

SleepGAN: Towards Personalized Sleep Therapy Music

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1. Goal and Challenges

Our goal: Generate personalized sleep therapy music

Automatically induce therapeutic properties into arbitrary user-selected music.

Two challenges:

- What musical features contribute to therapeutic effects of sleep music?
- How to bring such therapeutic sleep features into user-selected music?

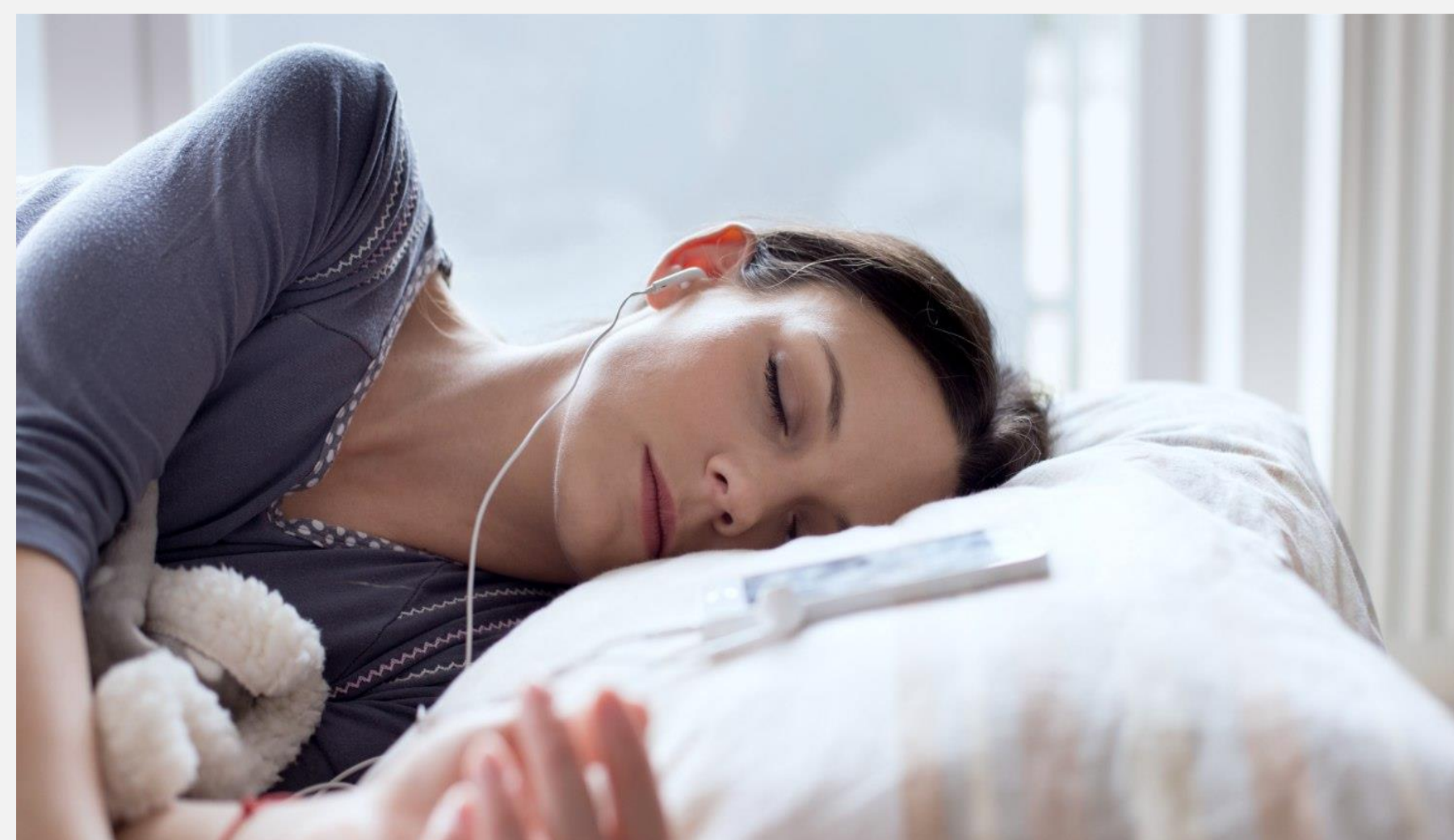
2. Motivation



Sleep disorders are influencing a lot of people and have a strong causal link to major lifestyle diseases.

Sleep therapy can be a promising solution to sleep problems.

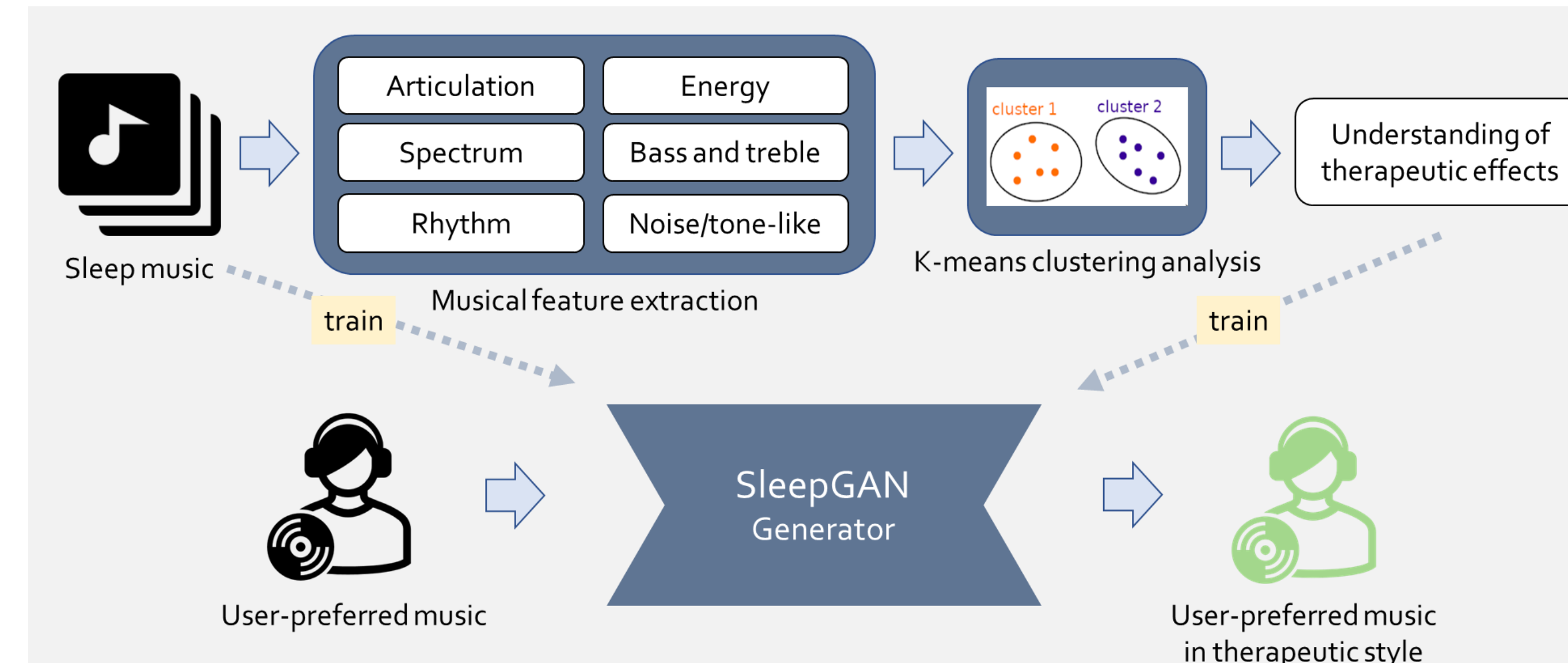
3. Sleep therapy approaches need improvement



Current issues of music used for sleep therapy:

- Little scalability
- Music fatigue
- Rarely consider individual music preference

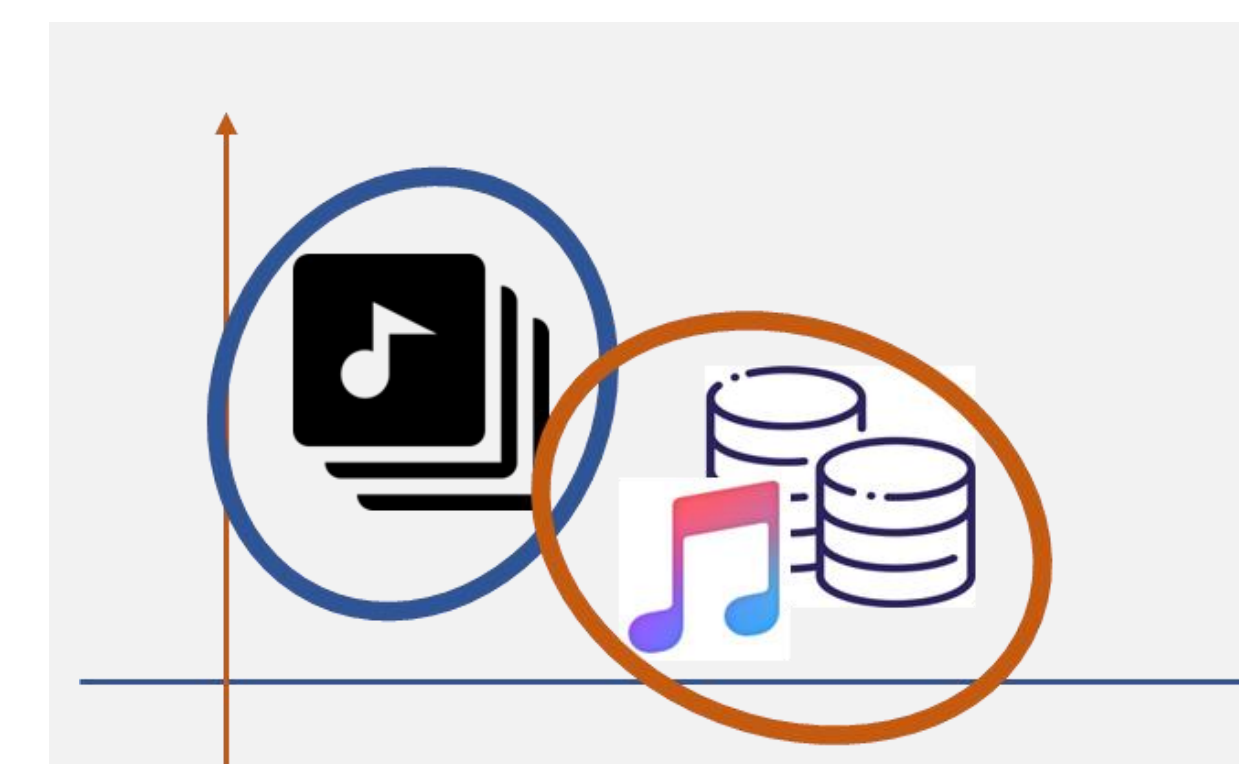
4. Overview of our approach



We first analyze musical features of typical sleep music to understand their correlation to therapeutic effects.

Based on the feature analysis results, we develop a music style transfer network, SleepGAN, to bring therapeutic effects into user-selected music.

5. Feature analysis using k-means clustering

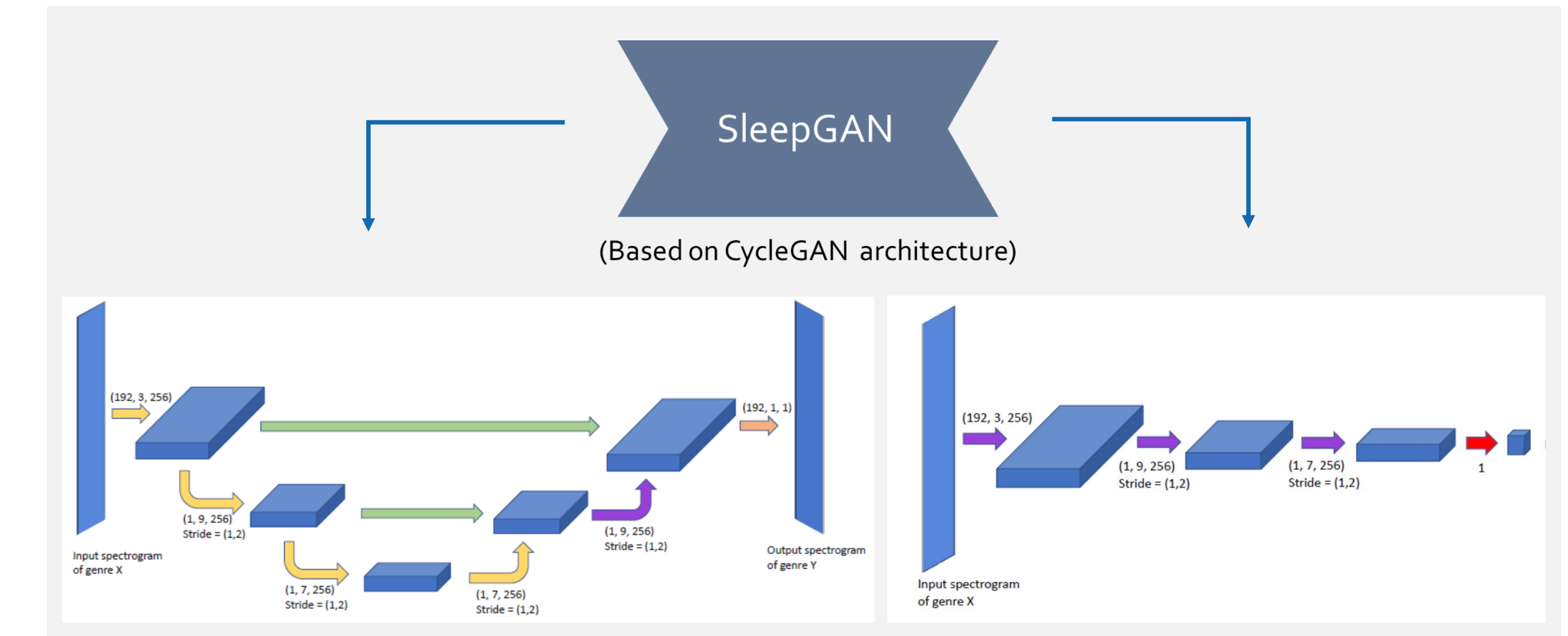


Which features perform the best to distinguish sleep music from the other music?

	Adjusted Rand Score
All 34 musical features	0.115
Only articulation and energy features	-0.063
Only MFCC features	0.096
Only rhythm features	0.112
Only spectral rolloff features	0.761
Only spectral flatness features	0.037

- Spectral roll-off features perform the best to distinguish sleep music from the other music.
- **Take-away:** Sleep music is mostly characterized by its spectrum-related features, such as bass, treble, overall pitch profile, etc.

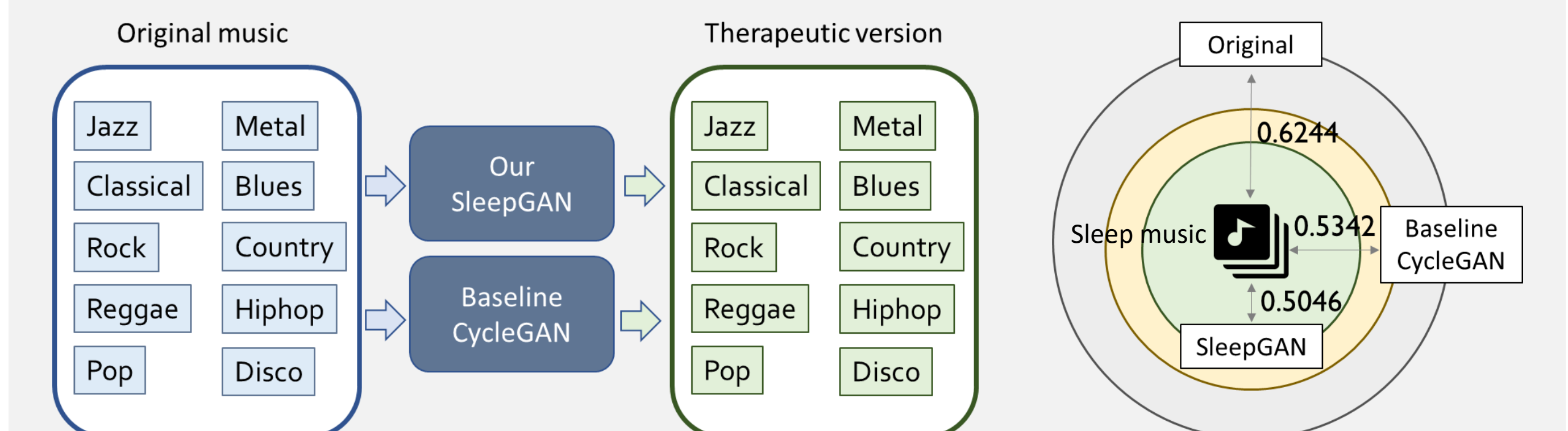
6. SleepGAN and evaluation



Generator: fully convolutional U-Net architecture

Discriminator: convolutional PatchGAN discriminator

Apart from the loss functions that are already included in CycleGAN, we further included a **musical loss** that optimizes the musical features. This way, we make our SleepGAN model more suitable for therapeutic style transfer.



Evaluation shows:

Our SleepGAN model makes arbitrary music **more similar to** sleep music than CycleGAN does.

7. Future work

