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Style-conditioned music generation with Transformer-GANs

Key words: Music generation; Style-conditioned; Transformer; Music emotion

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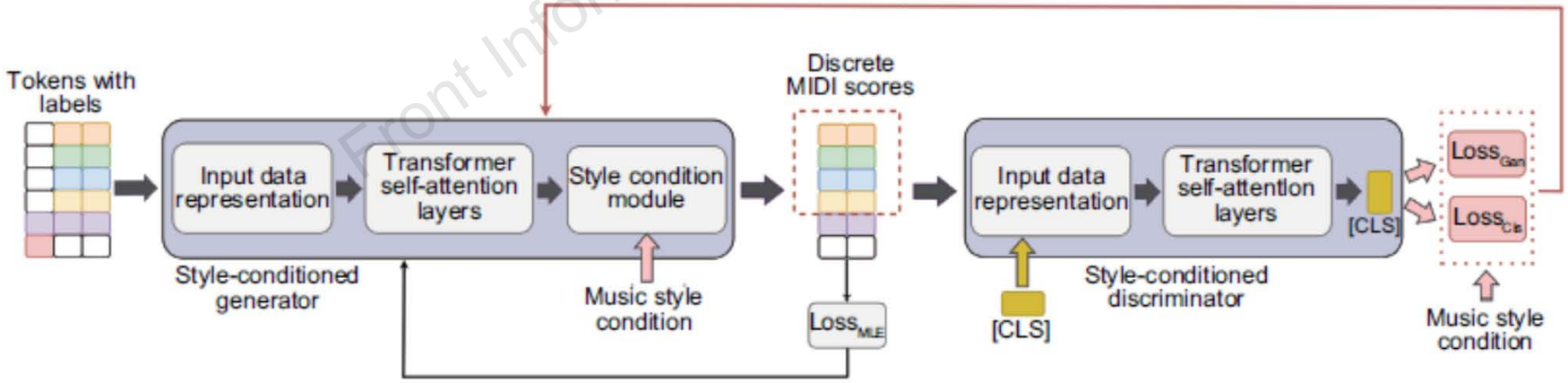
Music generation

- Recently, various algorithms have been developed for generating appealing music. Researchers are committed to studying two fundamental attributes: structural awareness and interpretive ability.

Algorithm	Main ideas
Music Transformer	Concerned with learning long musical sequences, music Transformer aims to recognize the varying degrees of repetition and variation between notes.
Museformer	Designing fine-grained and coarse-grained attention for the music generator, Museformer aims to better model the note sequence.
MG-VAE	Focusing on the stylistic differences of Chinese folk songs, MG-VAE implements the control of generated folk songs through special stylistic notation.
CPS	Concerned with exploring how the model can be controlled, CPS designs a new data representation method with style information for style-conditioned generation.

Method

- We propose a model for music generation under style control, namely style-conditioned Transformer-GANs (SCTG). Style information is effectively used to enhance the interpretive ability of the model and a style-conditioned patch discriminator is designed to consider structural awareness.
- Two specific losses, the music style category loss (for interpretive ability) and the music style information adversarial loss (for structural awareness), are designed in the discriminator.



Major results

- We use some existing objective (PR, NPC, SC) and subjective (H, R, O) metrics to evaluate the effectiveness of our model.
- We use a pre-trained music style classification model to evaluate the style consistency (CA). We also propose a new metric SD for it.
- We choose two widely used datasets for our experiments.

Dataset	Model	|PR|	|NPC|	|SC|	SD	CA	H	R	O
EMOPIA	Emopia	2.07	1.54	0.0012	16.62	52.5%	3.13	3.39	3.25
	Sulun et al. (2022)'s	4.52	1.63	0.0044	24.89	63.0%	3.46	3.17	3.52
	SCTG (ours)	**0.95**	**1.34**	**0.0012**	**12.45**	**69.5%**	**3.65**	**3.60**	**3.75**
Pianst8	Emopia	1.39	**0.88**	0.043	33.47	29.5%	3.22	3.34	3.15
	Sulun et al. (2022)'s	1.44	1.41	0.038	39.05	54.0%	3.39	3.45	3.44
	SCTG (ours)	**1.30**	0.90	**0.036**	**29.37**	**67.0%**	**3.92**	**3.81**	**3.96**

Major results (Cont'd)

- In the analysis of musical emotions, the arousal of music can be easily observed based on note density and note length. Thus, we also compare these metrics for the generated music with the original training data.

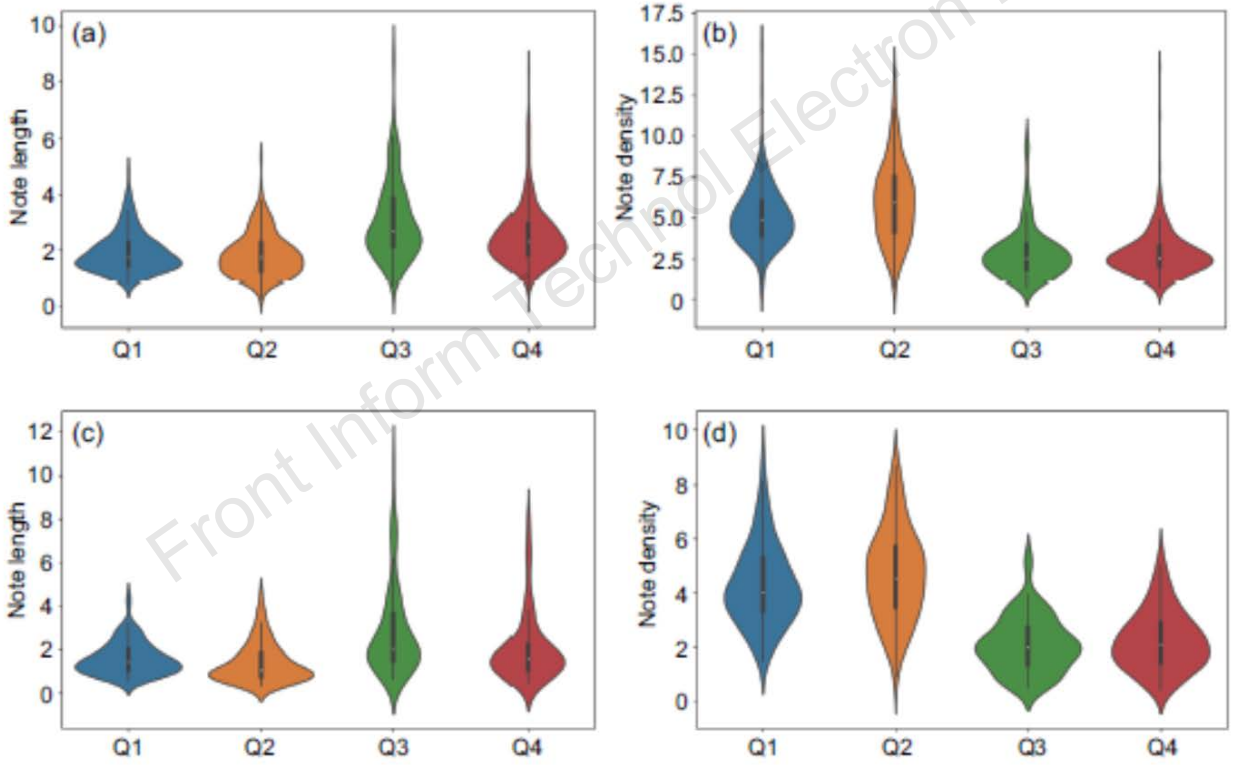


Fig. 5 Note length and note density distributions of the original dataset EMOPIA and the generated data: (a) note length of the original data; (b) note density of the original data; (c) note length of the generated data; (d) note density of the generated data

Conclusions

- We have proposed a novel music generation model, SCTG, which can generate a complete musical composition from scratch based on a specified target style.
- We innovatively embedded style information in our proposed style-conditioned linear Transformer. We also designed a style-conditioned patch discriminator with two innovative losses to enhance the interpretive ability and structural awareness of the model.
- In addition, to evaluate the style consistency, we defined a metric for the first time. Extensive experiments on two public datasets showed the effectiveness of our approach.
- In the future, we will build a richer dataset and continue to explore style-conditioned music generation. We will also further investigate the influence of style information on the inference stage of the model.

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