

# Supplementary Materials: A Chinese Multimodal Social Video Dataset for Controversy Detection

Anonymous Authors

## 1 NOTATIONS

To enhance understanding of the paper, we summarize a comprehensive list of notations used in the paper as Table 1. The notations are arranged in the order of their appearance.

## 2 DATA COLLECTION

We constructed a large-scale Multimodal Controversial Dataset (MMCD) in Chinese, which mainly involves *video content*, *metadata*, *publishers' profiles*, and *comments context*, as detailed in Table 2.

## 3 DATA DISTRIBUTION

Table 3 provides a detailed distribution of query keywords, categorized into 14 domains.

## 4 ANNOTATION SYSTEM

The annotators were provided with an annotation system comprising the video to be annotated, a set of 40 comments retrieved from the Douyin platform using the default sorting order, and a range of labels for selection. The developed annotation system is illustrated in Figure 1.

## 5 ETHICAL STATEMENT

We collect publicly available video information to investigate its controversial characteristics. Along with the annotated data, we only offer links for video downloads. Examples of data samples can be accessed through *metadata\_sample.json*. It is explicitly mentioned in the paper how the collected data is utilized. It is important to note that our data is solely intended for academic research and should not be used beyond the scope of academic research contexts.

## 6 MODEL PROMPTS

For ChatGPT3.5 and ChatGLM3, the prompts we used are as follows (originally in Chinese, translated into English in this material for better illustration):

You are a controversy detection model. Based on the video description, publisher information, ASR text, and comments, determine whether there is any controversy. If there is controversy, please output **1**; if not, please output **0**.

Video Description: { *description* }

Publish Information: { *publisher's profile* }

ASR Text: { *asr text* }

Comments: { *comments* }

For GLM4 and GPT4, we randomly select keyframes from the video as input and utilize the following prompt (originally in Chinese, translated into English in this material for better illustration):

Please determine if there is any controversy based on the video and input information. If controversy exists, please output **1**; if not, please output **0**. Please avoid providing any additional information besides **0** and **1**.

Video Description: { *description* }

Publisher Information: { *publisher's profile* }

Comments: { *comments* }

Table 1: Notations used in the paper

Notation	Description
$\mathcal{T}$	One training sample consists of $\mathcal{V}, \mathcal{D}, \mathcal{C}, \mathcal{P}, \mathcal{R}$
$\mathcal{V}$	Video keyframes
$\mathcal{D}$	Descriptions
$\mathcal{C}$	Comments
$\mathcal{P}$	Publisher's profile
$\mathcal{R}$	ASR text
$\Theta$	Set of all parameters associated with F
$\mathcal{G}$	A Video-Context graph
$\mathcal{V}$	Set of nodes in $\mathcal{G}$
$\mathcal{E}$	Set of edges in $\mathcal{G}$
$\mathcal{N}_i$	Set of neighbors of node $v_i$ (including the $v_i$ )
$\mathcal{G}$	A Video-Context graph
$\mathbf{X}^v$	Extracted features of video frames. $\mathbf{X}^v = [\mathbf{x}_1^v, \dots, \mathbf{x}_{n_v}^v]$
$\mathbf{X}^c$	Extracted features of comments. $\mathbf{X}^c = [\mathbf{x}_1^c, \dots, \mathbf{x}_{n_c}^c]$
$\mathbf{x}_{mod}, mod \in \{d, p, r\}$	Extracted features of description, publisher's profile, ASR text
$\mathbf{H}_{mod}, mod \in \{v, d, c, p, r\}$	Aligned features
$\mathbf{W}_{mod}, mod \in \{v, d, c, p, r\}$	Weight parameter
$\mathbf{b}_{mod}, mod \in \{v, d, c, p, r\}$	Bias parameters
$\mathbf{H}_o$	Output features from Transformer Layer
$\mathbf{W}_{moe}$	Weight parameter

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Notation	Description
$Z_1$	Output features of Modality Awareness Learning (MAL) module
$V^{(0)}$	Initial representations of the nodes
$v_i^{(l)}$	The hidden state of node $v_i$ in the $l$ -th layer of GCN
$v_j^{(l)}$	The hidden state of node $v_j$ in the $l$ -th layer of GCN
$\hat{A}$	Normalized adjacency matrix
$W^{(l)}$	Weight parameter
$b^{(l)}$	Bias parameter
$V^{(2)}$	Output vectors of GCN
$Z_2$	Output features of Contextual Graph Learning (CGL) module
$A$	Affective matrix
$W_{i,j}$	Weight parameter
$T$	Semantic attention matrix
$T_a$	Combination representations of $A$ and $T$
$C$	Contextual features attained by BiLSTM, $C = [c_1, ..., c_{n_c}]$
$W_a$	Weight parameter
$O$	Output features considering inconsistent matrices
$Z_3$	Output features of Inconsistency Enhanced Learning (IEL) module
$Z_o$	Concatenate features of $Z_1, Z_2, Z_3$
$W_o, W'_o$	Weight parameters
$b_o, b'_o$	Bias parameters
$p$	Final probability distributions
$F$	The multi-modal controversy detection model
$n_{mod}, mod \in \{v, d, c, p, r\}$	Lengths of $\mathcal{V}, \mathcal{D}, \mathcal{C}, \mathcal{P}, \mathcal{R}$
$\hat{y}$	Predicted label
$y$	Ground truth label
$d_o$	Dimension of visual vector
$d_t$	Dimension of textual vector
$m$	Size of expert networks
$k$	Top gate values
$q$	Ordinal position of the expert network
$l$	Layers of GCN
$c_i$	$i$ -th comment in $C$
$u(c_i)$	Affective score of comment $c_i$
$a_{i,j}$	One element in $A$ . Affective score between $c_i$ and $c_j$
$t_{i,j}$	One element in $T$ . Semantic attention score between $x_i$ and $x_j$
$\alpha$	hyperparameter of gated fusion
$p_0$	Predicted probability for the label 0 (non-controversy)
$p_1$	Predicted probability for the label 1 (controversy)

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Notation	Description
$w_{imp}$	Importance hyperparameter
$w_{ld}$	Load hyperparameter
$w_{spa}$	Sparsity hyperparameter
$\mathcal{L}_{ce}$	Cross-entropy loss
$\mathcal{L}_{moe}$	Balancing loss for the MoE layer
$\mathcal{L}_{reg}$	Regularization loss
$\mathcal{L}$	Sum loss of $\mathcal{L}_{ce}$ , $\mathcal{L}_{moe}$ and $\mathcal{L}_{reg}$
$G(\cdot)$	Gating network
$E(\cdot)$	Expert network
$g(\cdot)$	Aggregation function
$ \cdot $	Absolute value calculation
$(\cdot)^T$	Matrix transposition
$P(\cdot)$	Smooth function
$\ \cdot\ _F$	Frobenius norm of a matrix

Table 2: Overview of the crawled categories and fields on MMCD.

Category	Field
Content	Videos' IDs, timestamps, descriptions, URLs, lengths
Metadata	#(likes), #(forwards), #(comments)
Profile	Publisher's name, verification info, counts of likes & followers & videos
Comment	Comments' IDs, timestamps, counts of likes & replies, indicators denoting whether the publishers like them, indicators denoting whether they are deemed "hot" or not (according to Douyin platform)



Figure 1: Annotation system.

Table 3: Distribution of query Keywords categorized by domain.

Domain	Query Keyword
法律 law	罚款 fines, 诈骗 Fraud, 代孕 surrogacy, 男子在大慈恩寺纵火被刑拘 man arrested for arson at Daci'en Temple, 电信诈骗 telecom fraud, 张东健妻子被曝偷税漏税 Zhang Dongjian's wife was exposed for tax evasion, 缅北明家 Myanmar's Northern Akira
文化 culture	捧杀 flattery, 文化输出 culture output, 流行文化 popular culture, 传统文化 traditional culture, 消费观 consumption outlook, 精致穷 exquisite poverty, 感情观 relationship outlook, npc文学 NPC literature, 国货崛起 rise of domestic products, 穿衣自由 freedom of clothing choice, 小孩哥小孩姐 "little brother" and "little sister"
科技 technology	新能源 New energy, 苹果手机 iPhone, Chatgpt, 中国手机7年巨变 China's mobile phones have undergone tremendous changes in 7 years, OpenAI创始人奥特曼加入微软 OpenAI founder Altman joins Microsoft, 河南联通回应强迫用户换光猫 Henan Unicom responds to forcing users to replace optical modems
生活 life	道歉 apology, 我的保暖秘诀 my secret to keeping warm, 最佳睡眠时长真的是8小时? is the best sleep duration 8 hours?, 普通话哪里最标准 Which place has the most standard Mandarin?, 上海万圣节Halloween in Shanghai, 花西子眉笔 Huaxizi eyebrow pencil, 网瘾老年 Internet addiction among the elderly, 萝卜刀 radish knife, 爷爷接错孙女却未发现 grandfather mistakes another girl for his granddaughter without realizing, 导盲犬带主人吃火锅迷路 guide dog leads owner to eat hot pot and gets lost, 养儿五年发现非亲生 raised a child for five years, discovered not biologically related, 被拐34年终于回家 abducted 34 years ago, finally returns home
饮食 diet	香菜 coriander, 瑞幸酱香拿铁 Luckin's sauce-flavored latte, 预制菜 premade dishes, 淄博烧烤 Zibo barbecue, 在家改造个零食房 remodeling a snack room at home
教育 education	素质教育 quality education, 公立教育 public education, 鸡娃 Motivating children, 二八定律 the 28/20 rule, 助学金 bursaries, 学生起诉 students suing, 叫停安全教育平台打卡 stopping the safety education platform check-in, 艺考文化课成绩门槛提高 raising the performance threshold for art exams and cultural courses, 新东方遭网红举报停止办学 Oriental being reported by internet celebrities to stop running schools, PubScholar, gap year, 脆皮大学生 fragile crispy college student, 幼儿园小女孩八百米 kindergarten little girl runs 800 meters, 双减政策 Double Reduction Policy, 余华: 和人交往尽量少说话 Yu Hua: Try to speak less when interacting with others, 特困生苹果四件套 impoverished student's Apple four-piece set, 扫兴式父母 spoiler parents

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Domain	Query Keyword
经济 economy	保险 insurance, 股市 stock market, 微商 small-scale e-commerce, 油价 oil prices, 物价 commodity prices, A股市场在年末仍有回暖行情 A-share market shows signs of a year-end rebound, 27岁女子炒股一夜白头 27-year-old woman turns white-haired overnight from stock trading, 全家退休金加10亩地年入4万 Family retirement income increased by 10 acres of land, annual income 40, 000, 80后男子躺平: 存款75万三套房 post-80s man lies flat: 750, 000 savings, three houses
环境 environ-ment	环保意识 Environmental awareness, 气候变化 climate change, 垃圾分类 Garbage sorting, 寒潮将至局地气温零下24度 cold wave is coming, local temperature is minus 24 degrees Celsius, 四川多地频现野生大熊猫 wild giant pandas frequently spotted in various parts of Sichuan, 渔民出海误捕红海龟果断放生 fisherman accidentally catches red sea turtle at sea, promptly releases it, 日本第三批核污水排放结束 Japan's third batch of nuclear sewage discharge ends
体育 sports	NBA, 男足 men's football, 体育 sports, 女足 women's football, 世界杯 World Cup, 中国女足2001年至今换帅16次 the Chinese women's football team has changed coaches 16 times since 2001, 水庆霞不再担任女足教练 Shui Qingxia no longer serves as women's football coach
医疗 medical	加强针 Booster shot, 新冠共存 COVID-19 coexistence, 疫苗 vaccine, 医院 hospital, 医患关系 doctor-patient relationship, 口罩 masks, 群体免疫 population immunity, 癌症保险 cancer insurance, 女童注射阿奇霉素后死亡 girl dies after injection of azithromycin
娱乐 entertain-ment	媒体 media, 短视频 short videos, 直播带货 live streaming, 仲尼溺亡 Zhong Ni drowned, 金沙爸爸辣评女儿恋情 Jin Sha's father criticized his daughter's relationship, 蒋凡与张大奕 Jiang Fan and Zhang Dayi, 郭富城赛车场失控撞车 Aaron Kwok lost control and crashed at the racing track, 景区回应男子拍打表演鹦鹉 the scenic spot responded to the man slapping the performing parrot, 乌尔善取关封神演员 Wu Ershan unfollowed the actor of Creation of The Gods I: Kingdom of Storms, 以爱为营三观three outlooks of Only for Love, 我本是高山 I am originally a mountain, 疯马秀 Crazy Horse Show, 余文亮爆火 Yu Wenliang goes viral
工作 work	居家办公 working at home, 失业人群 unemployed people, 就业难 difficulty in finding a job, 毕业即失业 immediate unemployment upon graduation, 程序员被没收个人所得 confiscation of personal income for programmers, 00后整顿职场 workplace rectification for those born after 2000, 孔乙己的长衫 Kong Yiji's long robe, 失业保险金 unemployment insurance, 除夕调休 New Year's Eve adjustment of days off, 不要再为工资焦虑了 stop worrying about wages
社会 society	狗咬人 dog bites person, 垮塌 collapse, 大选 general election, 中国人口 population of China, 生育率 birth rate, 移民 immigration, 禁止养狗 prohibition of dog ownership, 遥遥领先 far ahead, 恒大地产 Evergrande Real Estate, 地铁判官 subway judge, 人血馒头 steamed buns with human blood, 女童遭恶犬撕咬 girl bitten by vicious dog, 大学生连续5天直播后猝死 college student dies suddenly after 5 consecutive days of live streaming, 女性车厢 women's compartment, 粉红税 gender-based pricing discrepancies, 产后抑郁 postpartum depression, 新型婚姻模式 new marriage model, 续约制结婚证 renewal system for marriage certificates, 吕梁市长道歉 Lvliang mayor apologizes, 人口负增长 population decline, 老龄化社会 aging society
交通 traffic	武汉被撞学生肇事老师 Wuhan student hit, causing the accident, teacher involved, 女骑手超车坠湖身亡 female rider overtakes and falls into the lake, dies, 司机逆行被逼退 driver forced to retire after driving against traffic, 江苏男子改车道 Jiangsu man changes lanes, 四川被打女司机 Female driver beaten in Sichuan