Pioneering Explainable Video Fact-Checking with a New Dataset and Multi-role Multimodal Model Approach

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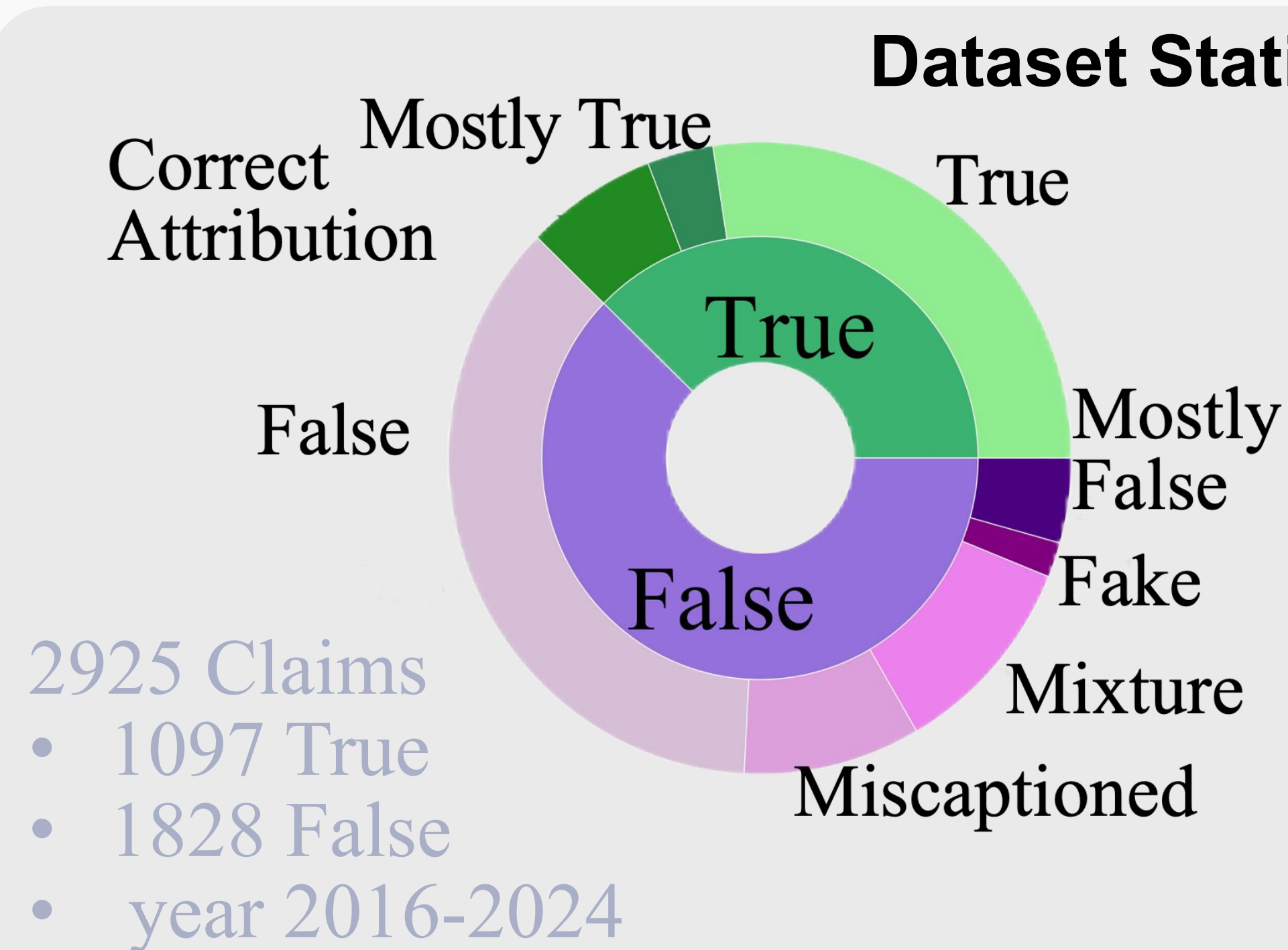
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Project Github

Motivation

Current challenges:

1. Lack of structured rationales in video fact-checking,
2. Limited explainable LLM fact-checking frameworks,
3. Insufficient evaluation metrics for explanation quality.

Dataset Statistics

Mostly True
Correct Attribution
True
Mostly False
Fake
Mixture
Miscaptioned
False

- 2925 Claims
  - 1097 True
  - 1828 False
  - year 2016-2024

TRUE Dataset

Sample Illustration from the Dataset

👉 Claim	📋 Label
A video shows an F-18 Super Hornet breaking the sound barrier and creating a sonic boom.	FALSE

🎥 Video Content		📚 Video Information	
		Video Headline	F18 Super Hornet - Jones Beach AirShow ...
		Video Date	25 May. 2009	Platform	YouTube
		Video Transcript	... not to *exceed the speed of sound* ...

🔍 Original Rationale	
main rationale	... the air show pilots didn't break the sound barrier.
additional rationale 1	... evidence of the plane going supersonic, it's not.

🏛 Summary Rationale	
synthesized rationale	... it did not break the sound barrier as confirmed ...
detailed reason 1	... F-18 did not exceed the speed of sound ...
detailed reason 2	... cone is explained to be a natural phenomenon ...
detailed reason 3	... regulations banning supersonic flight over land ...
detailed reason 4	... sonic booms causing widespread damage ...

📋 Evidences	
evidence1	The vapour cones are created by a shockwave that is ......

First **video fact-checking dataset** with **dual-annotated rationales** and **organized evidence**.

Expert-Crafted Rationale:
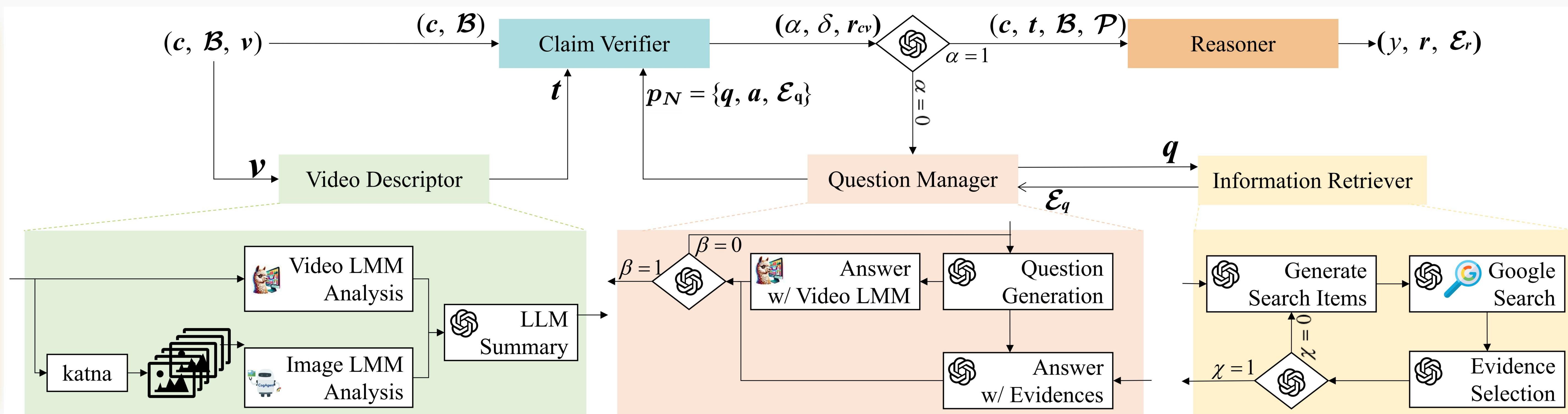Direct expert rationale **extracted** from fact-checking articles → Preserves natural verification flow

LLM-Summary Rationale:
Systematically **synthesized** explanations through LLMs → Ensures structured completeness

Framework

Highlights of 3MFact:

1. In / Out: Video + claim → veracity + rationales

2. Multi-role: Joint LLMs and LMMs for verification

3. Question-guided internal video and external analysis

Experimental Results and Conclusion

Veracity Evaluation Results

Model	Acc.	Recall	Prec.	F1
3MFact(M+M)	**79.63%**	**87.23%**	**71.93%**	**78.85%**
w/o IR	69.98%	60.12%	63.03%	61.54%
w/o QALMM	76.18%	81.58%	66.31%	73.16%
w/o VD	79.42%	85.71%	68.67%	76.25%
w/o 2Val	72.09%	74.85%	64.00%	69.00%

List of Abbreviations:
1. 3MFact(M+M): Using MiniCPM-V 2.6 as both ImageLMM and VideoLMM
2. IR: Information Retriever module
3. QALMM: Question Answering with VideoLMM
4. VD: Video Descriptor module
5. 2Val: Validation system for Q&A pairs and evidence

Rationale&Evidence Evaluation

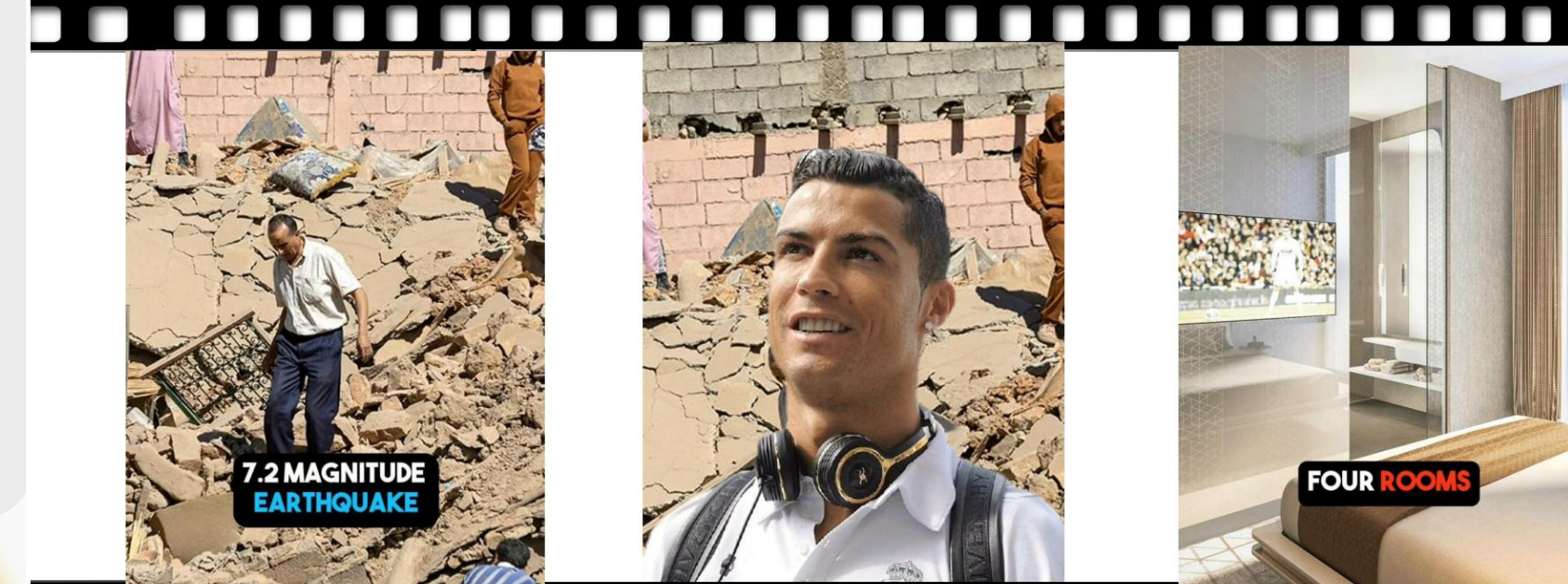|	Tradition		Content Credibility Analysis (G-Eval.)							
Model	Blue	Rou.	R-O	LC	SoE	COM	CUR	CON	FAI	FH
3MFact(M+M)	**0.04**	0.25	**2.37**	**4.47**	3.96	3.94	3.01	4.03	**4.28**	**4.55**
w/o IR	0.03	0.24	1.70	4.22	2.72	3.28	2.16	**4.05**	4.03	4.15
w/o QALMM	0.03	0.25	2.30	4.46	**4.24**	**4.07**	**3.27**	4.00	4.26	4.55
w/o VD	0.03	**0.26**	2.25	4.41	4.01	4.01	3.15	4.01	4.27	4.44
w/o 2Val	**0.04**	0.25	2.17	4.41	3.92	3.91	3.11	4.02	4.27	4.45

Conclusion:
Complete 3MFact framework achieves the highest performance, with **Information Retriever** being the most effective component for video fact-checking.

Case Study

📋 Label	**Claim:** Cristiano Ronaldo made his hotel available to provide shelter to victims of the September 2023 Morocco earthquake
FALSE	

Framework Result

Rating: False ✓
Rationale:
The hotel manager said that the hotel is not hosting refugees.

The critical module for success
Evidences: According to an article published on me.mashable.com, on Sep 12, 2023, Ronaldo's hotel management denies using their hotel for shelter to Morocco's earthquake victims.

📋 Label	**Claim:** Putin's entourage tells UFC fighter Conor McGregor not to put his arm around Russian President Vladimir Putin.
TRUE	

Framework Result

Rating: False ✗
Rationale:
The video shows no interaction between entourage and McGregor.

The critical module for failure:
Video Description: ··· The video instead portrays an engaged conversation and does not indicate any explicit or direct interaction between McGregor and ···