Verifiable Report Generation: A GraphRAG Approach to Grounded Security Analysis

Anastasiia Chernavskaia, Blanca Jiménez and Pablo Fernández

BSE Barcelona School of Economics

Presentation outline

1. Introduction
2. Results
3. Demo
4. Methodology
   a. Pipeline Overview
   b. Knowledge Graph Building
   c. Why GraphRAG?
   d. Using GraphRAG for Report Generation
   e. Accuracy Evaluation (LLM-as-a-judge)
5. Discussion

BSE Barcelona
School of
Economics

1. Introduction

Introduction

Report content:

- Forward-looking report, describing relevant events for the short-term security situation in a country
- Focus on conflict, security and humanitarian situation in a country

Motivation and pipeline principles:

- *Automation* of resource-intensive research on the security status of a country
- *Truthfulness* of LLM summarization through knowledge graphs (reduce hallucinations)
- Enhancement of *transparency* of LLM summarization
- Two-fold *scalability*:
  - Ready for the inclusion of additional data sources - structured or unstructured
  - Ready for the inclusion of any country

2. Results

Results (1): Initial Report

Impact on Civilians and Humanitarian Operations

The conflict continues to have severe humanitarian consequences. On June 5, 2025, at least 14 people were killed and others injured after an RSF militia attack on a camp in El Fasher [15]. Civilian populations in conflict zones, such as El Fasher, have been subjected to shelling and attacks on displacement camps [7, 10, 13, 15].

Humanitarian operations have also been directly impacted. On June 3, 2025, a WFP and UNICEF aid convoy carrying life-saving supplies was attacked near Al Koma, North Darfur. Five members were killed, several more injured, and multiple trucks were burned [17]. This incident highlights the extreme dangers faced by humanitarian workers attempting to deliver aid in Sudan.

BSE Barcelona School of Economics

Results (2): Accuracy Report

Claim 44: TRUE

> Several members of a WFP and UNICEF aid convoy were injured on June 3, 2025, near Al Koma, North Darfur.

Sources:

- reuters.com: https://www.reuters.com/world/africa/un-convoy-attacked-way-sudans-al-fashir-unicef-says-2025-06-03/, 2025-06-03, unicef.org: https://www.unicef.org/press-releases/wfpunicef-humanitarian-aid-convoy-carrying-life-saving-supplies-attacked-sudans, 2025-06-03

- unicef.org: https://www.unicef.org/press-releases/wfpunicef-humanitarian-aid-convoy-attacked-sudans, 2025-06-03

BSE Barcelona
School of
Economics

Results (3): Fact-Checked Report

Impact on Civilians and Humanitarian Operations

The conflict continues to impose severe humanitarian consequences. On June 5, 2025, an RSF attack on a camp in El Fasher resulted in at least 14 fatalities and numerous injuries [42]. Civilian populations in conflict zones, particularly El Fasher, have been subjected to shelling and attacks on displacement camps [34, 23, 43, 44].

Humanitarian operations have also been directly impacted. On June 3, 2025, a joint World Food Programme (WFP) and UNICEF aid convoy, transporting life-saving supplies, was attacked near Al Koma, North Darfur [27]. The incident resulted in the deaths of five convoy members, injuries to several others, and the burning of multiple trucks [27, 15]. This event underscores the extreme hazards faced by humanitarian personnel delivering aid in Sudan.
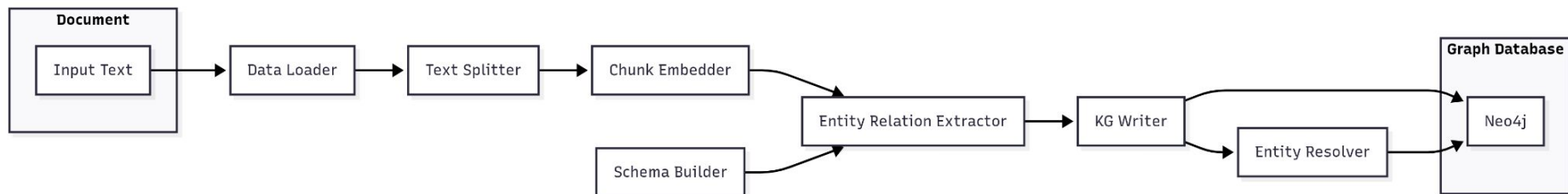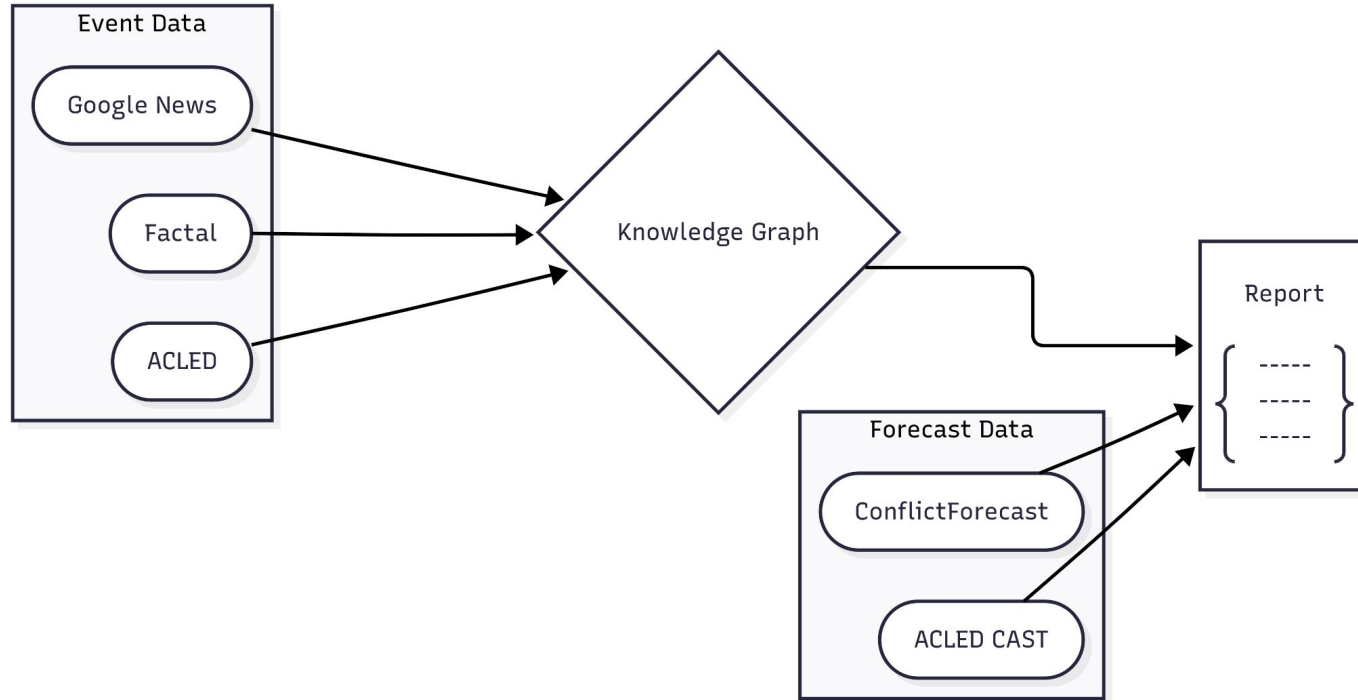
3. Demo

4. Methodology

4.1. *Pipeline Overview*
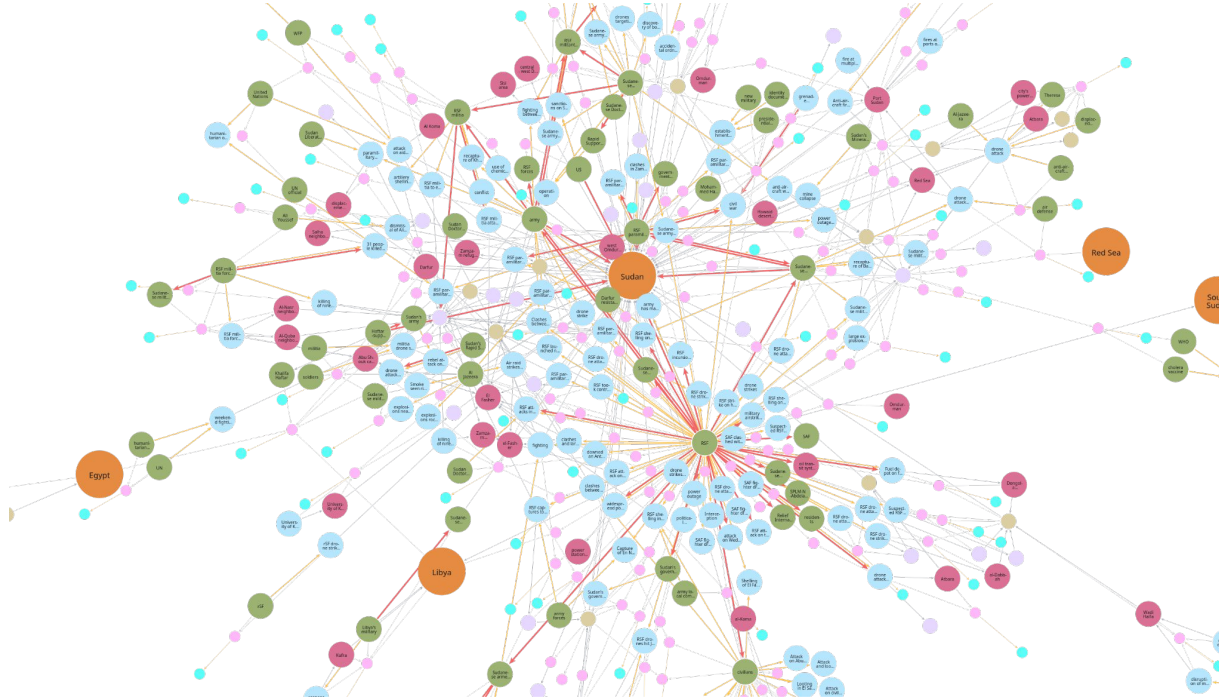
4.2. *Knowledge Graph Building*

Knowledge Graph Building (1): Overview

Knowledge Graph Building (2): Data

Knowledge Graph Building (3): KG Showcase

Knowledge Graph Building (4): Entity Resolution

ER Methods:

- TF-IDF Similarity
- Network-based Node Similarity
- BERT-based Semantic Similarity

Best Resolver for the "Precision-First" Strategy:

- SpaCy Semantic Matching Resolver: 0.99 threshold

Knowledge Graph Building (4): Entity Resolution

Entity 1	Entity 2	Similarity Score	Resolution Scenario
Washington (State)	Washington state (State)	0.99	With/without administrative suffix
Umm Keddada (Town)	Um Keddada (Town)	0.99	Spelling variation
United Nations (Actor)	UN (Actor)	0.99	Abbreviation and full name
Abyei (State)	Abyei (Town)	0.91	Same name, different entity types
North Darfur (State)	South Darfur (State)	0.83	Regional name variations
Army (Actor)	Militia (Actor)	0.64	Semantically similar, different status

4.3. Why GraphRAG

GraphRAG vs. vector–only RAG

1. **Multi-Hop Reasoning & Reduced Hallucinations**

   6-20% reduction in hallucinations, improved explainability
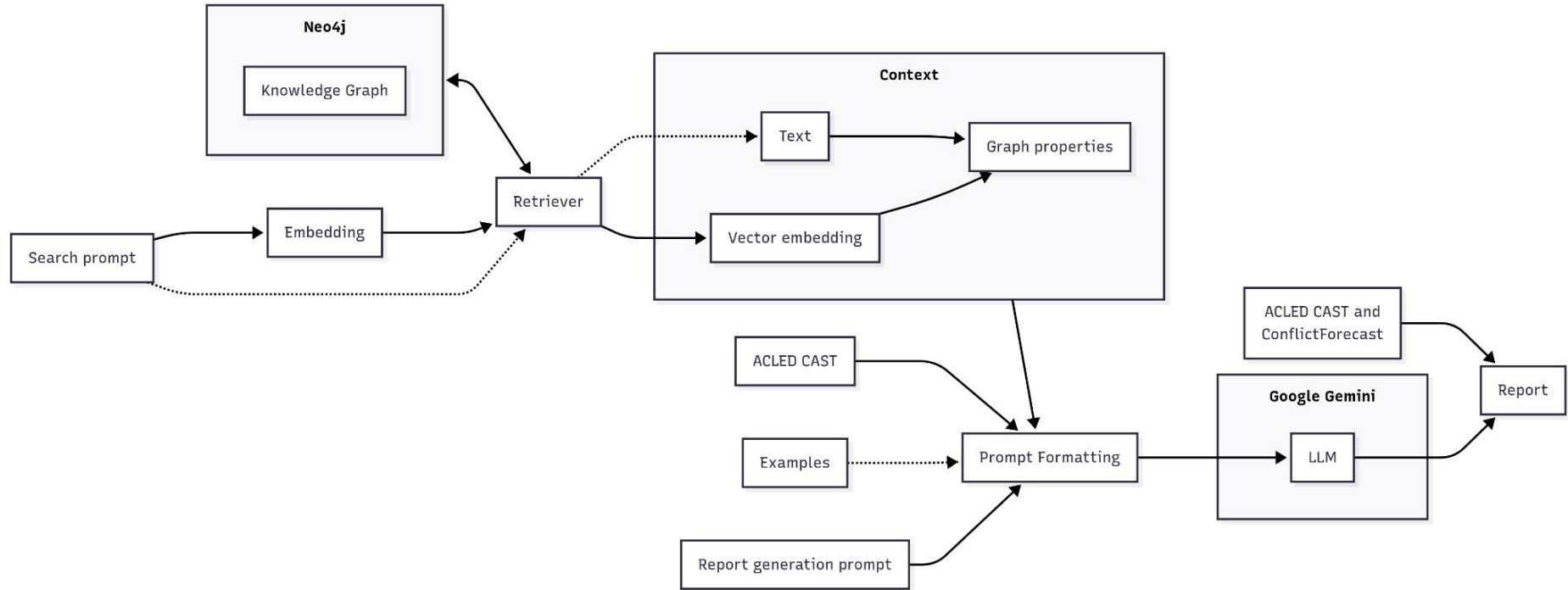
2. **Improved Accuracy & Cost Efficiency**

   40% more accuracy over baseline RAG on multi-hop queries
   26-97% fewer tokens required

3. **Versatility**

   Agnostic to data structure

4.4. Using *GraphRAG for Report Generation*

Using GraphRAG for Report Generation

Generated Reports

Showcase of "fresh" generated reports

4.5. *Accuracy Evaluation (LLM-as-a-Judge)*

Accuracy Evaluation (1): Approach

- Challenges to overcome
  - domain/task-specific knowledge
  - this knowledge being dynamic

- Main problems in the literature of domain-specific judges

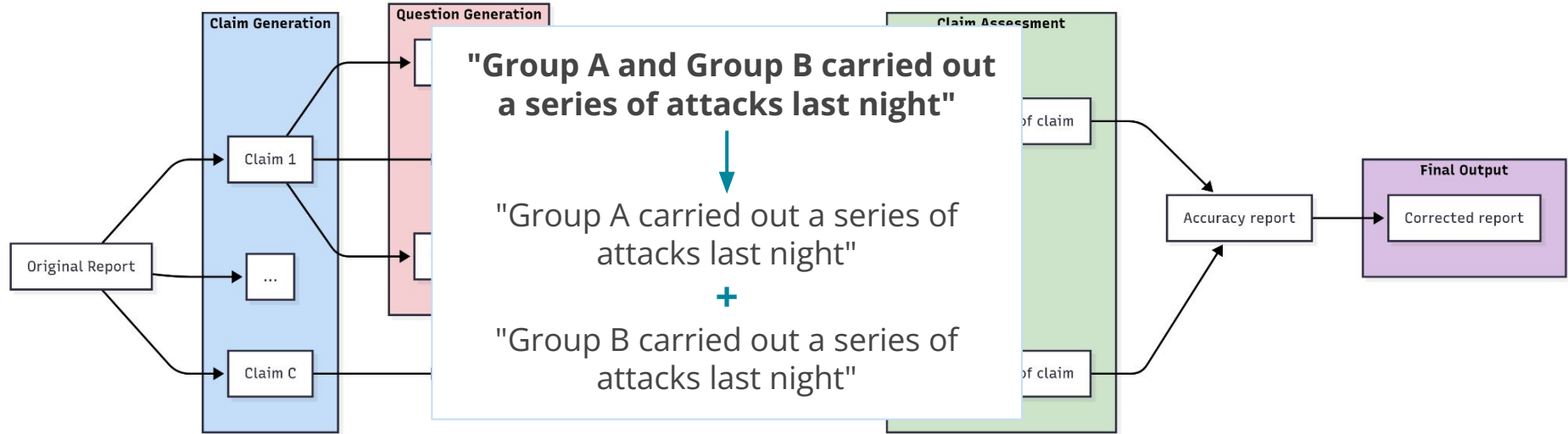| PROBLEMS	CAUSES
wrong answers factually wrong or hallucinations	missing/misleading specific knowledge
	low-quality retrieved context
inability to provide an answer	vague or overly broad tasks

Accuracy Evaluation (2): Pipeline

Accuracy Evaluation (2): Pipeline

"Group A and Group B carried out a series of attacks last night"

↓

"Group A carried out a series of attacks last night"

+

"Group B carried out a series of attacks last night"

Claim Generation

Question Generation

Claim Assessment

Original Report

Claim 1

...

Claim C

of claim

of claim

Accuracy report

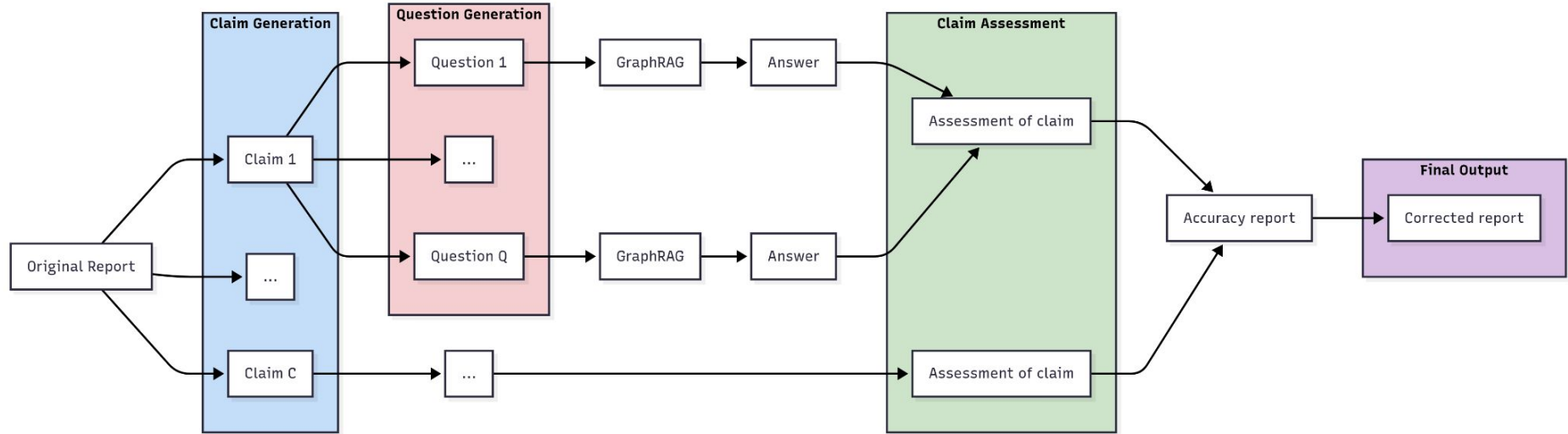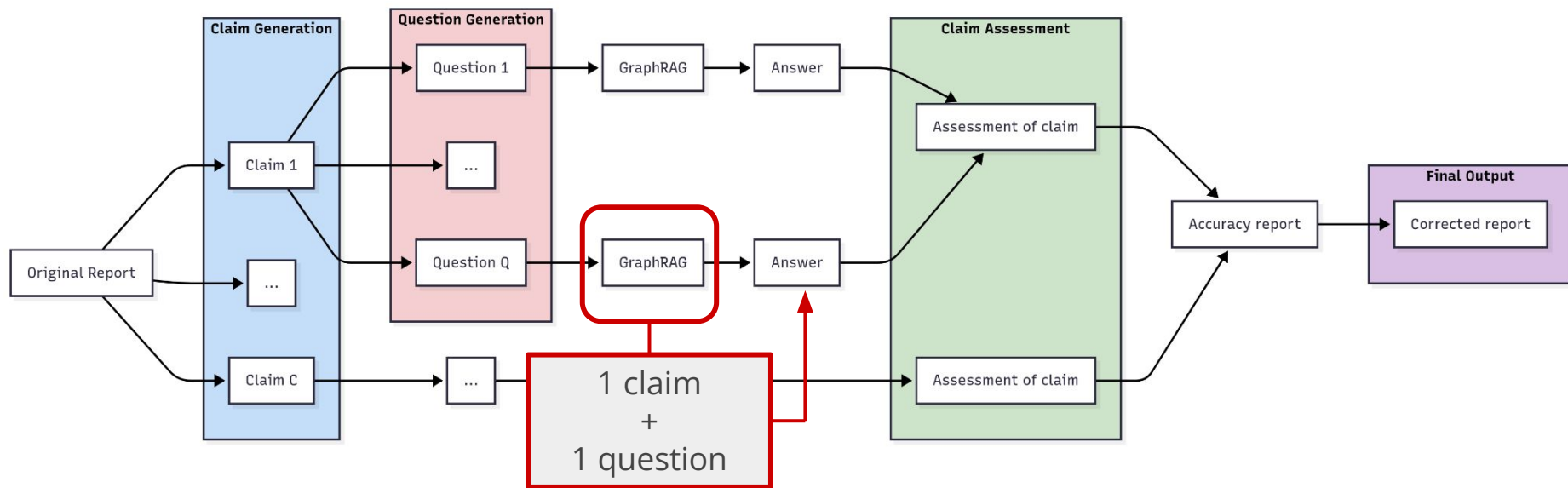Final Output

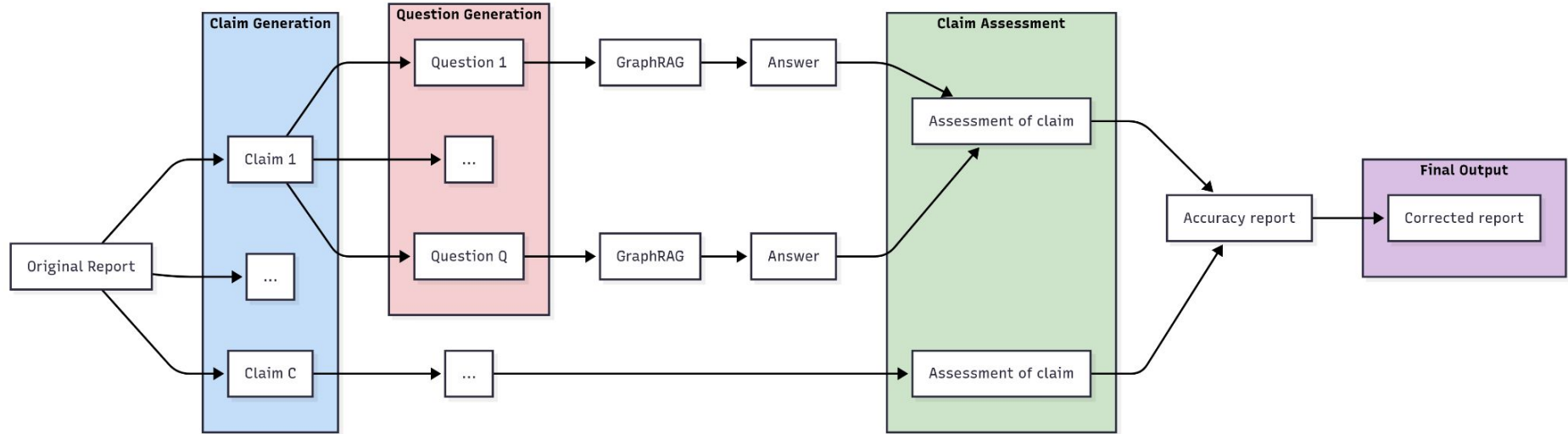Corrected report

BSE Barcelona School of Economics

Accuracy Evaluation (2): Pipeline

Accuracy Evaluation (2): Pipeline

Accuracy Evaluation (2): Pipeline

Accuracy Evaluation (3): Results

Identified claim	"The past year in Sudan has been dominated by the escalating civil war between the Sudanese Armed Forces (SAF) and the Rapid Support Forces (RSF) paramilitary group."		
Generated questions	Has the civil war between the Sudanese Armed Forces (SAF) and the Rapid Support Forces (RSF) paramilitary group been the dominant event in Sudan over the past year?	What are the primary factions involved in the ongoing conflict in Sudan?	Has the conflict in Sudan escalated over the past year?
Generated answers	Yes, the past year in Sudan has been dominated by the escalating civil war between the Sudanese Armed Forces (SAF) and the Rapid Support Forces (RSF) paramilitary group.	The primary factions involved in the ongoing conflict in Sudan are the Sudanese Armed Forces (SAF) and the Rapid Support Forces (RSF) paramilitary group.	Yes, the civil war in Sudan has been escalating over the past year.
Assessment	TRUE		

Accuracy Evaluation (3): Results

Resolution of conflicting claims by the LLM-judge

Source text	Original claim	Verdict	Corrected claim
Sudan army official says "large-scale operation" ongoing to reclaim all of Khartoum state as **fighting with RSF continues** in south and west of Omdurman. Khartoum State has been **recaptured in full** from the RSF militia by the army.	Military sources indicated that Khartoum State had been **recaptured in full** from the RSF militia by the army.	**False:** While military sources reported that Khartoum State had been recaptured in full, an official indicated **the army was "close" to recapturing** all of Khartoum State, and **fighting was still ongoing** in Omdurman. This suggests the **recapture was not yet complete**.	While military sources indicated that the army was **close to recapturing** all of Khartoum State from the RSF militia, fighting was still reported in Omdurman, suggesting the **recapture was not yet complete**.

5. Discussion

Reflection and future work

- **Scaling of the knowledge base**
  - inclusion of more sources
    UCDP, World Bank, UN internal sources...
  - refinement of unstructured data sources

regional experts + paid resources

- **Data streaming** (cache and purging)

- **Accuracy evaluation**:
  - good framework for future work on dynamic-info accuracy evaluations
  - can be adapted to the use of a different knowledge base as the reference

BSE Barcelona School of Economics

Thanks for your attention!