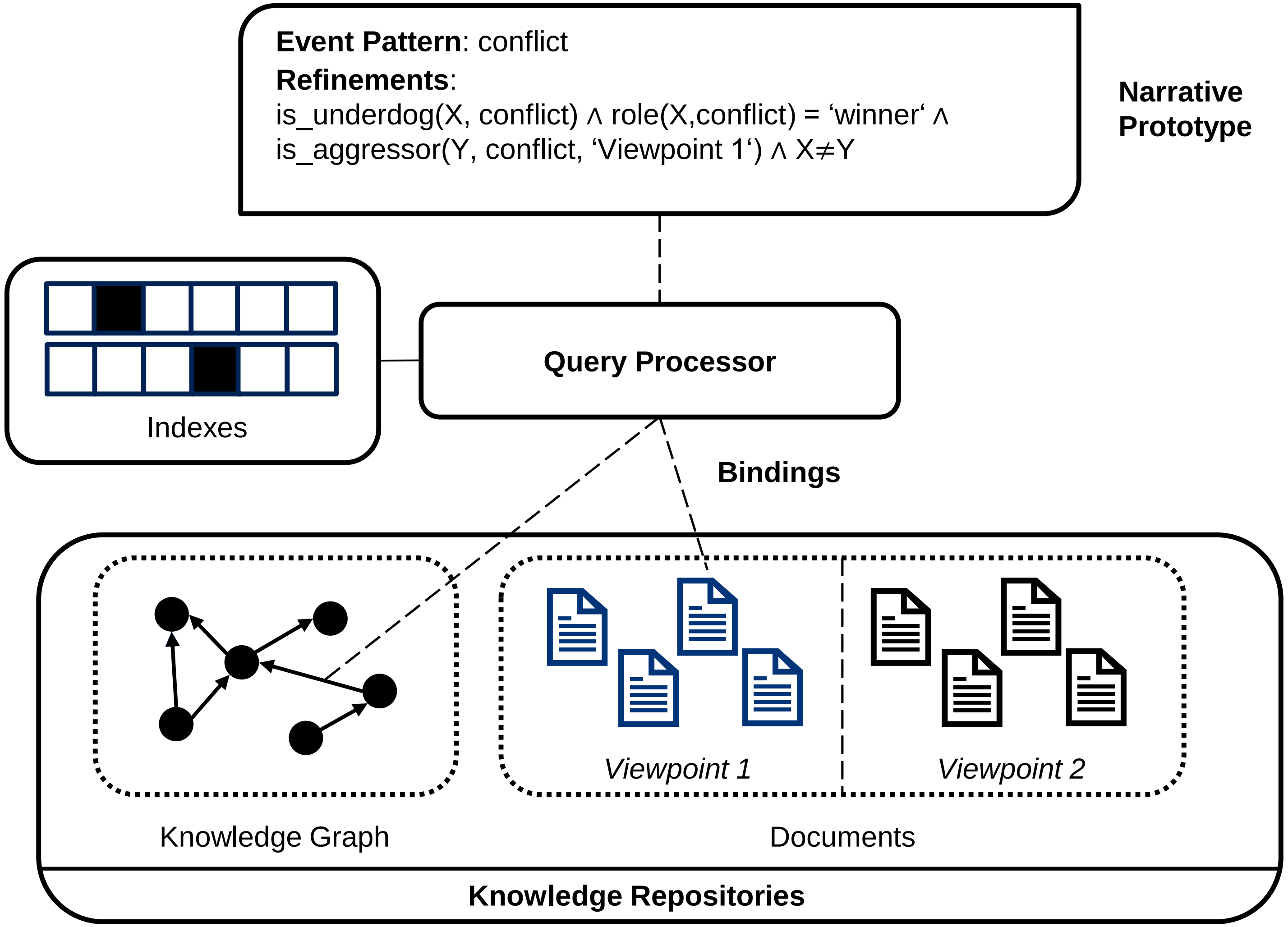
- **Events**: *interactions* between *entities* (participants) at a given location to a given time based on a *type*.

- **Idea**: Attributes vs. Attributions
  - **Objective Attributions**, generated from underlying data, e.g., underdog
  - **Subjective Attributions**, depending on a *viewpoint*, e.g., hero, aggressor



Prototype Evaluation

- **Insights** from a PoC:
  - Major difficulty: extracting the subjective attributions
    - Extraction problems
    - Out of context quotes
    - Viewpoint definition
  - Processing and indexing is otherwise rather straightforward



Take-Home Message

- We introduced **narrative prototypes** and an initial study on how to evaluate them on heterogeneous repositories.

- Novelties:
  - **Separation** of attributes and attributions of events with different evaluation strategies
  - Implicit enrichment for Event-Centric KGs by combining them with documents at query time

Part 2

Consistent Viewpoints in ECKGs

Motivation

- Real-world KGs often do not contain viewpoint-dependent information – thus, they miss a large part of reality

> In this context, in accordance with Article 51 (Chapter VII) of the UN Charter, with permission of Russia's Federation Council, and in execution of the treaties of friendship and mutual assistance with the Donetsk People's Republic and the Lugansk People's Republic, ratified by the Federal Assembly on February 22, I made a decision to carry out a special military operation.

Vladimir Putins address to the nation, Feb. 24, 2022

> ***War in Ukraine***
>
> Russia has launched a major invasion. Here's the latest.

The New York Times, Feb. 24, 2022

Motivation (II)

- Inserting both claims in the graph render the graph **inconsistent** in terms of ontological consistency – so, what can we do?

RQ2

How can we consistently represent viewpoint-dependent information in knowledge graphs?

F. Plötzky, K. Britz, and W.-T. Balke (2023): Shards of Knowledge – Modeling Attributions for Event-Centric Knowledge Graphs. In: Proc. of the Int. Conf. on Conceptual Modeling (ER)

F. Plötzky, K. Britz, and W.-T. Balke (2025): A Conceptual Model for Attributions in Event-Centric Knowledge Graph. Data & Knowledge Engineering (DKE)

Viewpoints in KGs (naïve solution)

- From Wikidata's respective entity
  - Q110999040

Statements

instance of

war
1 reference

military operation
statement supported by Russia
statement disputed by Ukraine
statement is subject of special military operation
1 reference

military offensive
0 references

invasion
nature of statement de jure
1 reference

Problems with the naïve solution

- **Viewpoint constitution**
  - What is “Russia” or “Ukraine” in this statement?
- **Viewpoint representatives**
  - Who should be the representatives of a viewpoint?
- **Information Representation**
  - How to represent viewpoint-dependent information?

Event Type

War Cause

Russian Role

The Model: Viewpoints

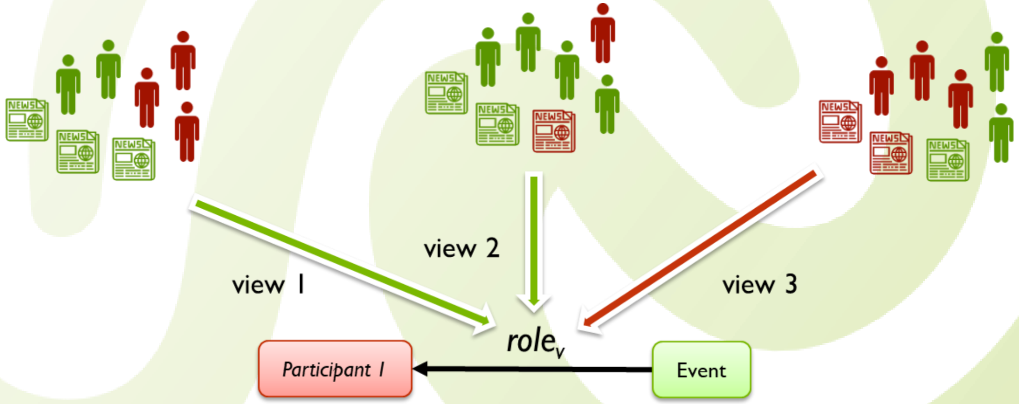
- **Viewpoints**
  - A *viewpoint* is a consensual stance (i.e., valid/invalid) towards a specific fact from a ECKG expressed by a group.

- Examples:
  - "Russia is an aggressor in the ongoing war" according to the US president
  - "The cause for the invasion is the NATO eastward expansion" according to the Russian government

The Model: Viewpoints and Groups

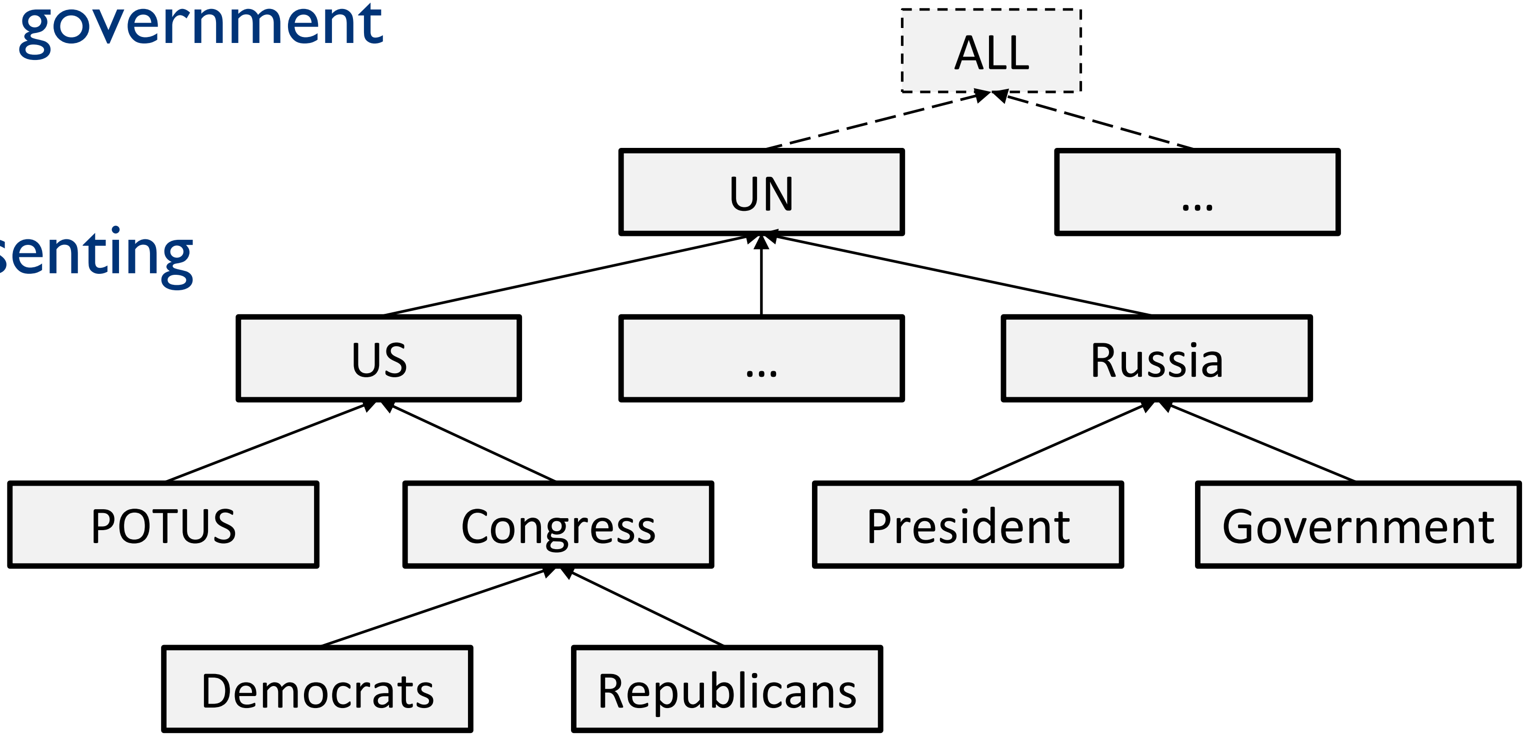
- In case of **group viewpoints**, a measure of *consensus* is needed
  - e.g., simple majority votes, 2/3 votes, etc.
  - groups consist of a set of entities that can express a stance
  - simple example: majority votes in parliaments

- Constitution is regulated by *viewpoint hierarchies*



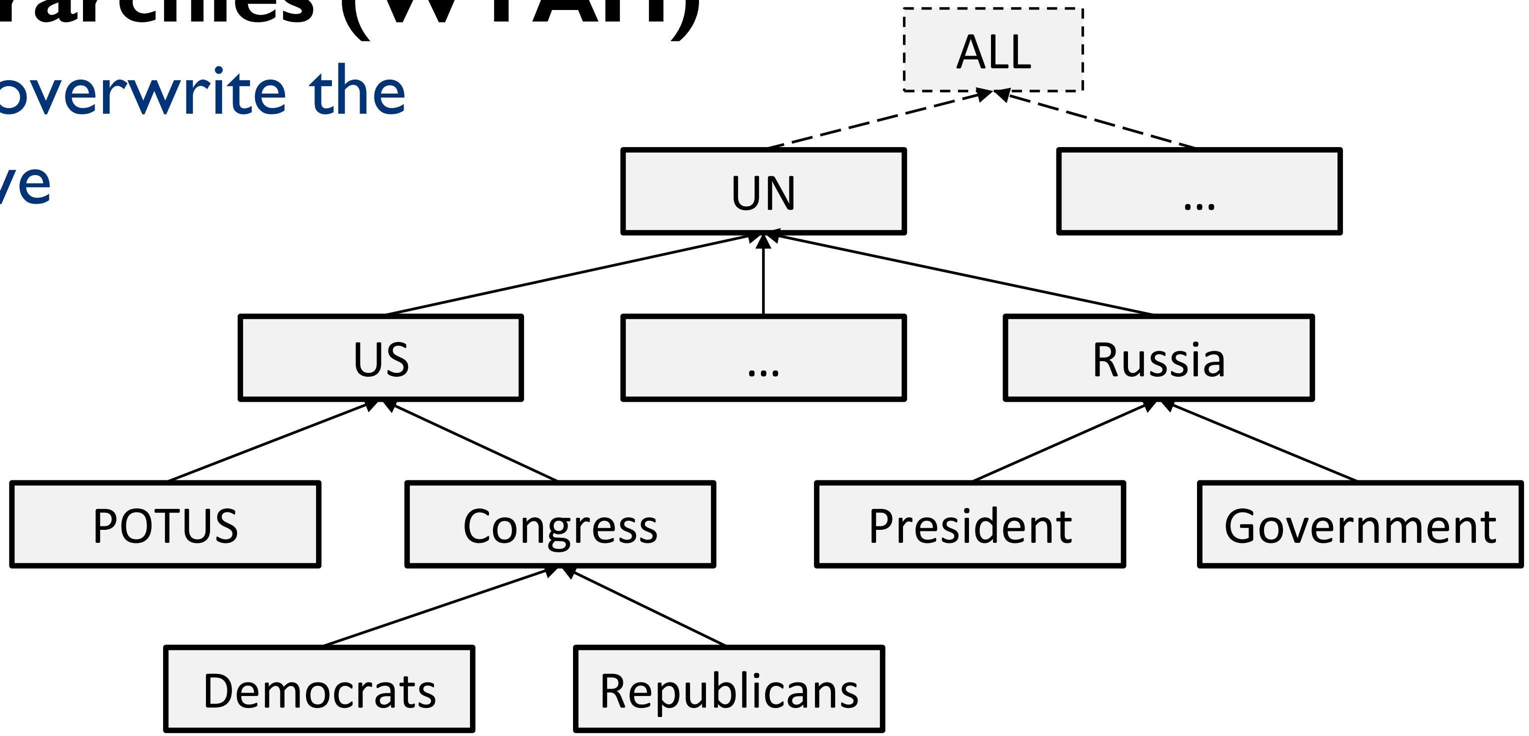
The Model: Viewpoint Hierarchies

- A viewpoint hierarchy depicts standard paths for viewpoint aggregations
  - Example: “The cause for the invasion is the NATO eastward expansion” according to the Russian government
- Problem:
  - How to handle non-consenting viewpoints?



The Model: Viewpoint Hierarchies (II)

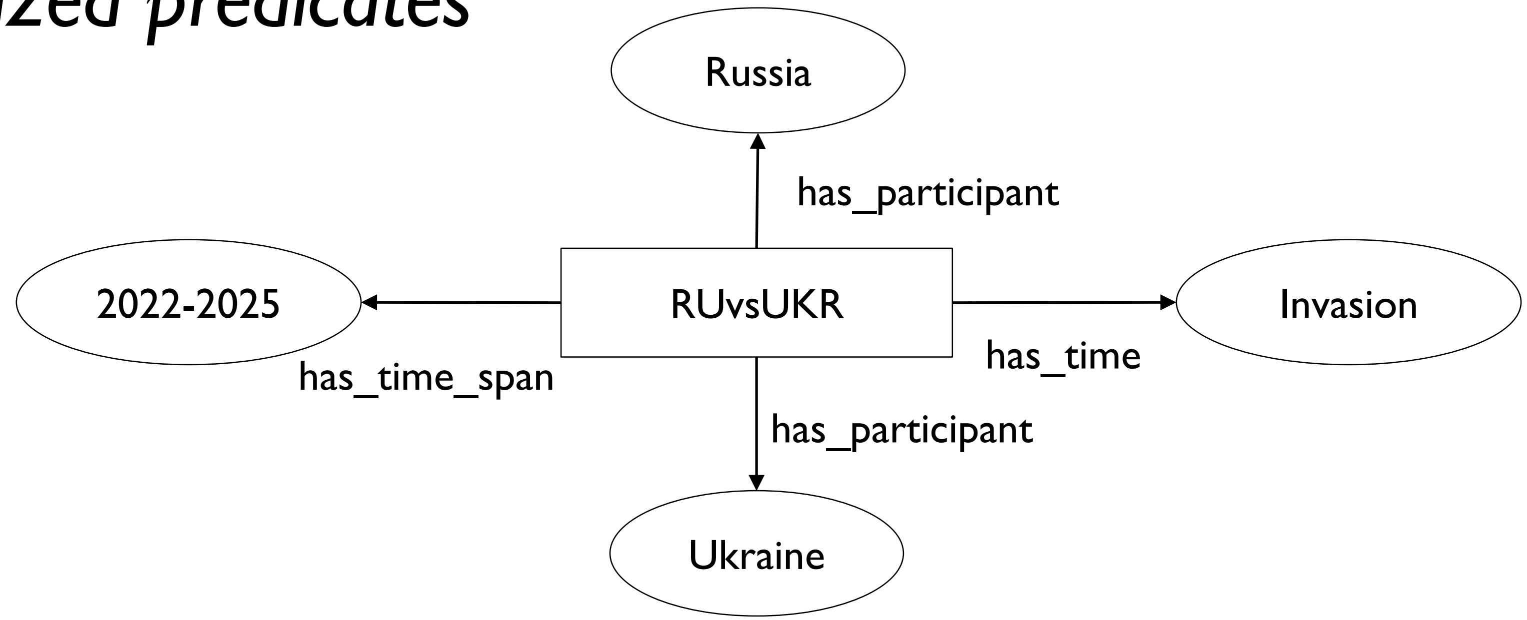
- **View-preserving Hierarchies (VPH)**
  - Each minority stance is preserved
  - e.g., every US Congress decision with non-bipartisan support
- **Winner takes all Hierarchies (WTAH)**
  - Higher-level viewpoints overwrite the stances of their respective subtree



The Model: Representation in ECKGS

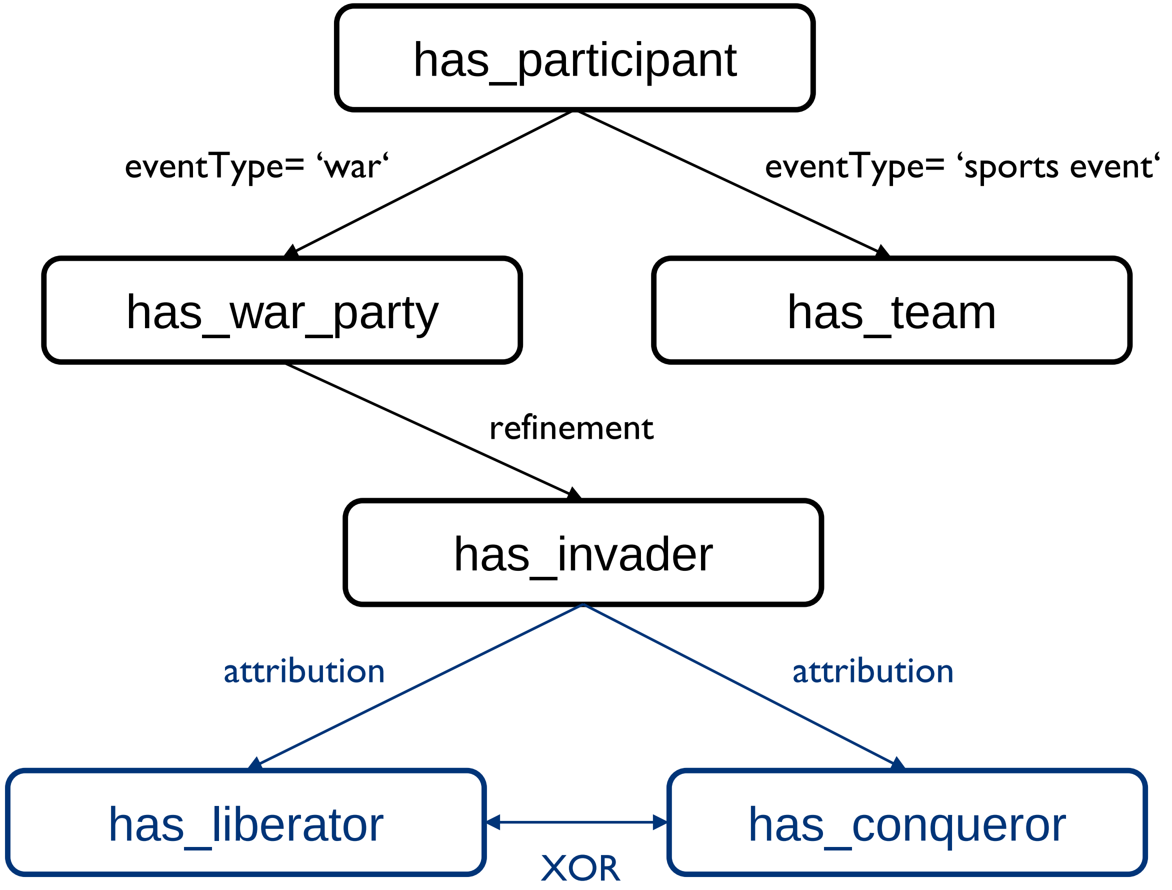
- **Event-Centric Knowledge Graphs**
  – i.e., RDF graphs where each subject is an event

- Observation: most viewpoint-related information can be expressed by *parameterized predicates*



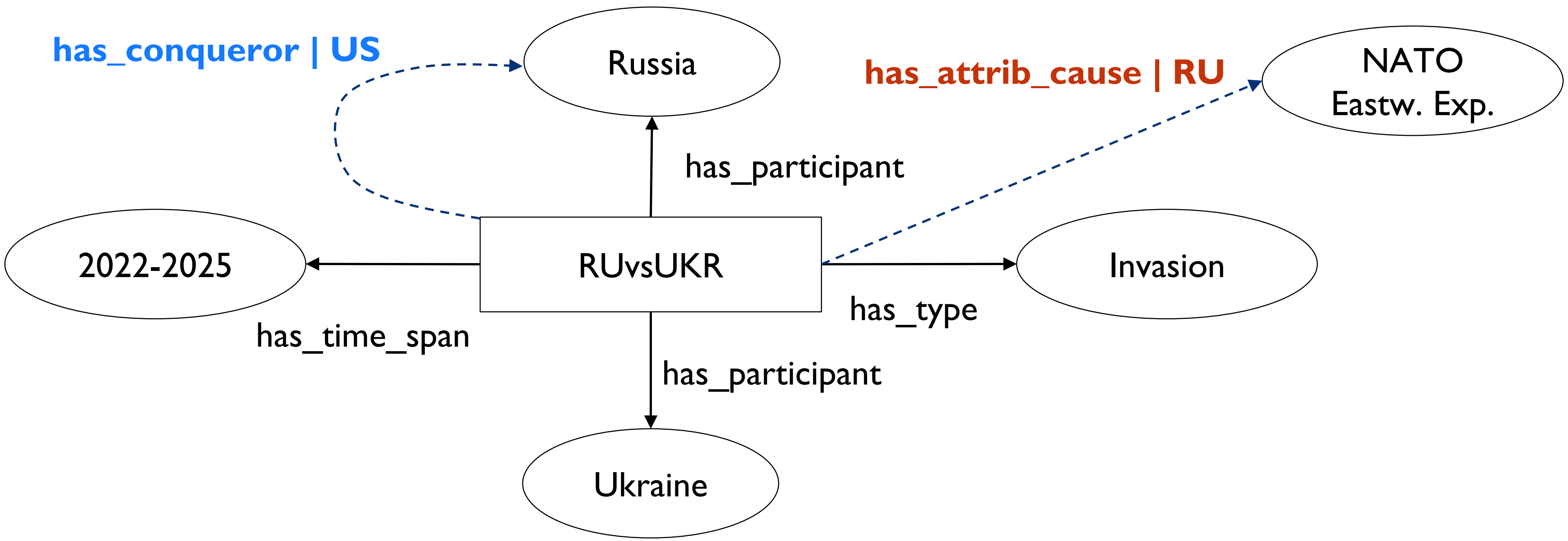
The Model: Parameterized Predicates

- **Parameterized predicates** can be specialized in two ways:
  - based on the **event type** and by **refinement**, i.e., express a more specialized version of a general predicate
  - based on the **viewpoint** of a certain group, i.e., this predicate only holds for this viewpoint.
    - called: *attributions*



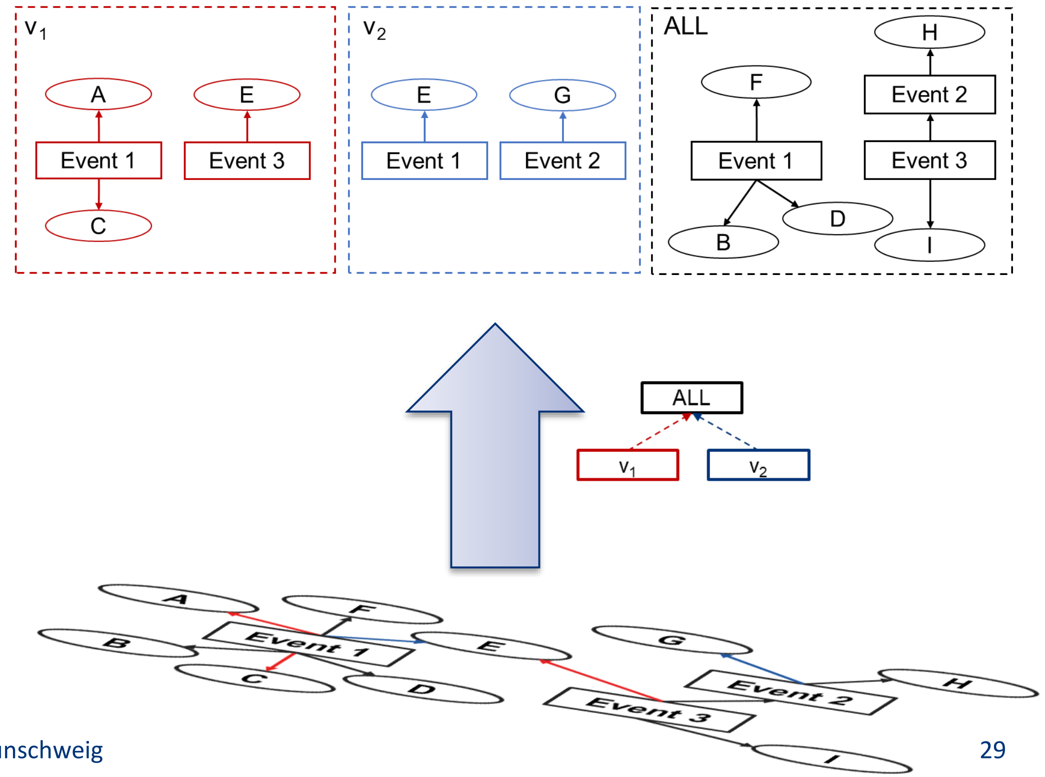
The Model: Viewpoint Consistency

- To ensure ontological consistency each viewpoint must be consistent, i.e., do not contain contradictions



Take-Home Message

- We introduced a **conceptual model for attributions**, i.e., viewpoint-dependent information for ECKGs and a new perspective on **consistency**



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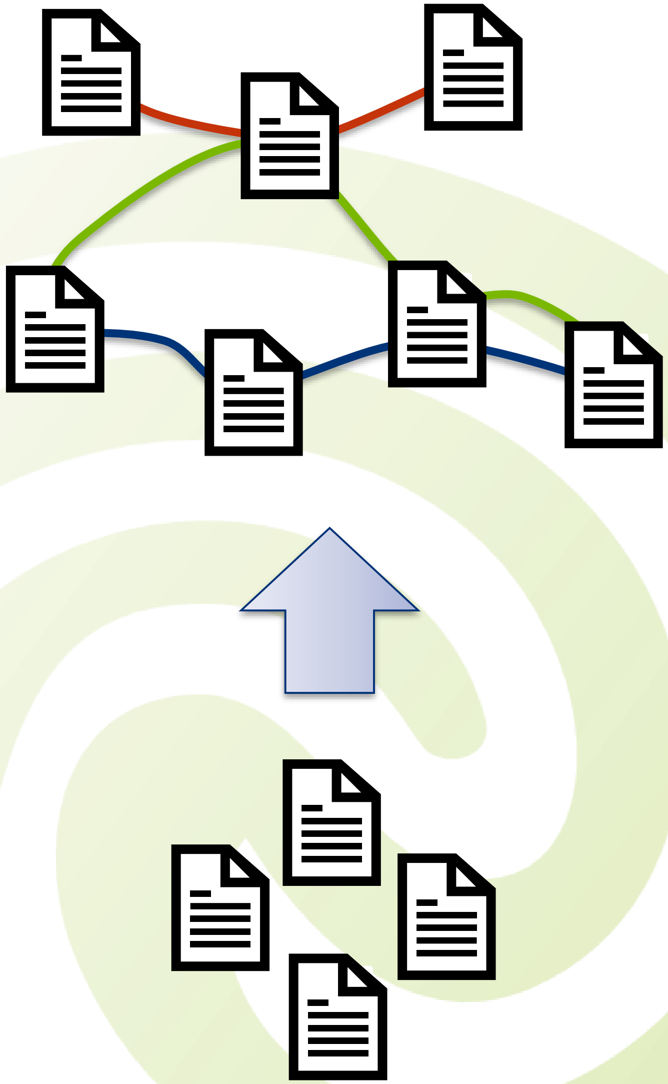
Part 3

Recursive Narratives

Narrative Chains

- Narratives shape the view on real-world events ⇒ different viewpoints shape different narratives
- Narratives are more than role frames, they also connect events in different ways ⇒ different communication of the same event



Motivation

- This leads to two research questions:

RQ3

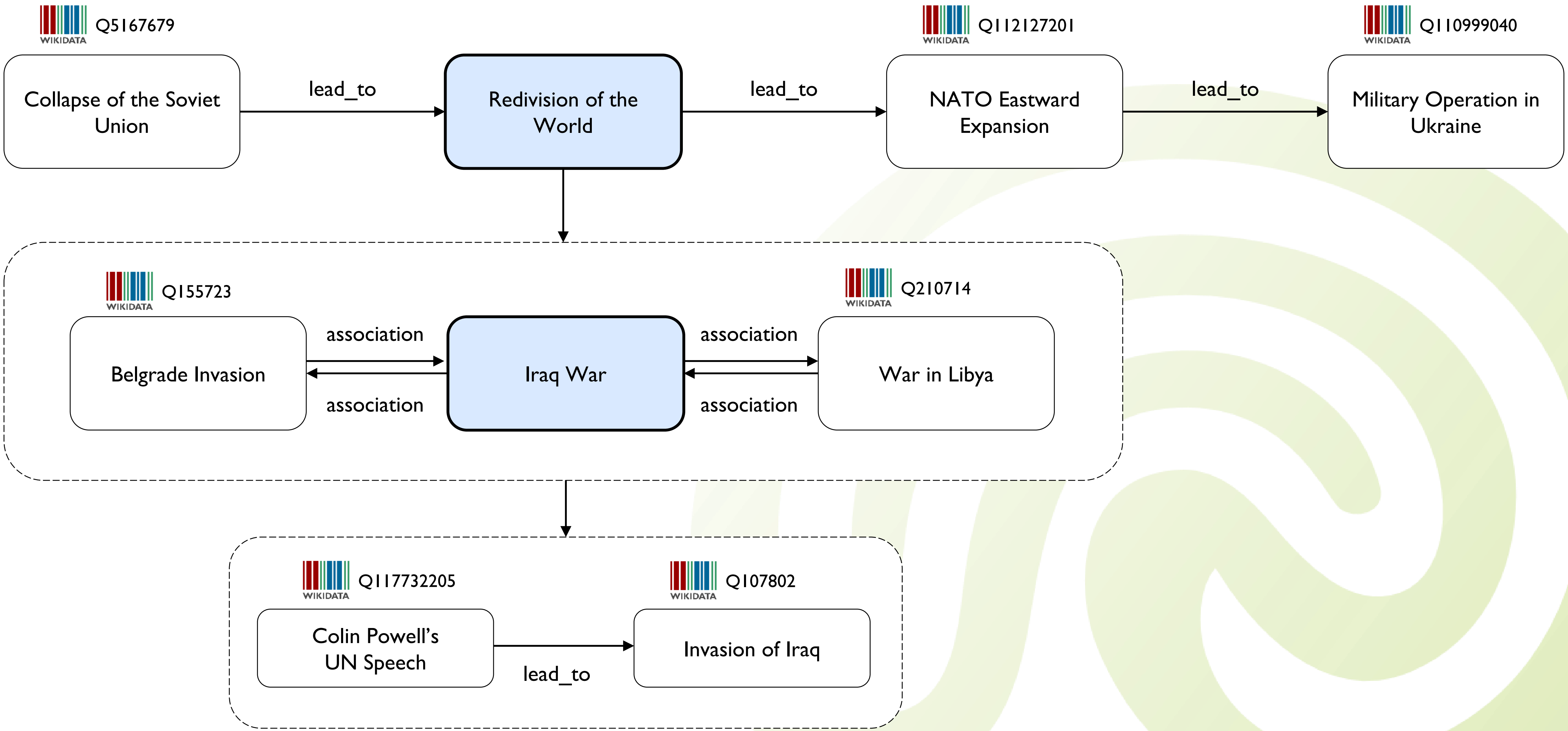
What is the shape of a narrative for real-world events?

RQ4

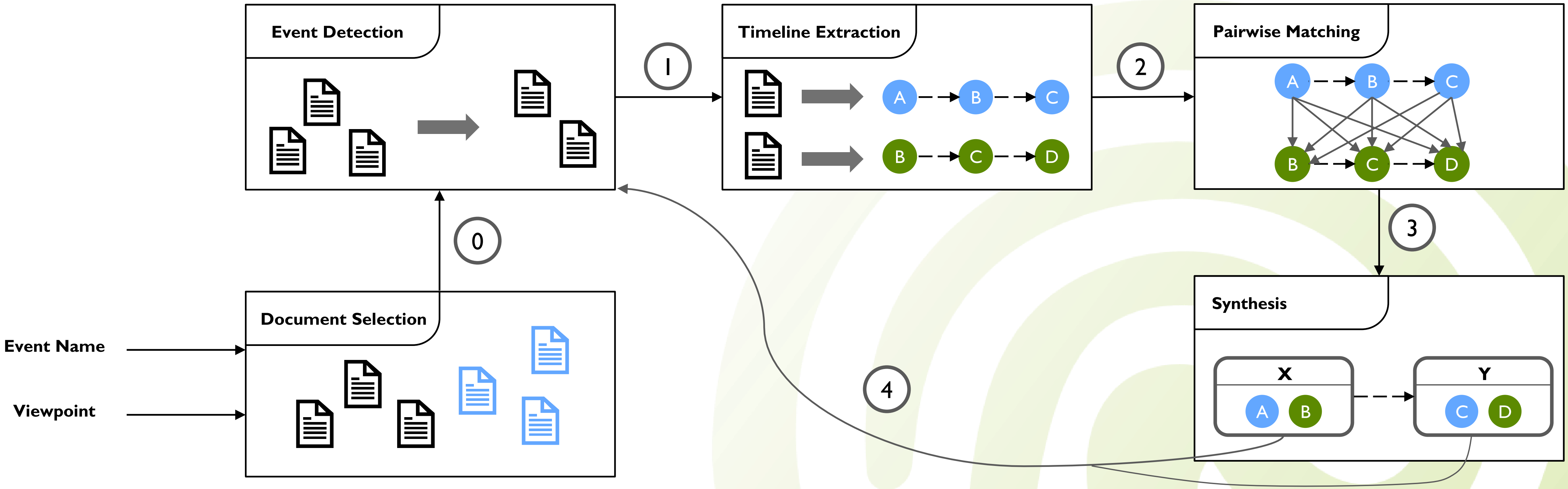
How can we automatically extract recursive narratives concerning real-world events from texts?

F. Plötzky, N. Kiehne, and W.-T. Balke (2024): Lost in Recursion: Mining Rich Event Semantics in Knowledge Graphs. In: Proc. of the 16th ACM Web Science Conference (WebSci)

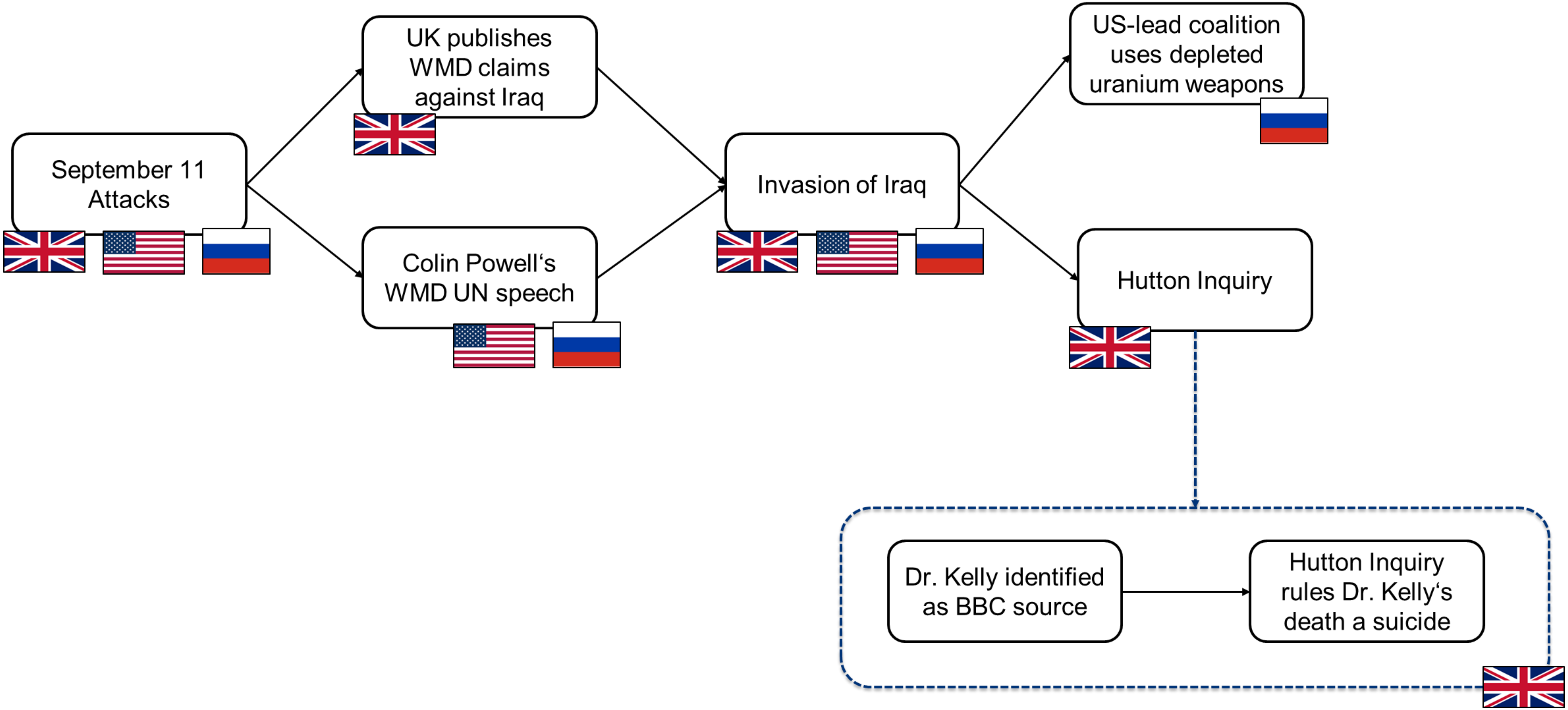
Recursive Structures



Mining Recursive Structures



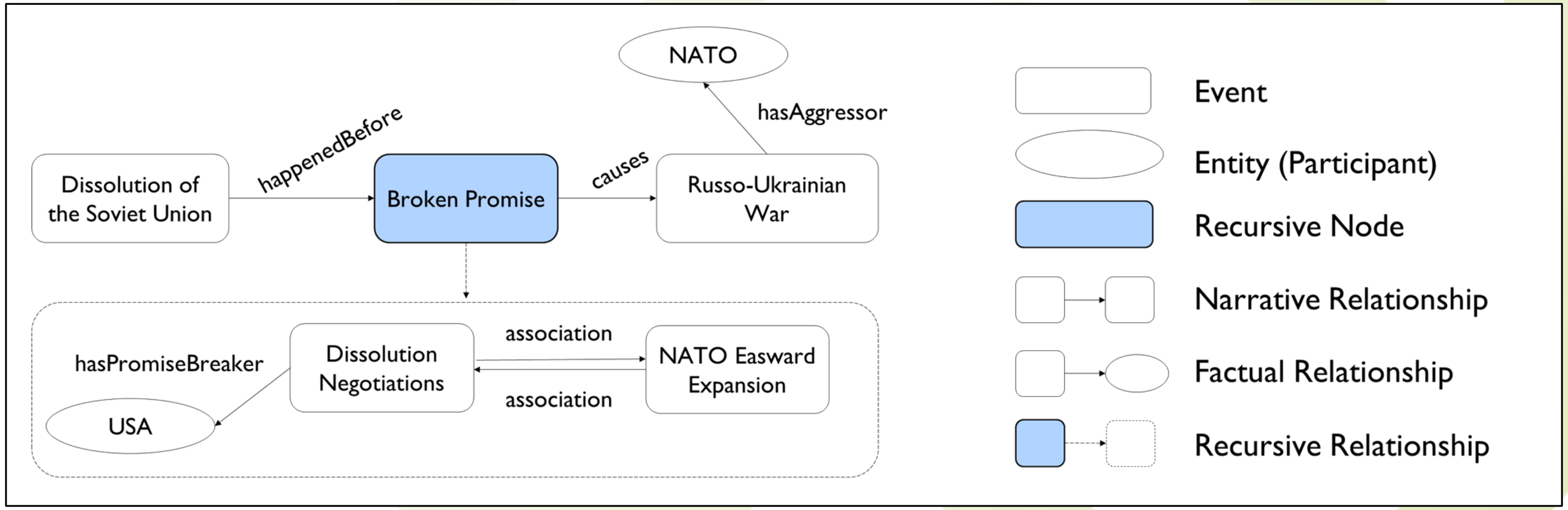
Findings from a Case Study (Excerpt)



Take-Home Message

- We showed how **recursive narratives** can be used to describe real-world events and how we can **generate** them from texts

- Applications: **narrative comparison**



Part 4 (Future Work)

Towards Narrative Plausibility

Open Problem

- **Until now** we have:
  1. A model for narratives
  2. Viewpoint-enabled ECKGs
  3. An algorithm to mine narratives from texts

- This leads to the final research question:

RQ5

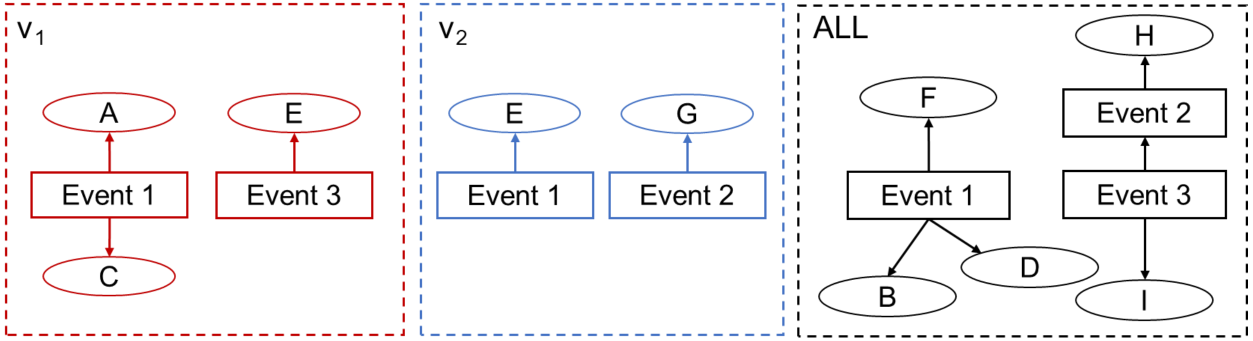
How can we assess the validity of narratives for different viewpoints?

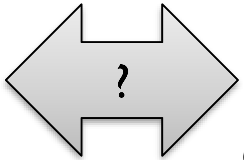
Idea: *Plausibility*

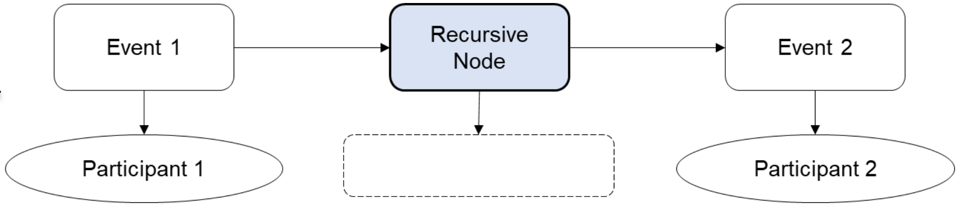
- Given a narrative, when is it **plausible** for a given *recipient*?
  - Plausibility is a proxy here

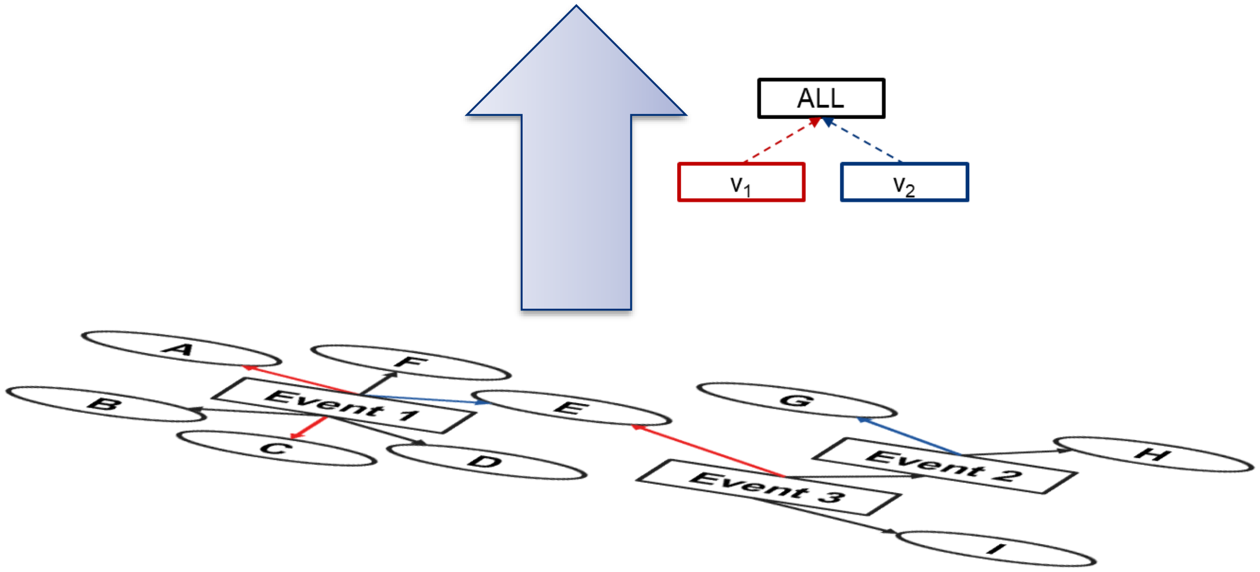
- Assumption: **plausible narrative** is
  - **Coherent**, i.e., it does not contradict itself
  - **Consistent**, i.e., it does not contradict the knowledge and beliefs of the recipient

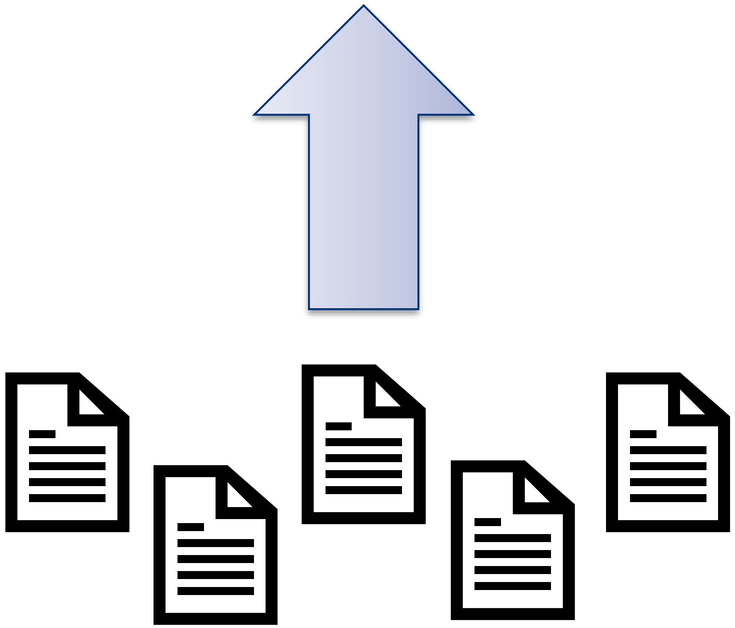
Problem: Plausibility Assessment











Potentials

- Simulation of a narrative‘s plausibility for different viewpoints
  - Automatic deduction whether a story is plausible based on prior known knowledge
  - What-if scenario testing

- Enhances the utility of narratives and provides a semantics for their evaluation (beyond simply presenting them to a user)

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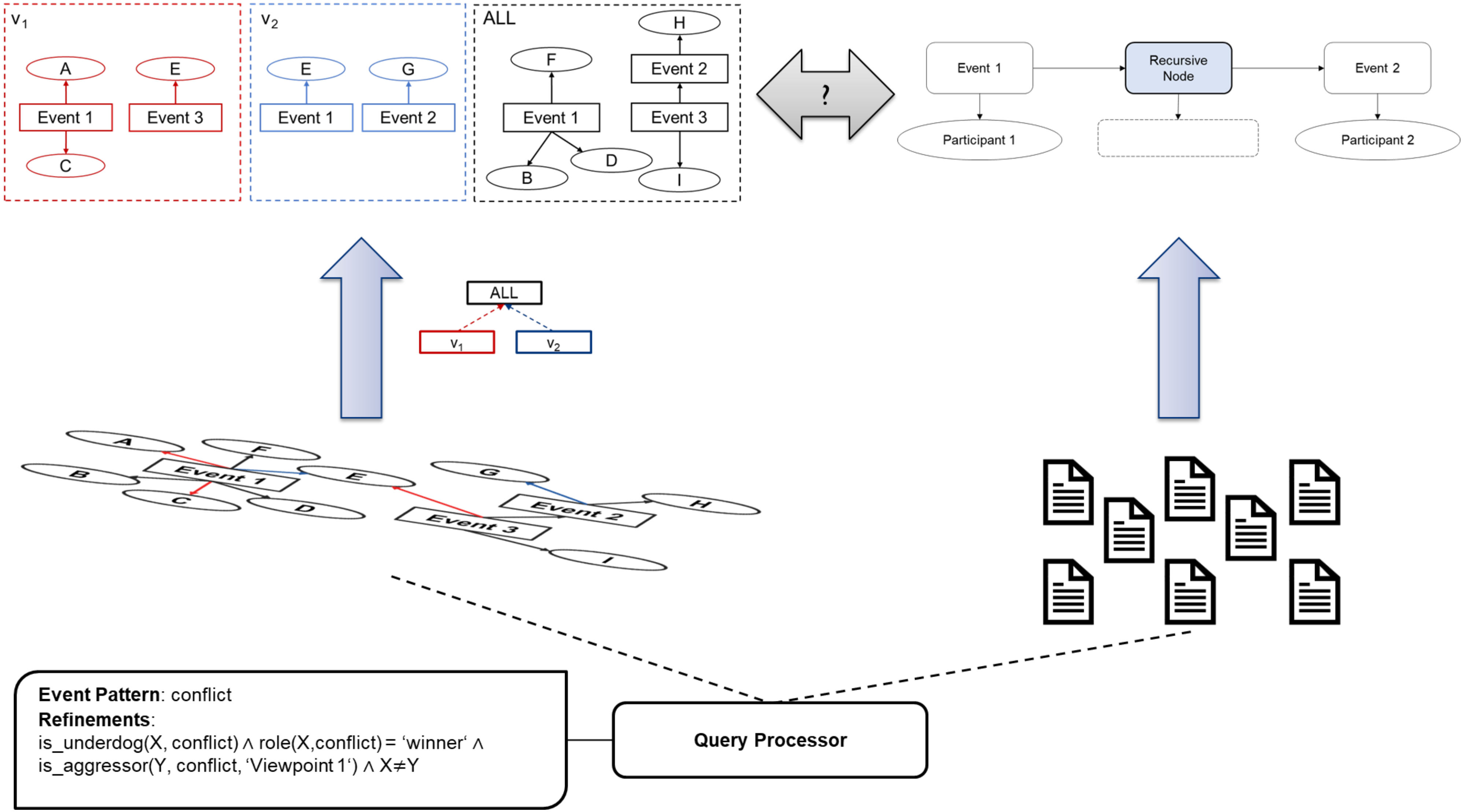
Part 5

Conclusion

At a Glance



v_1
A
E
Event 1
Event 3
C
v_2
E
G
Event 1
Event 2
ALL
H
F
Event 2
Event 1
Event 3
D
B
I
?
Event 1
Recursive Node
Event 2
Participant 1
Participant 2
ALL
v_1
v_2
A
F
B
Event 1
E
G
C
D
Event 2
H
Event 3
I
Event Pattern: conflict
Refinements:
is_underdog(X, conflict) ∧ role(X,conflict) = 'winner' ∧
is_aggressor(Y, conflict, 'Viewpoint 1') ∧ X≠Y
Query Processor

Contributing Papers

DISCO@JCDL'21	F. Plötzky & W.-T. Balke (2021): What it Boils Down to... The Case for Event Analogies to Combat Complexity in Digital Libraries. In: DISCO@JCDL
WebSci'22	F. Plötzky & W.-T. Balke (2022): It's the Same Old Story! Enriching Event-Centric Knowledge Graphs by Narrative Aspects. In: Proc. of the 14th ACM Web Science Conference (WebSci)
ER'23	F. Plötzky, K. Britz, and W.-T. Balke (2023): Shards of Knowledge – Modeling Attributions for Event-Centric Knowledge Graphs. In: Proc. of the Int. Conf. on Conceptual Modeling (ER)
WebSci'24	F. Plötzky, N. Kiehne, and W.-T. Balke (2024): Lost in Recursion: Mining Rich Event Semantics in Knowledge Graphs. In: Proc. of the 16th ACM Web Science Conference (WebSci)
DKE'25	F. Plötzky, K. Britz, and W.-T. Balke (2025): A Conceptual Model for Attributions in Event-Centric Knowledge Graph. Data & Knowledge Engineering (DKE)

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Thank You!

Literature

[Kroll et al.] H. Kroll, D. Nagel, and W.-T. Balke (2020): Modeling Narrative Structures in Logical Overlays on top of Knowledge Repositories. Proc. of the Int. Conf. on Conceptual Modeling (ER).

[DISCO@JCDL'21] F. Plötzky & W.-T. Balke (2021): What it Boils Down to... The Case for Event Analogies to Combat Complexity in Digital Libraries. In: DISCO@JCDL

[WebSci'22] F. Plötzky & W.-T. Balke (2022): It's the Same Old Story! Enriching Event-Centric Knowledge Graphs by Narrative Aspects. In: Proc. of the 14th ACM Web Science Conference (WebSci)

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[DKE'25] F. Plötzky, K. Britz, and W.-T. Balke (2025): A Conceptual Model for Attributions in Event-Centric Knowledge Graph. Data & Knowledge Engineering (DKE)

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Backup Slides

WebSci'22: Proof of Concept

- At hand: hybrid query processor
  - Core problems:
    - Determine subjective attributions from texts
    - Indexing of those attributions
  - Hence a preliminary study was conducted on a small set of documents from three viewpoints
    - Attributions: aggressor, threat, war criminal, enemy
    - Viewpoints: US, UK, RU

	Crimea Crisis	Gulf War	Iraq War	Ukraine Conflict	Vietnam War	Σ
New York Times	79	129	129	79	42	458
Washington Post	79	83	106	79	54	401
Daily Mail	91	28	70	66	12	267
The Guardian	78	51	127	79	1	336
RT.com	78	10	73	78	5	244
Sputniknews	79	8	10	79	1	177

WebSci’22: Proof of Concept (II)

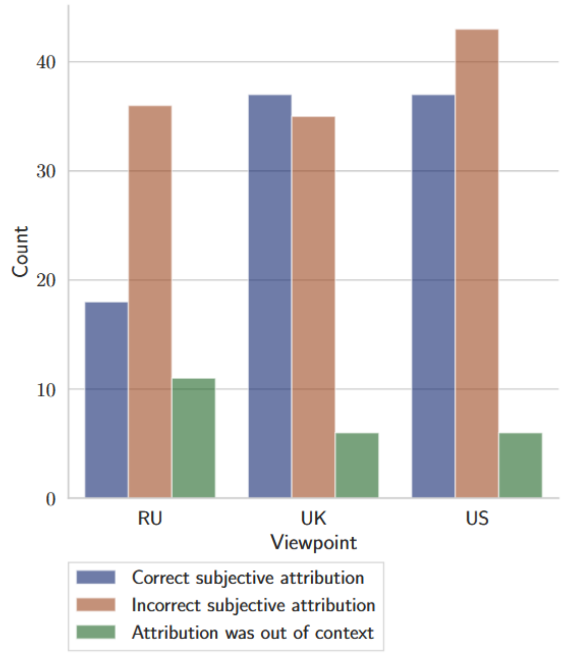
- Patterns
  - DvG: conflict type + winner(X), is_underdog(X)
  - DvG+A: DvG + is_aggressor(X,V) OR is_aggressor(Y,V)
  - RvU: event=‘RUvsUKR’ + is_aggressor(‘Russia’, US ∨ UK)
  - CP: conflict + is_aggressor(‘USA’, RU) and is_enemy(‘Russia’, ‘US’)
- Indexes:
  - ‘US’:
    - ‘aggressor’: BLOOM[entity1, entity2, …]
    - ‘war criminal’: BLOOM[…]
    - …

WebSci'22: Proof of Concept (III)

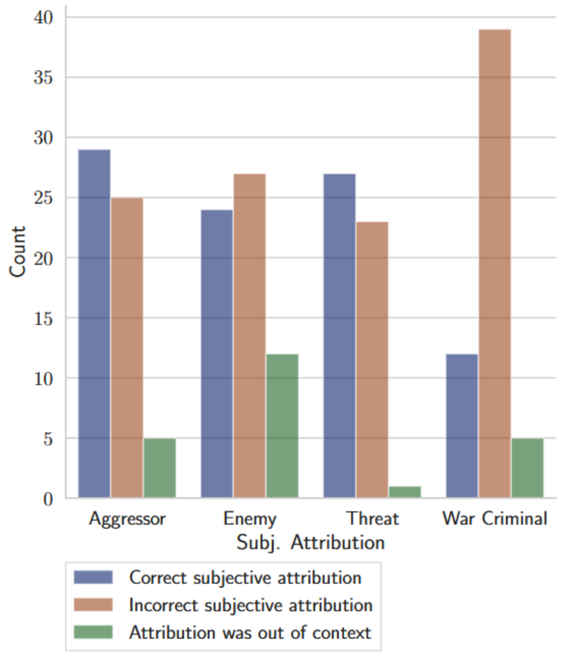
I Usage of Textual Entailment and Sentence Embeddings to determine the attributions from full articles [86 docs; 3 rater;κ=.33]

II Usage of Bloom Filters as index structure

I

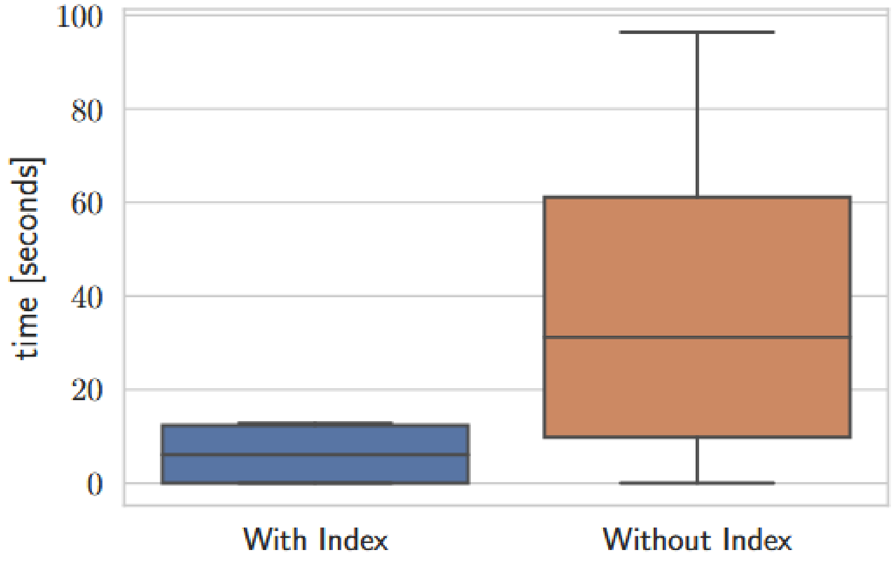


(a) Rater Evaluation Viewpoints



(b) Rater Evaluation Attributions

II



WebSci'22: Proof of Concept (IV)

- EQA negative examples:
  - *"Moscow has been throwing its weight around in recent years - in 2008 Russian troops humiliated the Georgians [...]"* → war criminal
  - *"From the Gulf of Tonkin Resolution to the Mai Lai massacre, the bombing of North Vietnam, [...]"* → North Vietnam as aggressor

ER'23 / DKE'25: Conceptual Model

Definition 1 (*Viewpoints*). A *viewpoint* $v \in V$ is a *consensual stance* $s \in \{valid, invalid\}$ towards a fact $f \in KG$ expressed by a group G.

Definition 2 (*Consensus*). A *consensus* in a group G is reached, if a *weighted consensus measure* $\phi_W(G, f)$ with weights W, surpasses a given threshold θ.

Definition 3 (*Viewpoint Hierarchy*). A *viewpoint hierarchy* is a directed acyclic graph $H(N, A)$ with $N = V \cup \{ALL\}$ being a set of viewpoints and A a set of arcs indicating *aggregation* relationships.

Definition 4 (*Viewpoints (Generalization)*). Given a viewpoint hierarchy H, a set of facts $F \subseteq KG$ and a group G. A *viewpoint* (with respect to G) is a consensual stance $s \in \{valid, invalid\}$ for each $f \in F$ with respect to H.

Definition 5 (*Events*). Let P be a set of entities and T be a set of literals referring to points in time. An *event* is an interaction between participants $p \in P$ that takes place at a specific point in time $t \in T$ or in a specific time span $(t_1, t_2) \in T \times T$, with $t_1 < t_2$. We denote the set of events as EV.

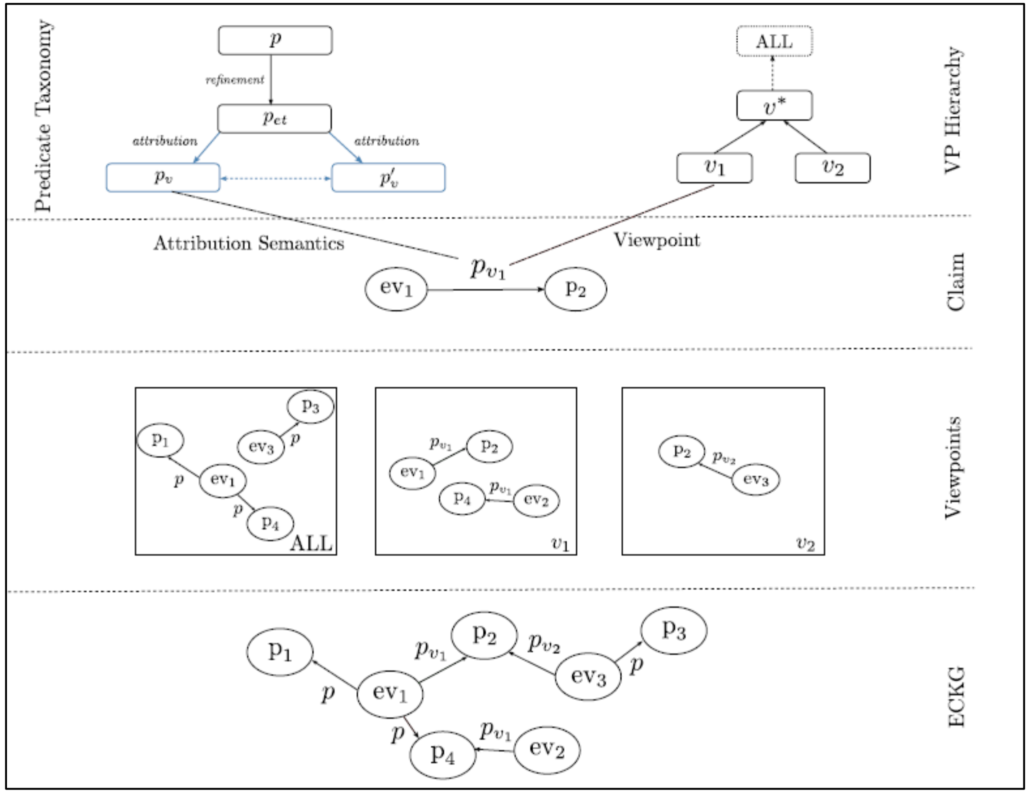
Definition 6 (*Event-Centric Knowledge Graphs*). An *event-centric knowledge graph* is a *knowledge graph*, represented by RDF triples $\langle s, p, o \rangle$ (subject-predicate-object), where each subject is an event.

Definition 7 (*Attributions*). An *attribution* is a *parameterized predicate* with a parameter $v \in V$, i.e., $\langle \mathrm{s}, \mathrm{p}_v, \mathrm{o} \rangle$ has attribution p_v. We call a triple that contains an attribution a *claim*.

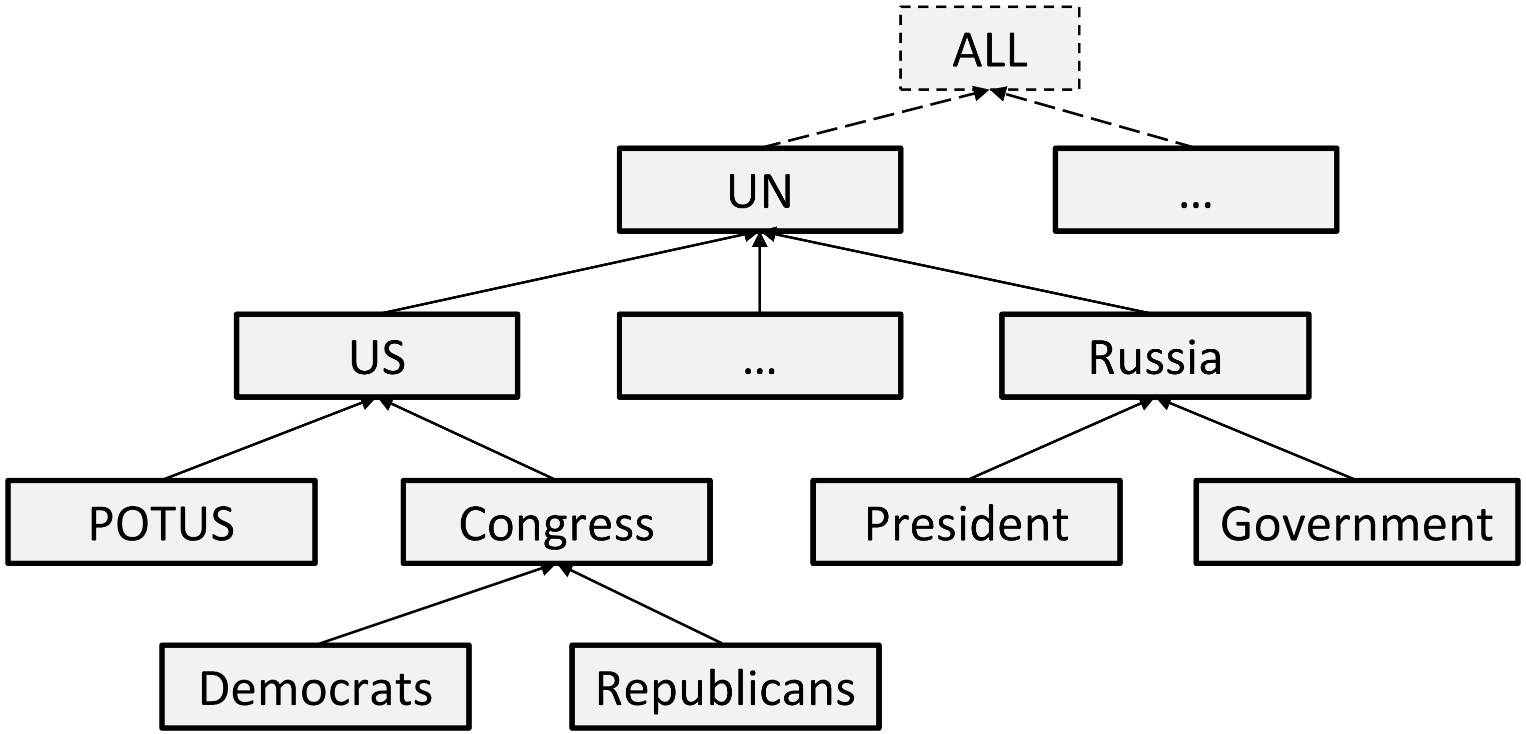
ER'23 / DKE'25: Conceptual Model (II)

Definition 8 (*Viewpoint-Compatibility*). Two claims c_1, c_2 with attributions $p_v^1, p_v^2 \in \mathcal{P}^{ATT}$ are *viewpoint-compatible* in v if their fusion is *non-contradictory*.

Definition 9 (*Viewpoint-Consistency*). Given a viewpoint hierarchy $H(N, A)$, a viewpoint $v \in N$, an ECKG KG and a set of claims C_v stemming from KG. We call C_v *consistent* if $c_1 \simeq_c c_2$ for all $c_1, c_2 \in C_v$. If for all $v \in N$ the corresponding C_v is consistent, we call KG *viewpoint-consistent*.



ER'23: WTAH vs. VPH



1. $\langle s, p_{ALL}, o \rangle$
2. $\langle s, p_{US}, o \rangle$
3. $\langle s, p_{POTUS}, o \rangle$
4. $\langle s, p_{Russia}, o \rangle$
5. $\langle s, p_{Russia}, o \rangle$
6. $\langle s, p_{Congress}, o \rangle$

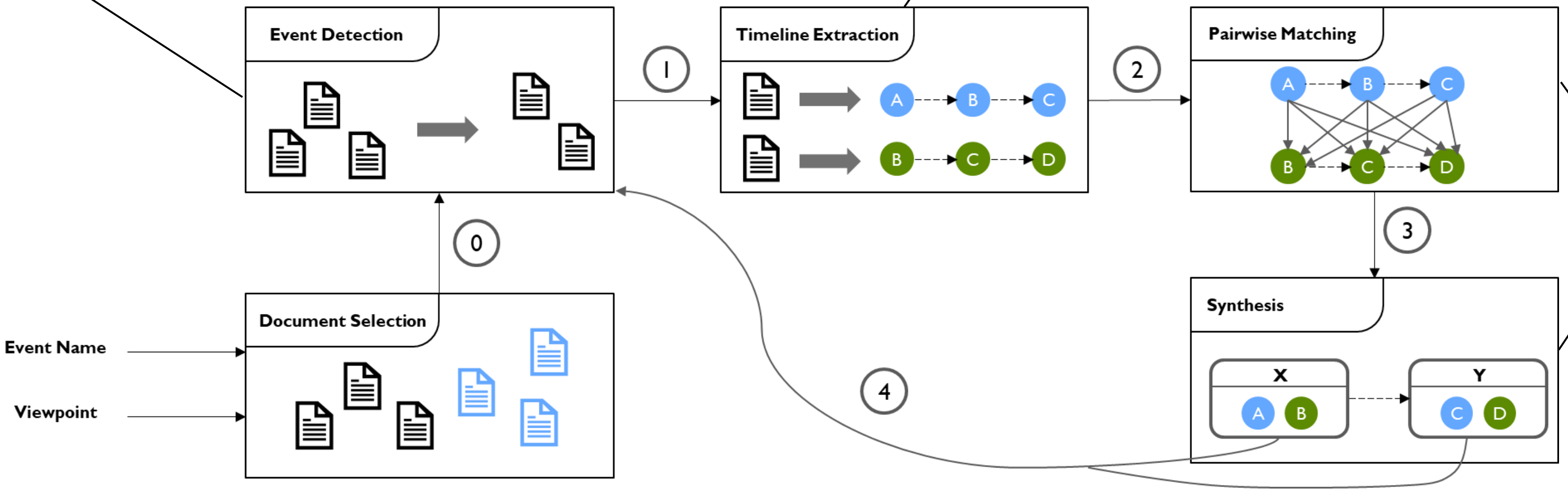
ER'23: Limitations

- **Stances**
  - We need an explicit stance from each group, neutrality means 'no' in this model
  - Positive stances might be rare and sometimes hard to extract
- **Hierarchical approach**
  - Not compliant with social physics, e.g.:
    - Senate and House paradox with both parties
    - Viewpoint constitution is assumed to be independent; however: Donald Trump will certainly have an impact on the Republicans beside having a different role …
    - Social similarity is hard to express in a hierarchy

WebSci'24: Mining Algorithm in Detail

Prompting: "Here is a news article. Is it about $EVENT? $ARTICLE. Answer only with yes or no only if the article is clearly about the $EVENT (2003-2011)

1. Prompting for the timeline (sequence of events) in each document
2. Few-shot prompting for a precise headline for each event [format: headline (time)]



Find connected components via clustering (SBERT all-mpnet-base-v2 and HDBSCAN (epsilon=.1)) and incremental combinations (threshold = .7).

Prompting for a headline for each cluster.

WebSci’24: Case Study

- Focus of interest: the **Iraq War** (2003)
  - Three different viewpoints (Russia, U.K., USA)
  - State-of-the art language model (Llama2-70B)

Viewpoint	*Media Outlet*	*# Documents*
RU	sputnikglobe.com	59
	rt.com	138
UK	theguardian.com	158
	independent.co.uk	128
US	latimes.com	145
	washingtonpost.com	59
	nytimes.com	158