



WWW 2025 – The ACM Web Conference 2025

Panoramic Interests: Stylistic-Content Aware Personalized Headline Generation

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Personalization in News Headlines



Personalized news headline generation involves generating a *user-specific headline* based on the *user's reading interest*.

Existing methods largely *overlooking the stylistic features* of news headlines.

Content interests and **stylistic preferences** are **interwoven** to form users' **panoramic interests**.

Historical clicks

- 1. The Iron Bowl: Alabama Not Dead Yet
- 2. Where did Trump and Harris win? Election 2024 results ...
- 3. Did Biden and Trump hatch the Lebanese ceasefire?
- 4. Real Madrid 'in TOTAL CRISIS': European champions are ...

[Trump's Shocking Move: Did He Just Win Over the Youth Vote?](#)



Half of young voters view Republican Party favorably post-election

[Messi Nominated for FIFA Best: Fair decision or bias?](#)



Lionel Messi gets nominated for FIFA Best Award

[Colombia Travel Tips: Stay Safe and Explore Smart](#)



Colombia Travel Tips: Things You Need To Know Before You Go

Historical clicks

- 1. The 5 best states to visit on your first trip to the US
- 2. Messi's son debuts at Argentina youth tournament ...
- 3. It lives! 47-year-old Voyager 1 is back in action
- 4. The 10 Best NBA Centers of All Time ...

User A
User B



We identified two major challenges:

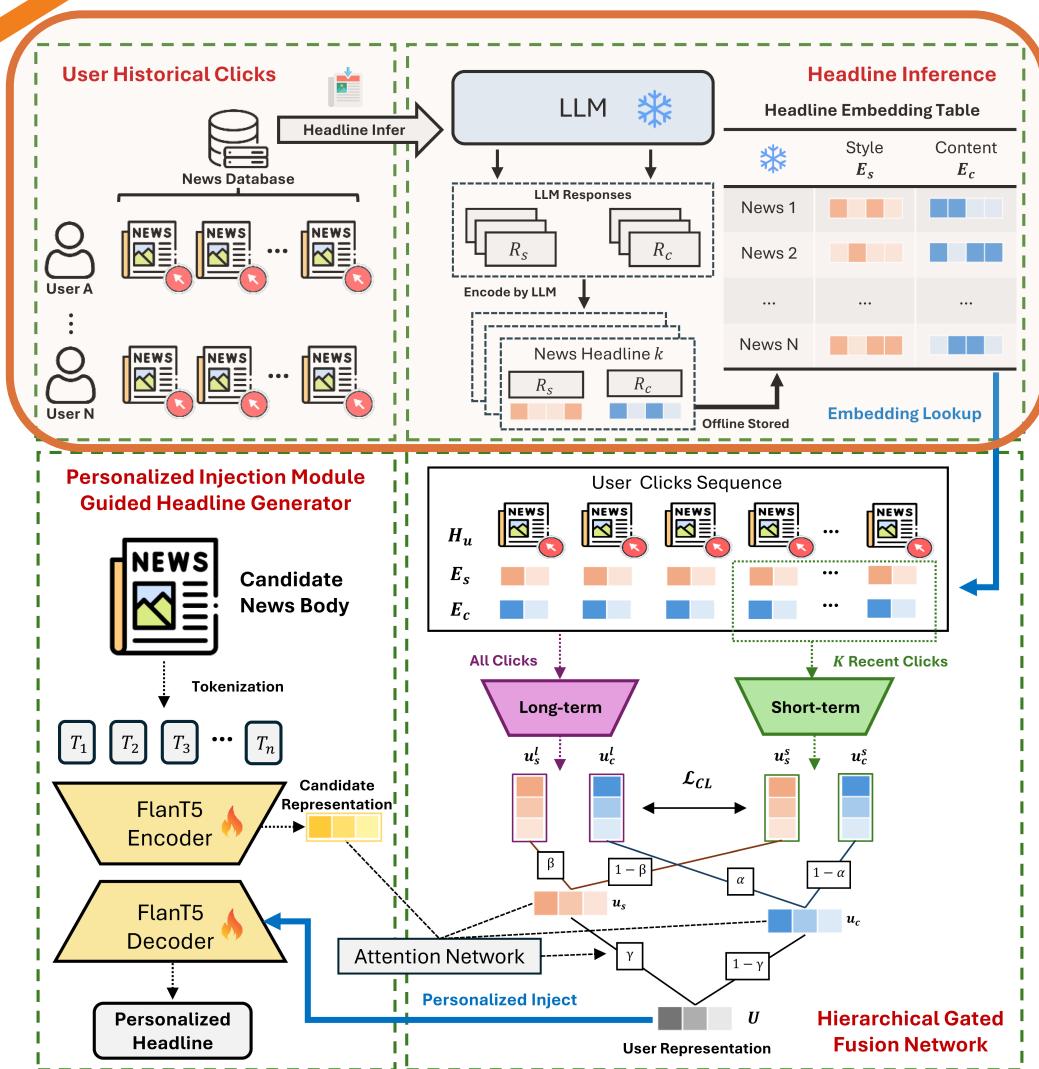
◆ Style-Content Features Extraction

How to extract the inherent content and stylistic features encapsulated in headlines without ground-truth labels?

◆ Panoramic Interest Decoupling

How to decouple implicit user panoramic interests and integrate them into headlines without explicit supervision?

SCAPE Framework



◆ LLM-based headline feature inference.

$$R_S = LLM_{inst}(t_i, \mathcal{P}_{\text{style}}) \quad R_C = LLM_{inst}(t_i, \mathcal{P}_{\text{content}})$$

◆ Offline embedding for latent attributes.

$$E_S = LLM_{emb}([t_i, I_S, R_S]) \quad E_C = LLM_{emb}([t_i, I_C, R_C])$$

$$E = \{(E_S(t_i), E_C(t_i)) \mid n_i = (t_i, b_i) \in \mathcal{D}\}$$

SCAPE Framework



- ◆ Hierarchical gated fusion for long & short-term interests.

$$\tilde{E}_c(t_{h_j}) = \text{MLP}(E_c(t_{h_j})) \quad \forall j \in \{1, \dots, L\}$$

$$u_c^l = \text{Attn}(\tilde{E}_c(t_{h_1}), \dots, \tilde{E}_c(t_{h_L}))$$

$$u_c^s = \text{GRU}([\tilde{E}_c(t_{h_{L-K+1}}), \dots, \tilde{E}_c(t_{h_L})])$$

$$\alpha = \sigma(W_{gc} \cdot [u_c^l, u_c^s] + b_{gc}) \quad \beta = \sigma(W_{gs} \cdot [u_s^l, u_s^s] + b_{gs})$$

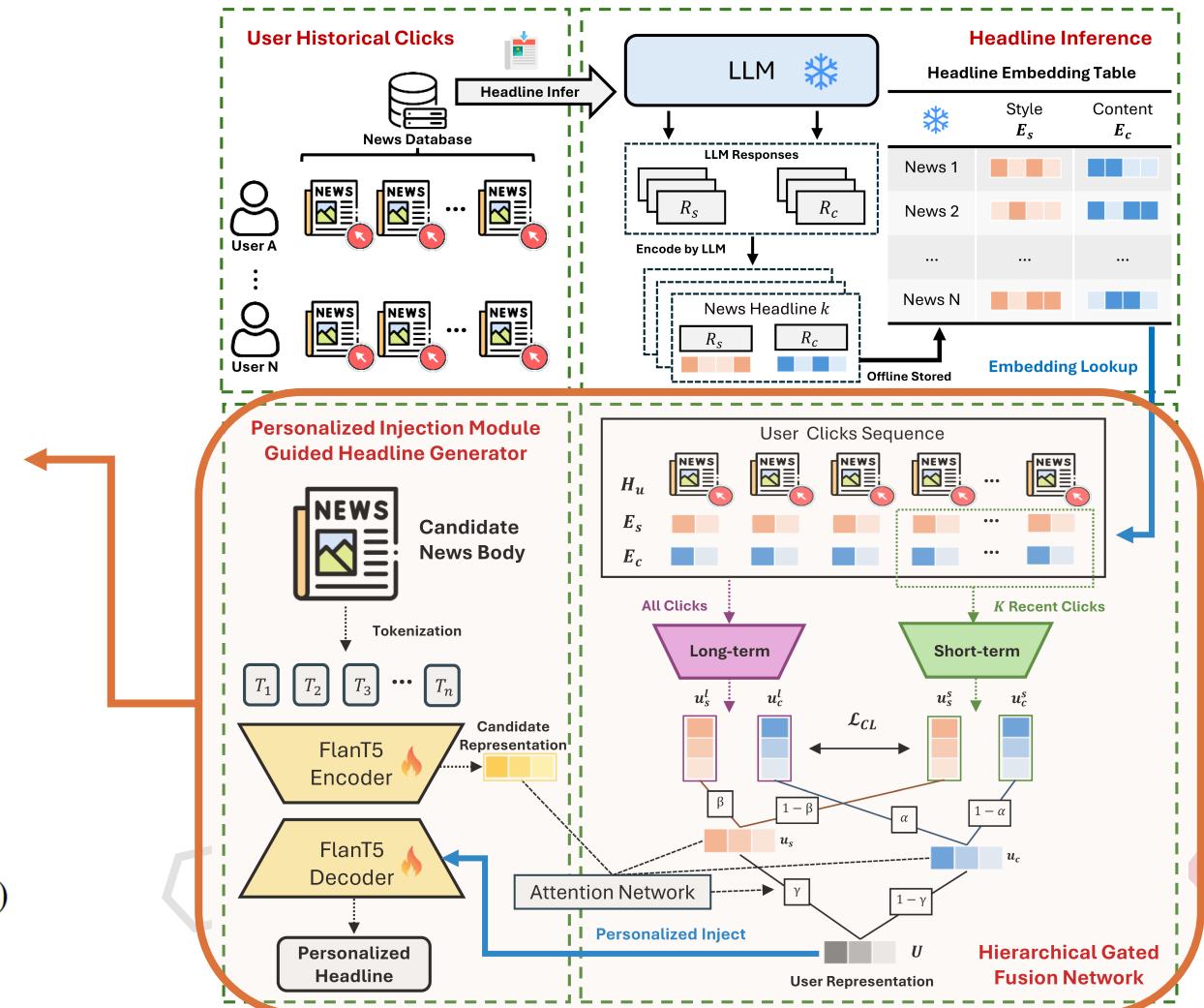
$$u_c = \alpha \cdot u_c^l + (1 - \alpha) \cdot u_c^s \quad u_s = \beta \cdot u_s^l + (1 - \beta) \cdot u_s^s$$

- ◆ Personalized injection at token-level generation.

$$\mathbf{X}' = \mathbf{X} + (1_n \otimes U)$$

- ◆ Disentanglement Strategy.

$$\mathcal{L}_{CL} = \frac{1}{|\mathcal{R}|} \sum_{R \in \mathcal{R}} \frac{1}{|\mathcal{N}_R|} \sum_{N \in \mathcal{N}_R} \max(0, d(R, P_R) - d(R, N) + m)$$



Experiments



Our method sets a new benchmark for personalized headline generation in SOTA results by considering both *user-oriented content interests* and modeling *linguistic style preferences* in users' historical clicks.

Table 1: Performance of the Compared Baseline Methods.

Types	Methods	ROUGE-1	ROUGE-2	ROUGE-L	Fact Scores
Open-source LLMs	FlanT5-large	24.91	8.48	21.13	80.83
	FlanT5-XL	27.73	10.08	23.23	84.16
	Qwen2.5-1.5B	27.45	9.45	22.24	83.34
	Qwen2.5-7B	<u>29.54</u>	<u>10.47</u>	<u>24.04</u>	<u>88.67</u>
LLMs API services	GLM-4-Flash	26.91	8.40	21.47	85.88
	GLM-4-Air	27.45	8.89	22.03	88.02
	DeepSeek-V2.5	28.27	9.55	22.60	86.90
	GPT-4o	<u>29.58</u>	<u>11.03</u>	<u>24.26</u>	<u>90.11</u>
Personalized models	PENS-NRMS	26.15	9.37	21.03	50.73
	PENS-NAML	28.01	10.72	22.24	50.16
	PNG	28.78	11.27	22.39	51.23
	EUI-PENS	32.34	13.93	26.90	NA
	FPG	33.06	13.76	26.78	<u>89.55</u>
	GTP	<u>33.84</u>	<u>14.23</u>	<u>27.85</u>	NA
	SCAPE_{ours}	34.26*	14.79*	28.36*	92.36*

The symbol * denotes the significance level with $p \leq 0.05$. **Bold** font indicates the best-performing method. Underline indicates the second-best results in the group.

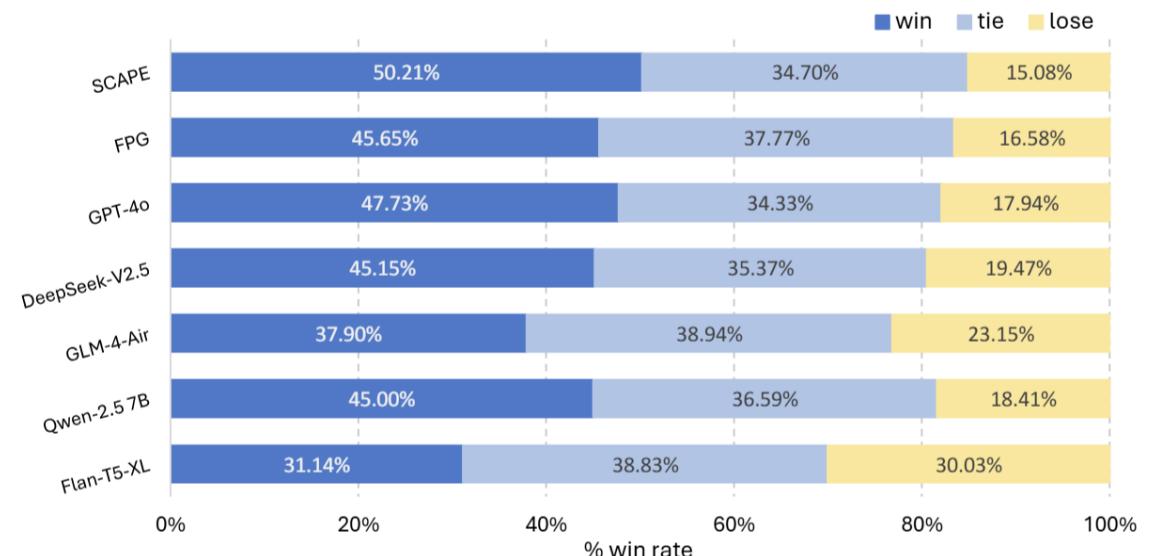


Figure 3: Win Rates in Personalization Evaluation.



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The source code will be ready soon at <https://github.com/ictmldm/SCAPE>

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