# Font Representation Learning via Paired-glyph Matching

Junho Cho[1,2], Kyuewang Lee[1], Jin Young Choi[1]
Department of ECE, ASRI, Seoul National University[1]
Samsung Advanced Institute of Technology, Samsung Electronics[2]

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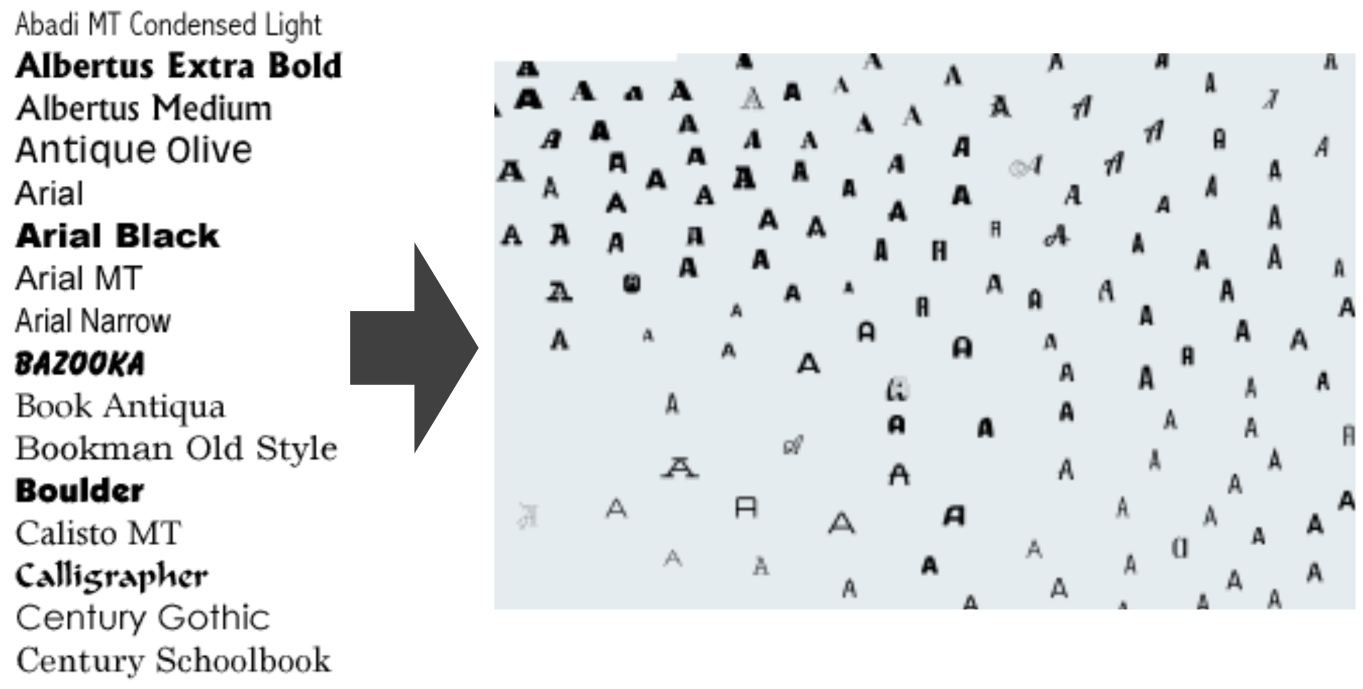
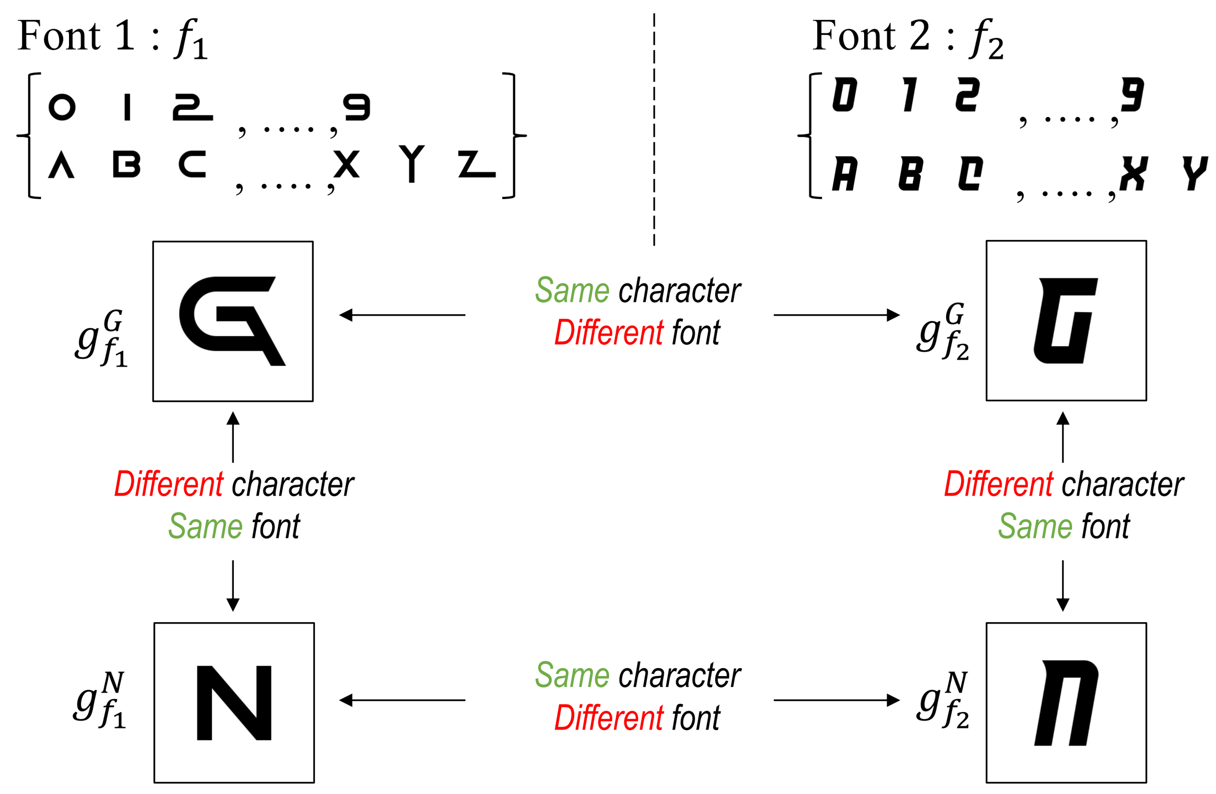
## Introduction



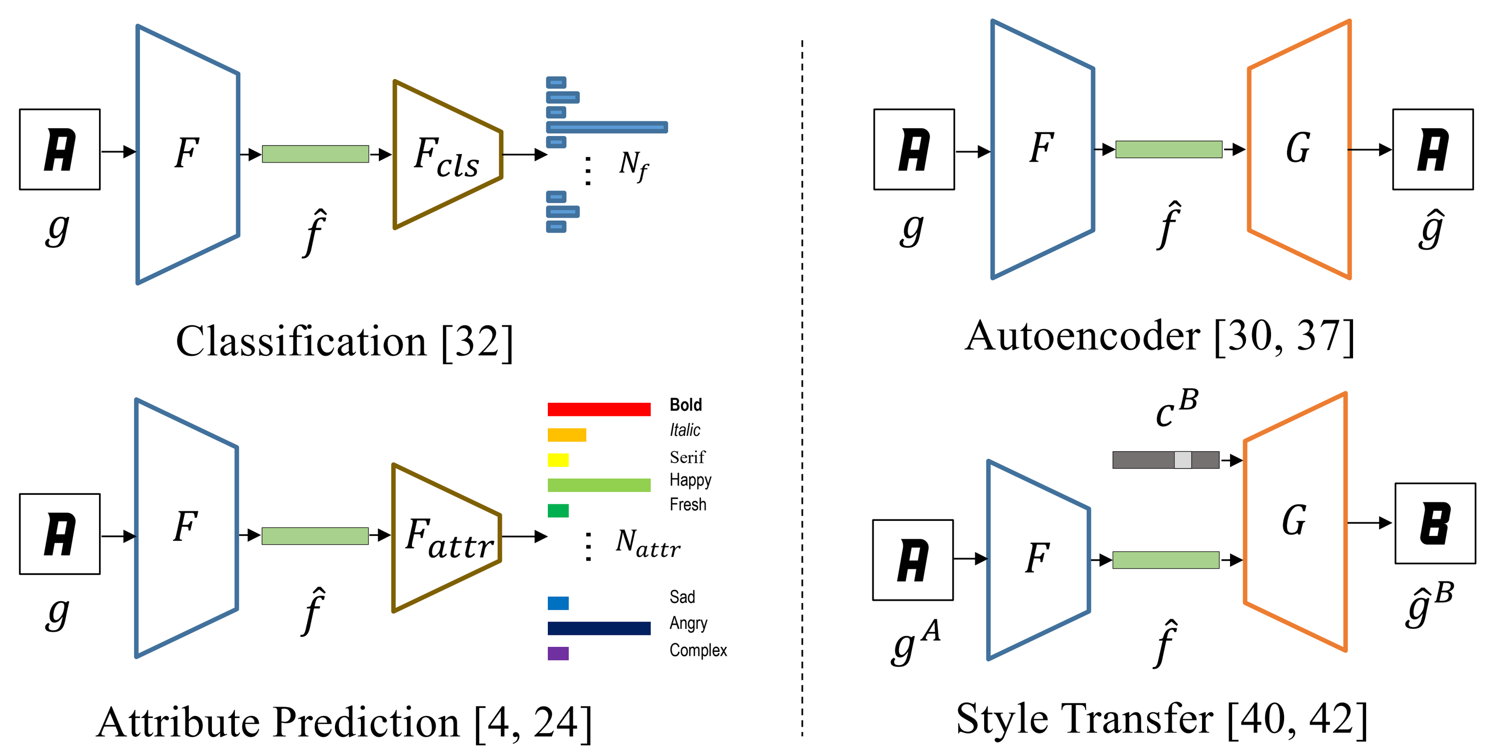

We aim to learn ***font representation*** to explore vast font styles.

## Preliminary

- A glyph ($g$) is an image form of a character that has a specific style in a font.
- A font ($f$) is a matching style set of glyphs.




## Previous Method




## Reference

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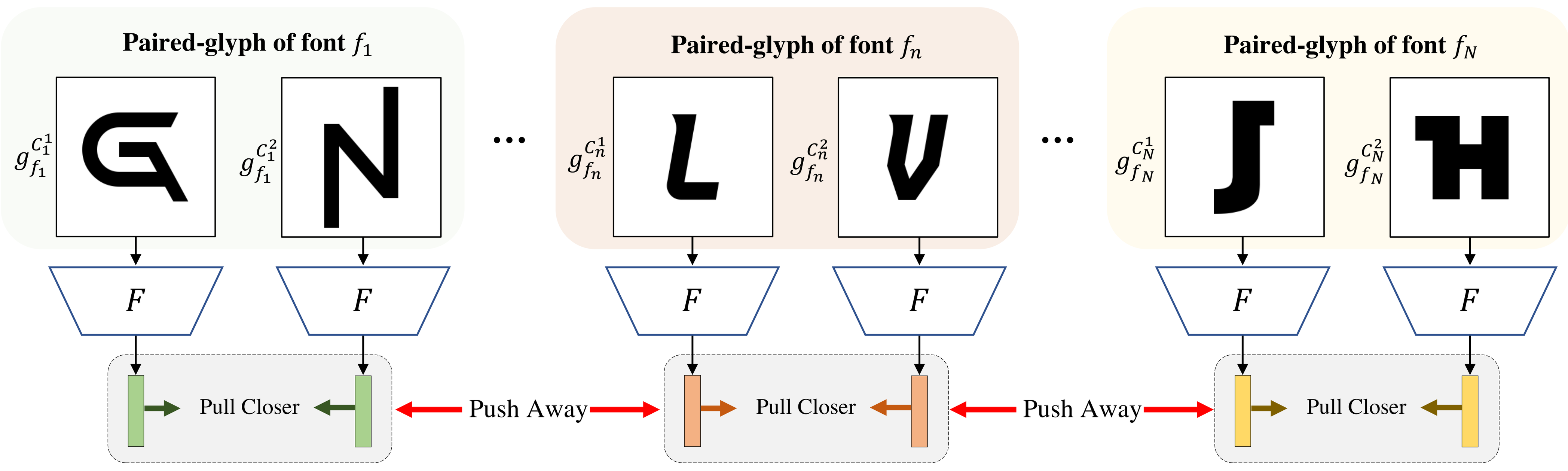
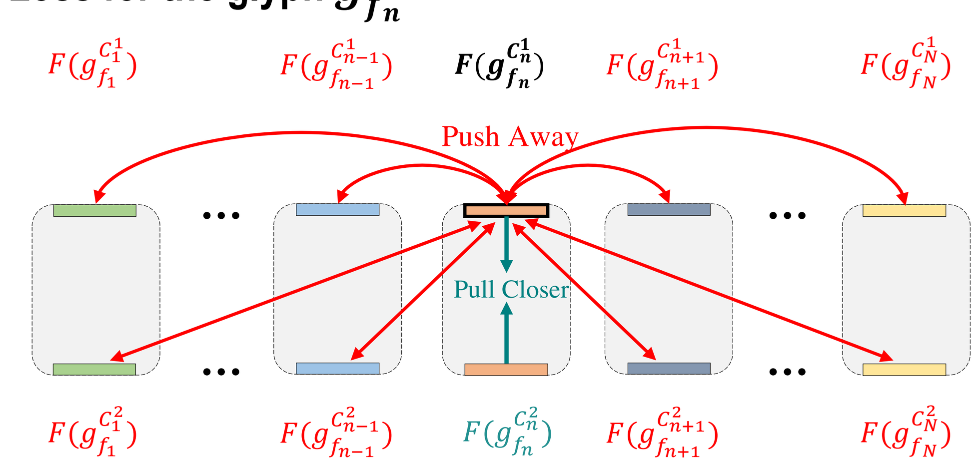
| Methods | Captials64 valset $\text{MACC}_{Ret}(\mathbb{C}_{\text{A-Z}})$ | Captials64 testset $\text{MACC}_{Ret}(\mathbb{C}_{\text{A-Z}})$ | O'Donovan $L_1$-error |
|---|---|---|---|
| $\hat{f}$ of Paired-$g$ Matching | **61.38** | **62.66** | **0.09589** |
| $\hat{f}$ of Classification [32] | 55.27 | 56.31 | 0.1275 |
| $\hat{f}$ of Style Transfer [40, 42] | 32.22 | 32.53 | 0.1217 |
| $\hat{f}$ of Autoencoder [30, 37] | 13.60 | 14.16 | 0.1312 |
| $\hat{f}$ of Srivatsan *et al.* [28] | 11.72 | 11.56 | 0.1097 |

Performance evaluation (MACC and Font attribute prediction) on the Capitals64 dataset. Font attribute prediction is evaluated on O'Donovan dataset with $L1$ error.

## Proposed Method



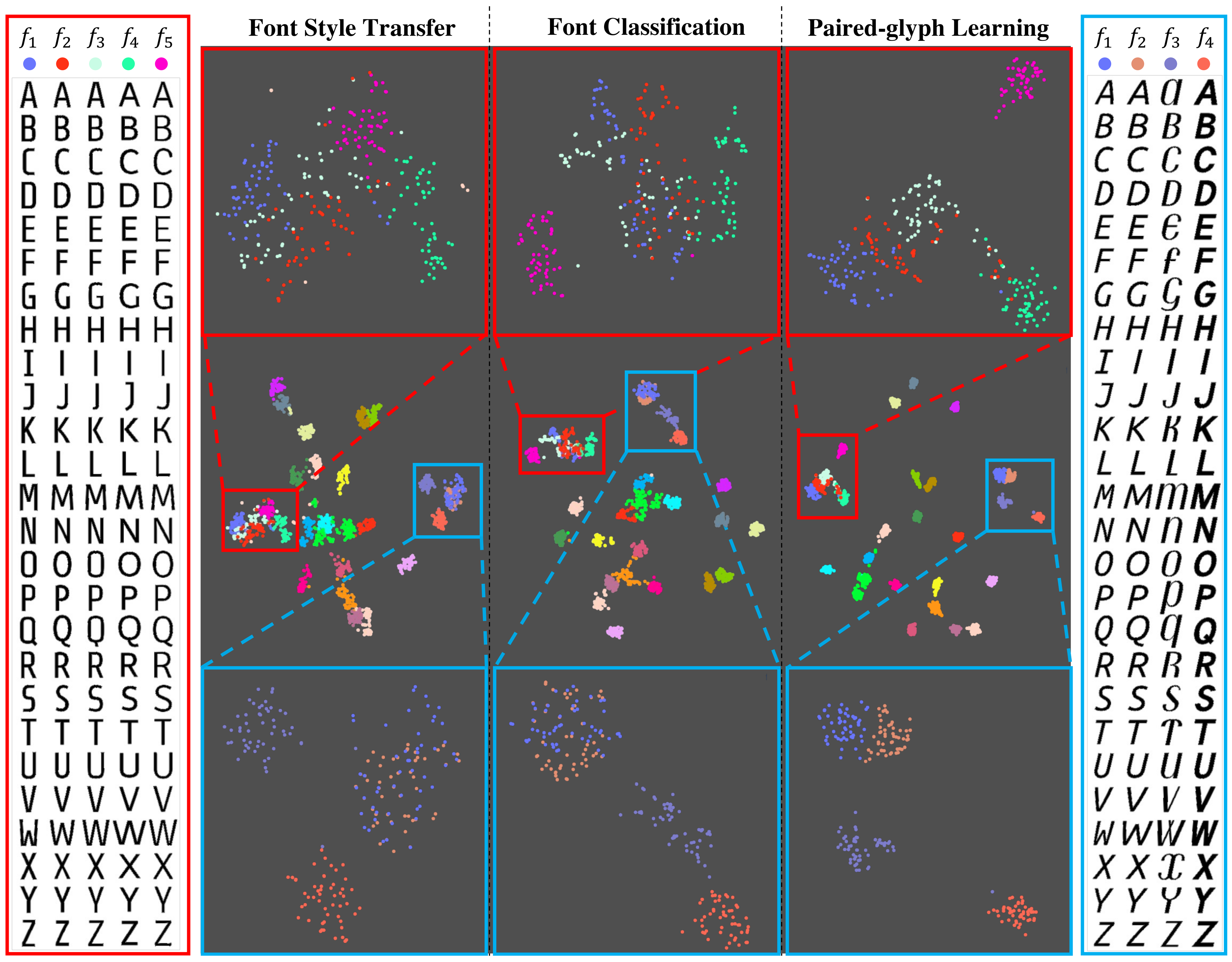

Loss for the glyph $g_{f_n}^{c_n^1}$

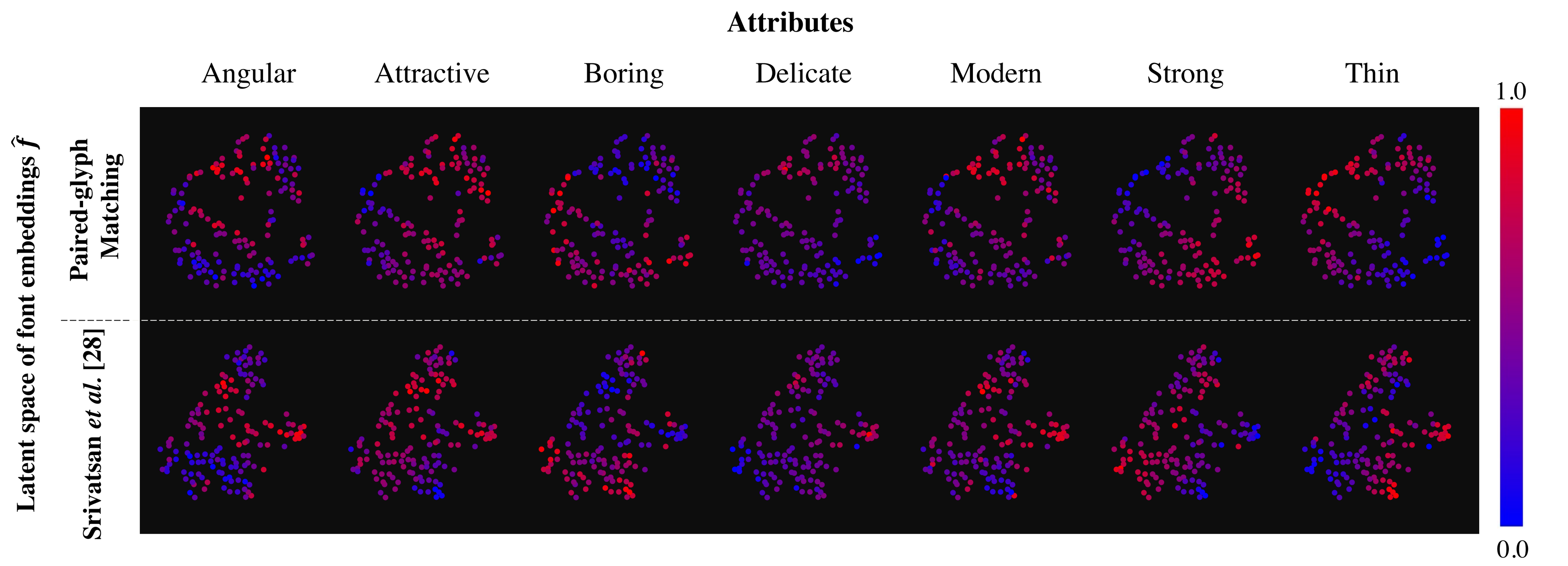



$$\ell_{n_1} = -\log \frac{\texttt{pos-sim}(f_n)}{\texttt{pos-sim}(f_n) + \sum_{m=1,m\neq n}^{N} \texttt{neg-sim}_1(f_n, f_{m\neq n})}$$
$$= \log\left(1 + \frac{\sum_{m=1,m\neq n}^{N} \texttt{neg-sim}_1(f_n, f_{m\neq n})}{\texttt{pos-sim}(f_n)}\right).$$

The loss is derived from "the normalized temperature-scaled cross entropy loss" [5].

## Result



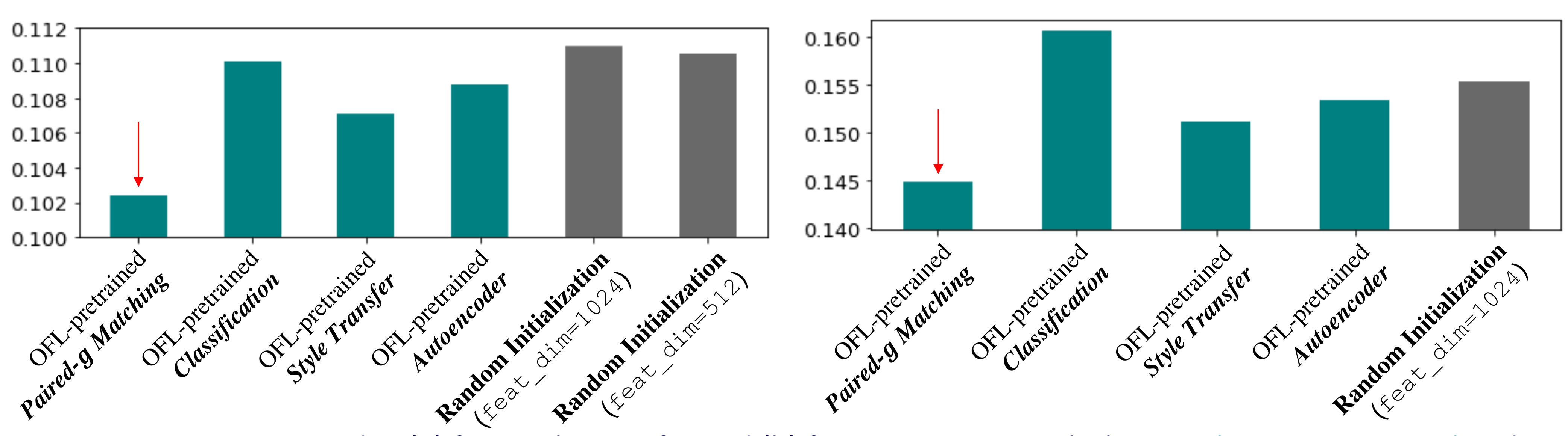




Image L1-error measured in (a) font style transfer and (b) font generation with the OFL dataset pretrained and random initialization.