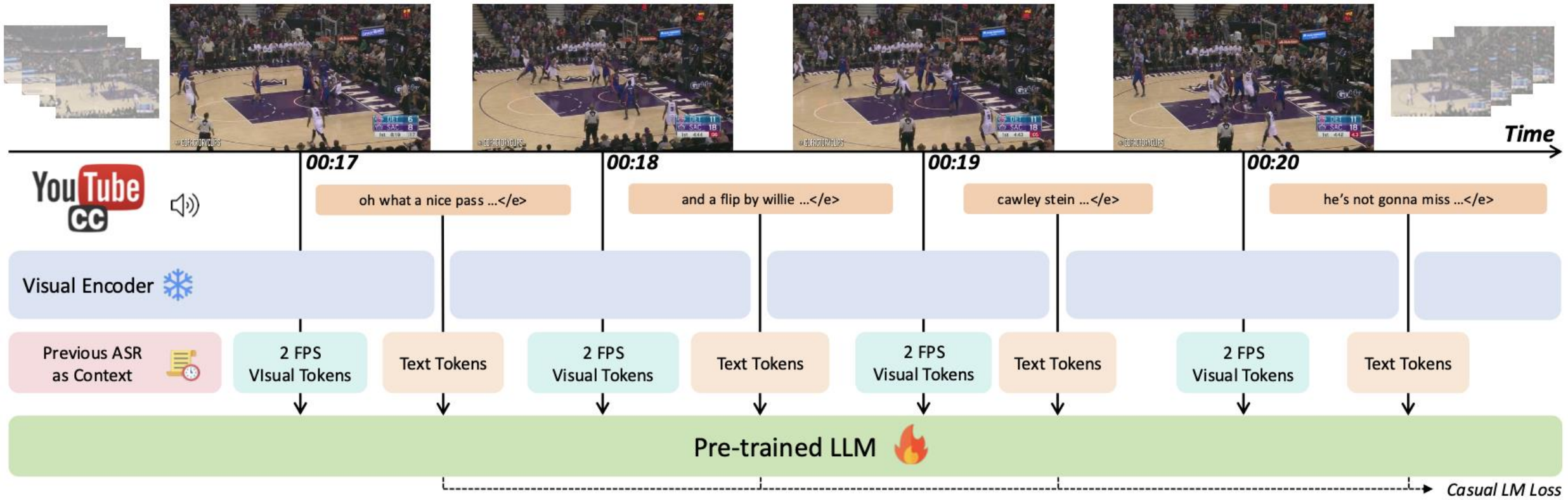
Key Points: Modeling

1. Densely interleaving frame-words according to their timestamps

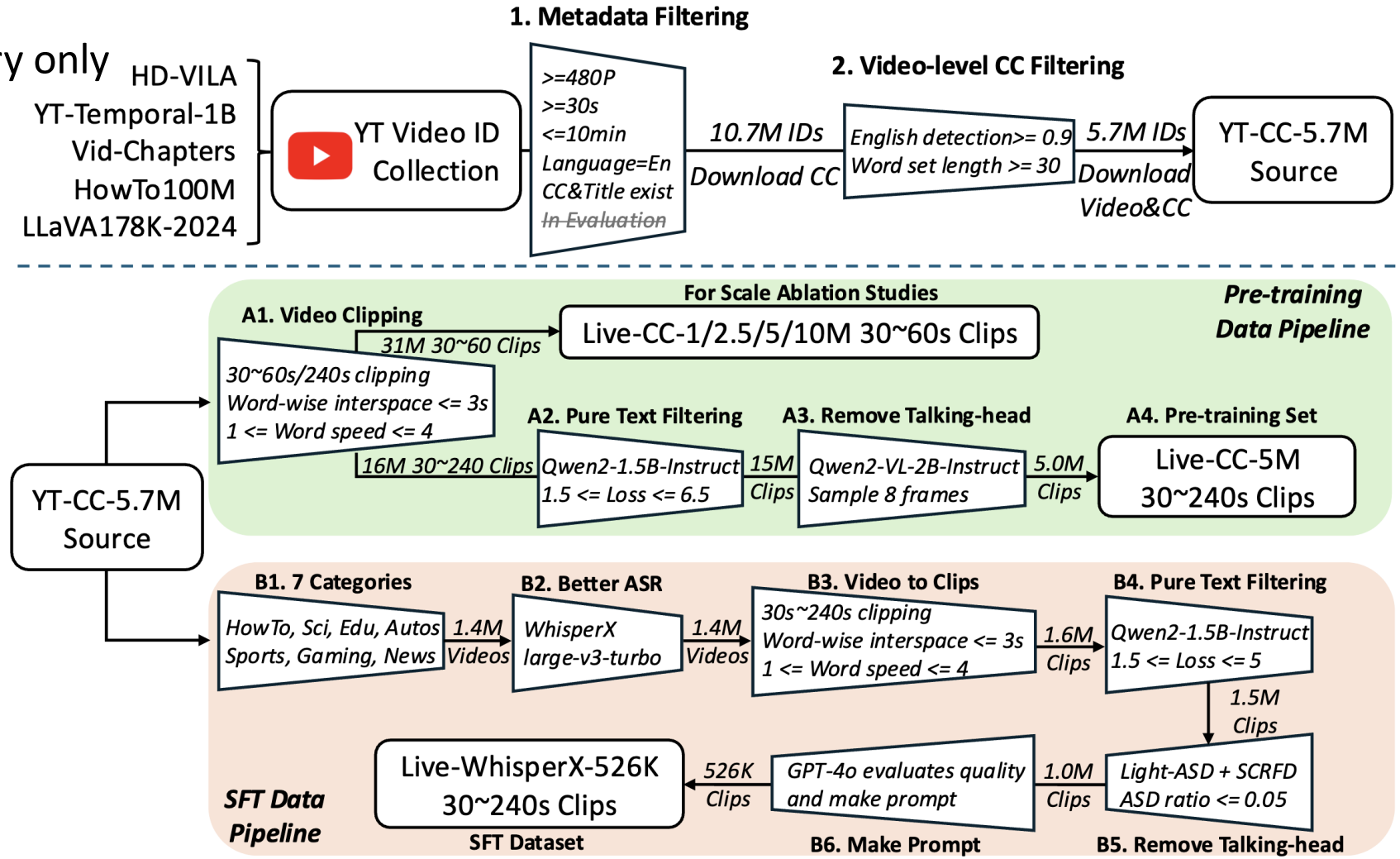
2. Title or Previous ASR as context during pre-training, but not during SFT

3. Introducing '…' as the streaming EOS token, instead of reusing the common EOS token



Key Points: Data Production Pipeline

1. Language perplexity to remove low-quality ASR
2. Active speaker detection (ASD) to remove talking-head videos
3. GPT-4o for making query only



Key Points: Datasets

1. 5M Pre-training Video-ASR Data with YouTube CC

2. 526K SFT Video-ASR Data with WhisperX

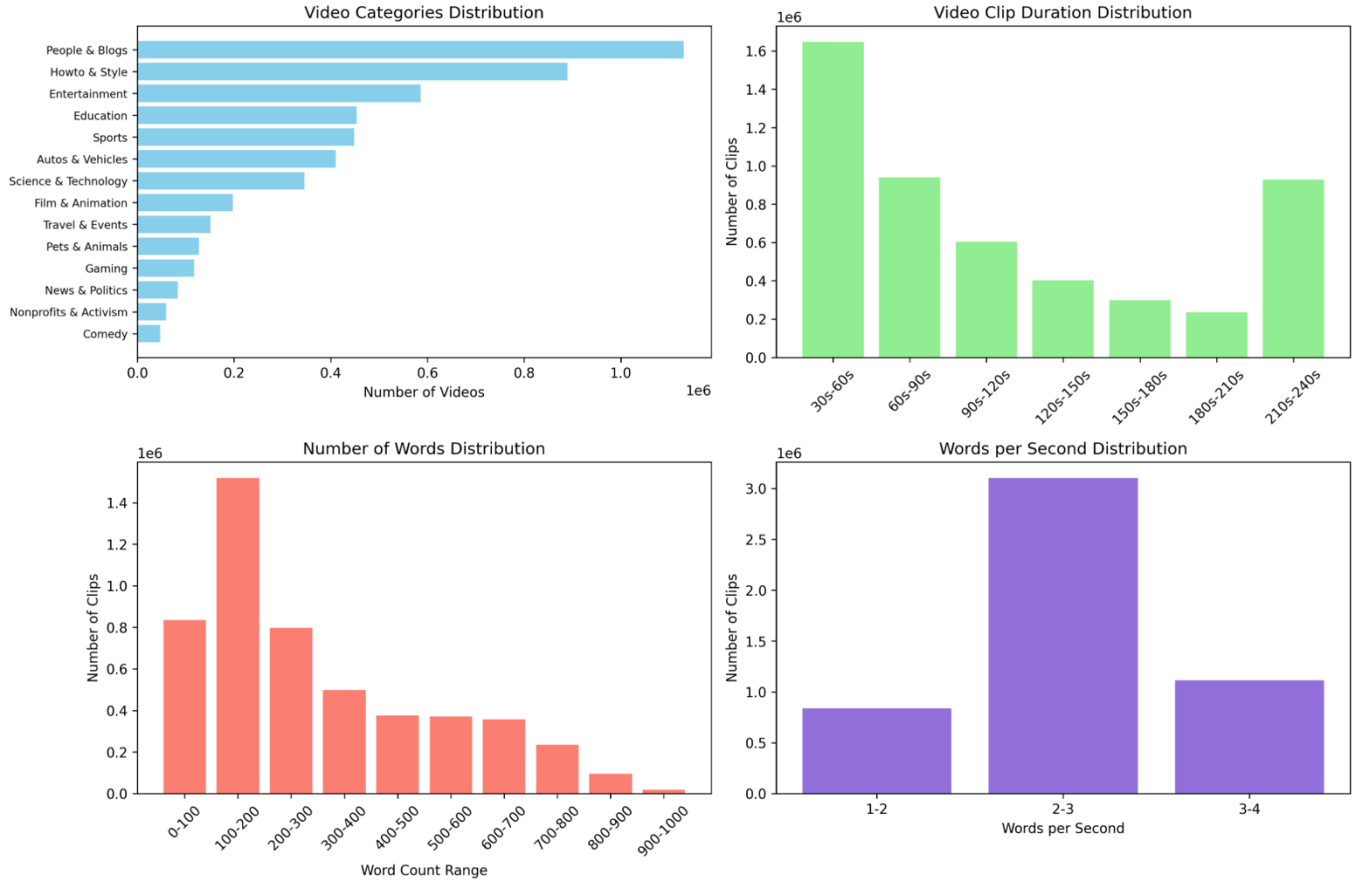
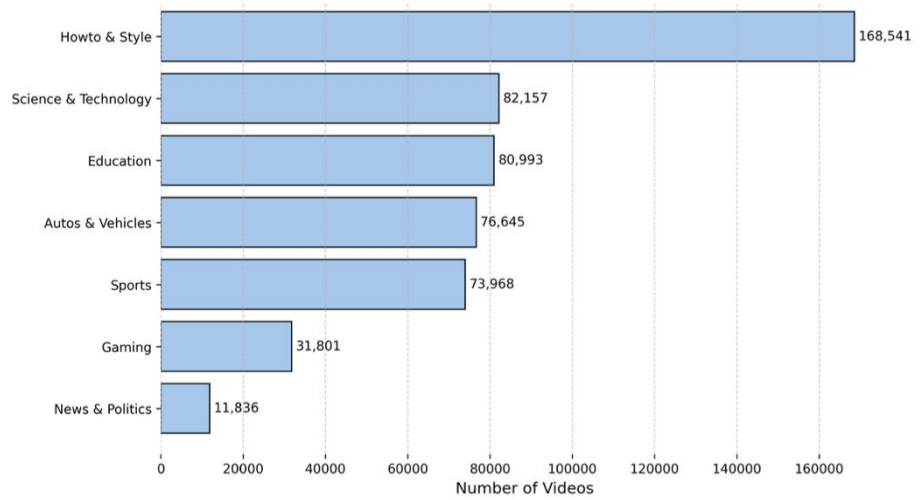
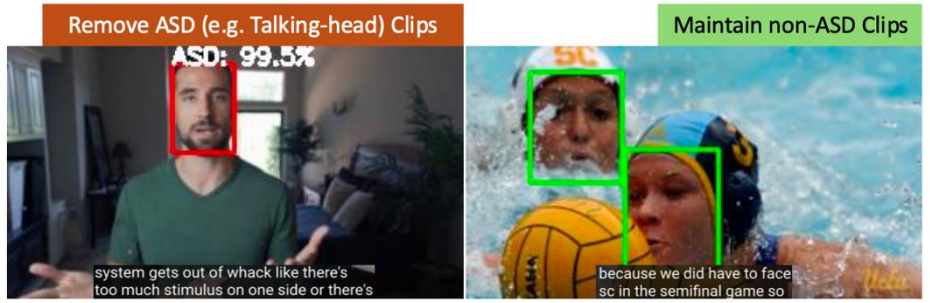


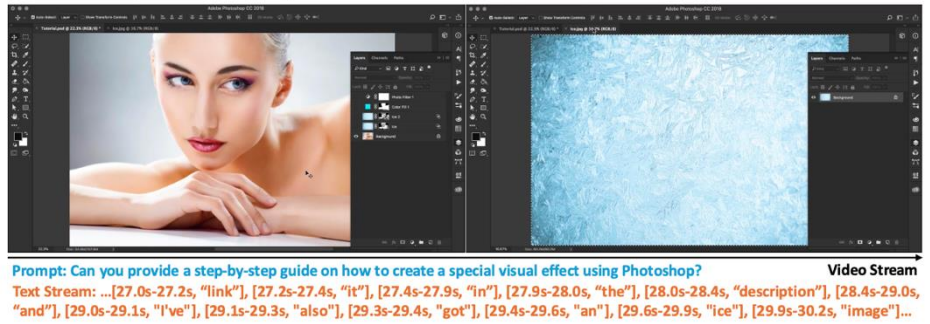
Figure 3. Overview of our proposed YT-CC-5M dataset.



(a) Statistics of our proposed Live-WhisperX-526K dataset.



(b) An example of ASD removal in SFT data pipeline.

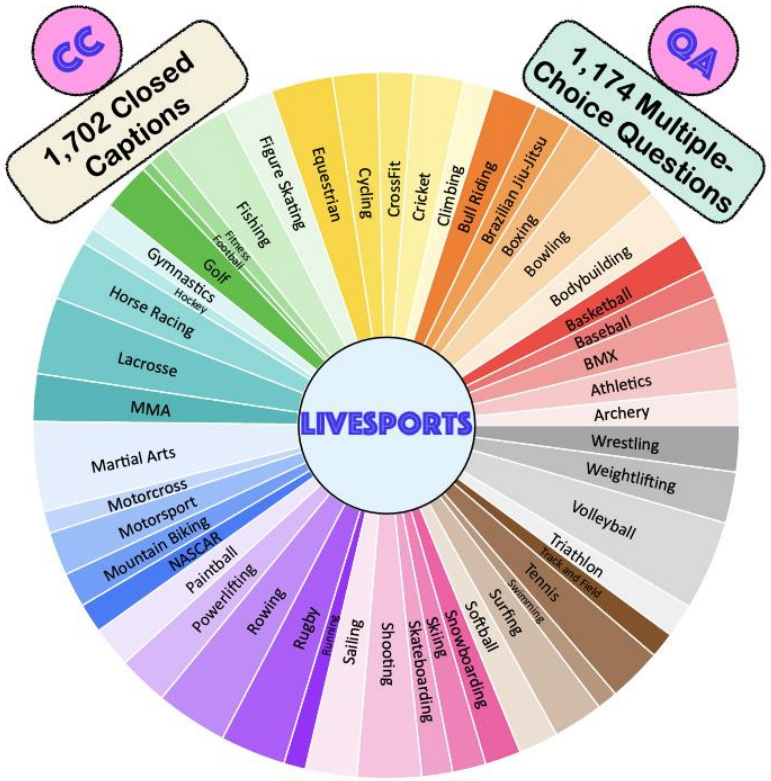


(c) An example from the Live-WhisperX-526K dataset.

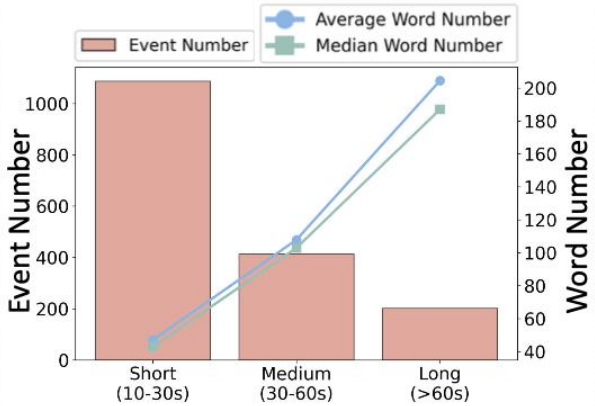
Key Points: Benchmark

1. LiveSports-3K Benchmark, with CC and QA tracks, focusing on human instance in live sports video

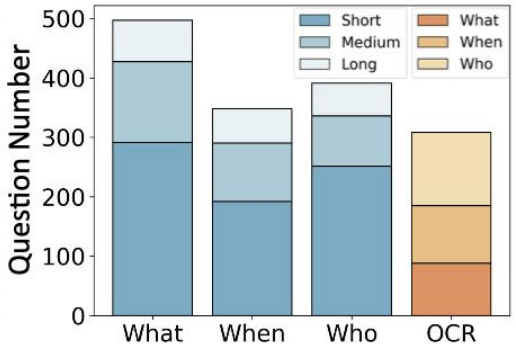
2. LLM-as-a-judge to evaluate CC (video commentary) winning rate vs. GPT-4o



(a) Category Distribution of the LIVESPORTS Benchmark



(b) Event Duration and ASR Word Count in LIVESPORTS-CC



(c) Question Count by Type in LIVESPORTS-QA

(d) Sample Closed Captions in LIVESPORTS-CC and Three Query Types in LIVESPORTS-QA

Key Points: Experiments

1. Video-ASR Streaming Pre-training & SFT improve both CC and QA
2. 7B/8B Scale, SOTA on VideoMME (before CVPR submission), OVOBench, LiveSports3K-QA
3. Commentary winning rate vs. GPT-4o surpasses all 72B models

Pre-training	SFT	LiveSports-3K						VideoMME															
		CC	QA	OCR	Who	When	What	All	Duration			Perception			Recognition		Reasoning				OCR	Count	IS
									S	M	L	Te	Sp	At	Ac	Ob	Te	Sp	Ac	Ob			
Qwen2-VL-7B-Base	LV178K	16.7	67.0	66.1	**70.6**	**57.6**	71.0	62.7	**74.7**	62.4	51.1	74.5	**61.1**	73.4	64.5	70.1	49.7	**80.4**	49.8	57.0	**76.3**	**45.1**	76.2
	LV178K+Live526K	**33.7**	**67.1**	**66.8**	69.8	57.0	**72.3**	**63.6**	74.4	**63.1**	**53.2**	74.5	57.4	**75.2**	**66.5**	70.1	49.7	76.8	**54.4**	**57.5**	72.7	44.4	**78.9**

(a) **Ablation study in the SFT data.**

Pre-training	SFT	LiveSports-3K						VideoMME															
		CC	QA	OCR	Who	When	What	All	Duration			Perception			Recognition		Reasoning				OCR	Count	IS
									S	M	L	Te	Sp	At	Ac	Ob	Te	Sp	Ac	Ob			
Qwen2-VL-7B-Base	-	16.3	**64.0**	**64.8**	**65.2**	**57.9**	**67.3**	**63.4**	**73.2**	**63.2**	53.9	**72.7**	63.0	**76.1**	**63.9**	**67.2**	44.6	78.6	**57.5**	61.5	**72.7**	39.6	80.2
LiveCC-7B-Base	-	**43.2**	57.9	61.4	59.4	50.7	61.9	61.4	68.1	58.9	**57.3**	65.5	63.0	64.9	60.7	61.0	**50.3**	**80.4**	56.1	61.5	61.2	**42.9**	**82.4**
Qwen2-VL-7B-Base	LV178K+Live526K	33.7	**67.1**	**66.8**	69.8	57.0	**72.3**	63.6	74.4	63.1	53.2	74.5	57.4	75.2	**66.5**	**70.1**	49.7	76.8	54.4	57.5	72.7	44.4	78.9
LiveCC-7B-Base	LV178K+Live526K	**41.5**	66.8	66.4	**71.4**	56.1	70.8	**64.1**	**74.8**	**63.9**	**53.7**	74.5	**64.8**	74.3	66.1	68.6	**50.3**	76.8	52.3	**59.5**	**77.0**	**46.3**	**79.9**

(b) **Ablation study in the SFT model initialization.**

Model (7B/8B)	VideoMME		MVBench	OVOBench			
	w/o sub	*w sub*	*Avg.*	*Avg.*	*RTVP*	*BT*	*FAR*
LongVA-7B [102]	52.6	54.3	-	-	-	-	-
InternVL2-8B [18]	54.0	56.9	66.4	50.2	60.4	43.4	46.6
LLaVA-OV-7B [42]	58.2	61.5	56.7	52.7	**64.0**	43.7	50.5
Oryx-7B [56]	58.3	62.6	63.9	-	-	-	-
mPLUG-Owl3-7B [93]	59.3	68.1	59.5	-	-	-	-
LongVU-7B [74]	60.6	-	66.9	46.7	57.6	35.0	47.5
MiniCPM-v2.6 [91]	60.9	63.6	-	-	-	-	-
Qwen2-VL-7B-Instruct [79]	63.3	69.0	**67.0**	50.4	56.0	46.5	48.7
LLaVA-Video-7B [105]	63.3	69.7	58.6	52.9	63.5	40.4	**54.8**
LiveCC-7B-Instruct	**64.1**	**70.3**	62.8	**59.8**	59.1	**68.9**	51.5

Size	Model	LiveSports-3K ↑						
		Live?	CC	*Overall*	*OCR*	*Who*	*When*	*What*
-	GPT-4o-08-06 [29]	✗	❀	**72.2**	**74.0**	**75.8**	**63.4**	**75.4**
	Gemini-1.5-Pro [3]	✗	52.8	61.8	61.7	59.9	51.6	70.7
72B	Qwen2-VL-72B-Instruct [80]	✗	17.0	70.8	67.8	74.6	61.2	74.6
	VideoLLaMA-2-72B [18]	✗	24.8	62.4	55.7	63.6	54.3	67.3
	LLaVA-OV-72B [41]	✗	29.2	68.7	61.7	71.1	61.5	71.8
	Qwen2.5-VL-72B-Instruct [6]	✗	30.4	**73.7**	**70.1**	**75.7**	**69.3**	**75.3**
	LLaVA-Video-72B [106]	✗	**35.0**	71.1	65.1	74.1	64.8	73.3
7B	Qwen2-VL-7B-Instruct [80]	✗	9.3	65.8	65.8	67.9	**58.8**	69.2
	Qwen2.5-VL-7B-Instruct [6]	✗	17.3	67.0	64.8	70.3	60.6	69.0
	InternLM-XC2.5-7B [102]	✗	17.3	59.3	56.7	60.7	54.9	61.3
	Qwen2.5-Omni-7B [87] (*Thinker*)	✗	17.6	66.8	66.1	70.0	60.0	69.2
	LLaVA-Video-7B [106]	✗	27.1	66.4	64.1	**72.7**	56.4	68.6
	LLaVA-OV-7B [41]	✗	27.7	63.4	60.7	67.4	53.7	67.1
	Qwen2-VL-7B-LiveCCInstruct	✓	33.7	**67.1**	**66.8**	69.8	57.0	**72.3**
	LiveCC-7B-Instruct	✓	41.5	66.8	66.4	71.4	56.1	70.8
	LiveCC-7B-Base	✓	**43.2**	57.9	61.4	59.4	50.7	61.9