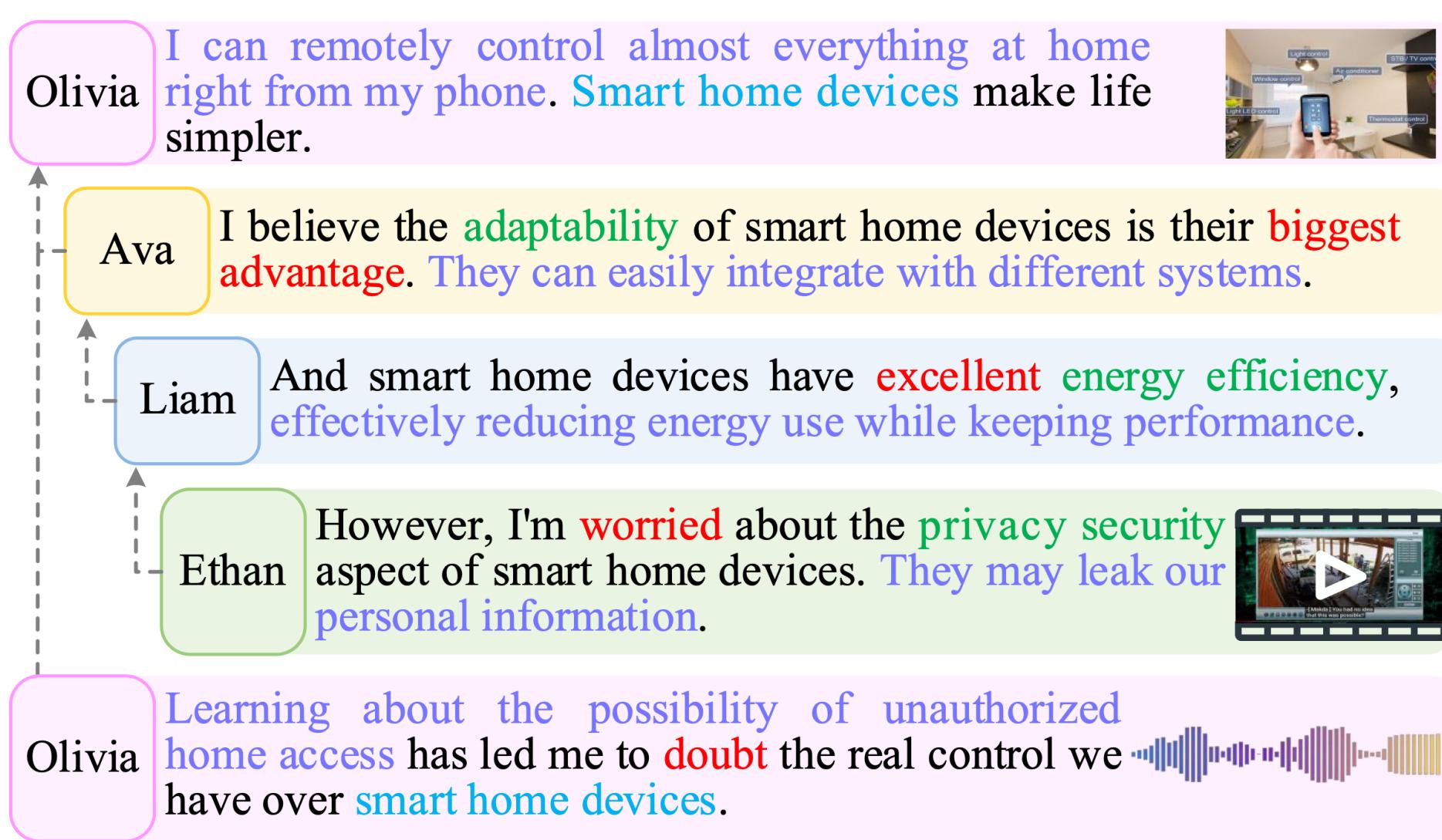


Meng Luo<sup>1</sup>, Hao Fei<sup>1</sup>, Bobo Li<sup>2</sup>, Shengqiong Wu<sup>1</sup>, Qian Liu<sup>3</sup>, Soujanya Poria<sup>4</sup>, Erik Cambria<sup>5</sup>, Mong-Li Lee<sup>1</sup>, Wynne Hsu<sup>1</sup>
<sup>1</sup>National University of Singapore <sup>2</sup>Wuhan University

<sup>3</sup>The University of Auckland <sup>4</sup>Singapore University of Technology and Design <sup>5</sup>Nanyang Technological University

## Highlights

Firstly upgrade ABSA with a comprehensive definition at the cognitive level, introducing **Panoptic Sentiment Sextuple Extraction** and **Sentiment Flipping Analysis**, achieving the ultimate form of sentiment analysis.



### Subtask-1: Panoptic Sentiment Sextuple Extraction

Holder	Target	Aspect	Opinion	Sentiment	Rationale
Olivia		[controlability]	[convenient]	positive	I can remotely ... from my phone
Ava		adaptability	bigest advantage	positive	They can easily ... systems
Liam	smart home devices	energy efficiency	excellent	positive	effectively ... performance
Ethan		privacy security	worried	negative	They may leak ... information
Olivia		[controlability]	doubt	negative	Learning about the ... access

### Subtask-2: Sentiment Flipping Analysis

Holder	Target	Aspect	Initial Sentiment	Flipped Sentiment	Trigger
Olivia	smart home devices	[controlability]	positive	negative	Introduction of New Information

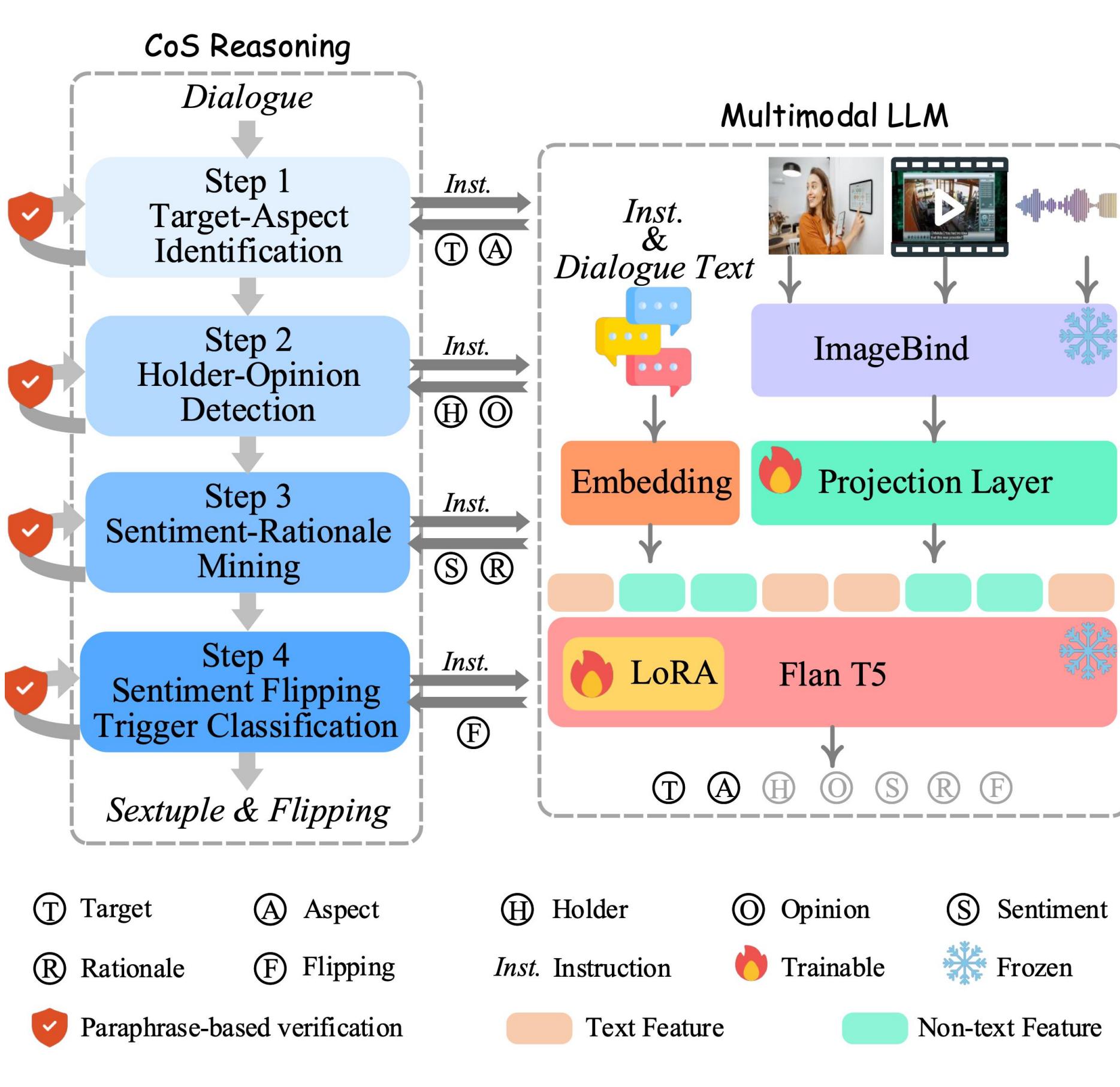
A large-scale, high-quality **benchmark dataset**, **PanoSent**, featuring multiple aspects: conversational contexts, multimodality, multilingualism, and multidomain.

Table 1: Summary of existing popular benchmarks of sentiment analysis (representatively summarized, not fully covered).										
Benchmark	Granularity	Sentiment Picture	Modality	Scenario	Language	Causal Rationales	Sentiment Change			
CR [4]	Fine	Sentiment	Text	Sentence	EN	X				
MRPC [21]	Coarse	Sentiment	Text	Document	EN	X				
SemEval [63]	Fine	Target, Aspect, Sentiment	Text	Sentence	EN	X				
TOWE [16]	Fine	Aspect, Opinion	Text	Sentence	EN	X				
ACOS [6]	Fine	Target, Aspect, Opinion, Sentiment	Text	Sentence	EN	X				
ASTE [15]	Fine	Aspect, Opinion, Sentiment	Text	Sentence	EN	X				
DiaASQ [37]	Fine	Target, Aspect, Opinion, Sentiment	Text	Sentence	EN, ZH	X				
Twitter2015 [51]	Fine	Target, Sentiment	Text, Image	Sentence	EN	X				
CUAD [87]	Coarse	Sentiment	Text, Audio, Video	Sentence	EN	X				
IEAMOCAP [5]	Coarse	Sentiment	Text, Audio, Video	Dialogue	EN	X				
MED [64]	Course	Sentiment	Text, Image, Audio, Video	Dialogue	ZH	X				
PanoSent	Fine	Holder, Target, Aspect, Opinion, Sentiment, Rationale	Text, Image, Audio, Video	Dialogue	EN, ZH, SP	✓	✓			

Table 2: Main statistics of PanoSent dataset.

Dialogue			Sextuple			Modality			Manner			
Dia.	Utt.	Spk.	Sext.	Flip.	Txt.	Img.	Aud.	Vid.	Mix.	Imp.	Exp.	
Total	6,000	28,822	26,831	28,464	2,136	3,360	1,320	360	240	720	1,680	
EN	Total	2,000	9,573	8,827	9,298	694	1,102	427	108	70	232	536
Real	Real	2,000	9,573	8,827	9,298	694	1,102	427	108	70	232	536
Synth	Synth	4,000	19,249	18,004	19,166	1,442	2,258	893	252	170	488	1,144
												2,856
Total	3,000	14,033	13,444	13,965	1,068	1,680	660	180	120	360	840	2,160
ZH	Real	1,000	4,702	4,510	4,672	360	582	210	63	41	125	289
Synth	Synth	2,000	9,331	8,934	9,293	708	1,098	450	117	79	235	551
												1,449
Total	1,000	4,667	4,490	4,671	356	560	220	60	40	120	280	720
SP	Real	333	1,547	1,488	1,551	114	181	72	18	12	35	90
Synth	Synth	667	3,120	3,002	3,120	242	379	148	42	28	75	190
All	All	10,000	47,522	44,765	47,100	3,560	5,600	2,200	600	400	1,200	2,800
												7,200

An advanced reasoning framework, the **Chain-of-Sentiment**, based on our **MLLM backbone Sentica**, achieving high task performance and providing a strong baseline for subsequent research.



## CoS Reasoning Framework

### Step 1: Target-Aspect Identification

#### Input Data: $D$

**Instruction:** Based on the multi-party dialogue and its accompanying multimodal data, please identify all possible targets and their specific aspects mentioned in the dialogue. Extract each target and aspect explicitly from the utterance text spans, or infer them implicitly via your understanding of the input data. Ensure each identified target is paired with its aspect(s), forming target-aspect pairs.

**Expected Output:**  $(\text{target}, \text{aspect})_1, (\text{target}, \text{aspect})_2, \dots$

### Step 2: Holder-Opinion Detection

#### Input Data: $D, \{(t_i, a_i)\}$

**Instruction:** Based on the dialogue and each target-aspect pair identified previously, please identify the holder (the person who expresses an opinion, normally should be a speaker of certain dialogue utterance) and the opinion, both either directly extracted from the text or inferred implicitly via your understanding of the input data. Formulate your output into ‘holder-target-aspect-opinion’ quadruples, ensuring each element is clearly identified.

**Expected Output:**  $(\text{holder}, \text{target}, \text{aspect}, \text{opinion})_1, (\text{holder}, \text{target}, \text{aspect}, \text{opinion})_2, \dots$

### Step 3: Sentiment-Rationale Mining

#### Input Data: $D, \{(h_j, t_i, a_i, o_j)\}$

**Instruction:** Based on the dialogue and each holder-target-aspect-opinion quadruple identified previously, please identify the sentiment polarity associated with the opinion and analyze the causal rationale behind it. The sentiment polarity should be classified as ‘positive’, ‘neutral’, or ‘negative’. The rationale should be extracted explicitly from the text, or inferred implicitly via your understanding of the input data. Formulate your output into ‘holder-target-aspect-opinion-sentiment-rationale’ sextuples, ensuring sentiment polarity is clearly analyzed and the other five elements are clearly identified.

**Expected Output:**  $(\text{holder}, \text{target}, \text{aspect}, \text{opinion}, \text{sentiment}, \text{rationale})_1, \dots$

### Step 4: Sentiment Flipping Trigger Classification

#### Input Data: $D, \{(h_j, t_i, a_i, o_j, s_k, r_l)\}$

**Instruction:** Based on the dialogue and each holder-target-aspect-opinion-sentiment-rationale sextuple, please identify instances where a sentiment flip occurs for the same holder regarding the specific target-aspect pair. Determine the trigger type for these flips from the predefined categories: *introduction of new information, logical argumentation, participant feedback and interaction, personal experience and self-reflection*. Formulate your output to include the holder, target, aspect, initial sentiment, flipped sentiment, and the trigger type, or state “None” if no flips are identified.

**Expected Output:**  $(\text{holder}, \text{target}, \text{aspect}, \text{initial sentiment}, \text{flipped sentiment}, \text{trigger type})_1, \dots$ ; or “None”

## Experiment

### Quantitative Results

Table 3: Main results of Subtask-I, Panoptic Sentiment Sextuple Extraction. ‘H/T/A/R/S’ represents Holder, Target, Aspect, Opinion, Rationale, and Sentiment, respectively. All the scores are averaged over five runs under different random seeds.

Model	PLM	Element-wise				Pair-wise				Sextuple			
		H	T	O	R	T-A	H-O	S-R	O-S	Micr.	Ident.		
M1	DiaASQ	mBERT Base	69.56	58.61	52.04	44.39	22.90	33.07	33.52	18.98	40.26	13.49	19.07
M2	UGF	mT5-XXL	71.17	61.83	55.25	47.68	25.87	35.35	36.08	22.37	42.80	15.85	20.12
M3	NEXT-GPT	Vitru 7B	76.07	66.25	59.97	52.12	29.95	40.23	41.24				