IEEE SAMI2021

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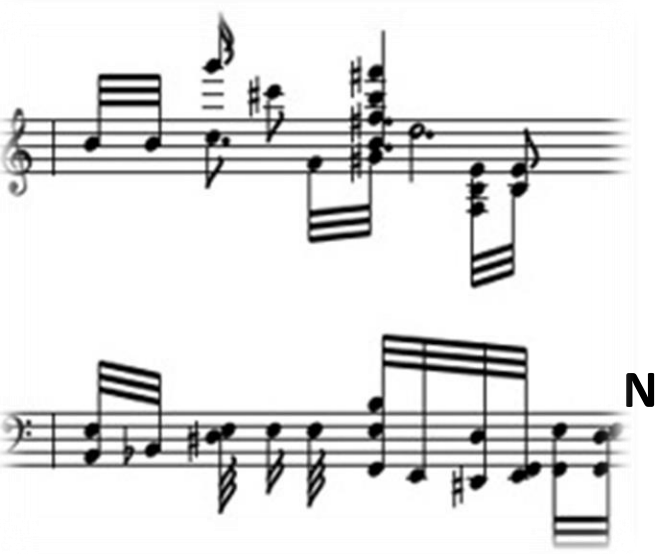
IEEE 19th World Symposium on Applied Machine Intelligence and Informatics
January 21-23, 2021, Herl'any, Slovakia

Style-Specific Turkish Pop Music Composition with CNN and LSTM Network



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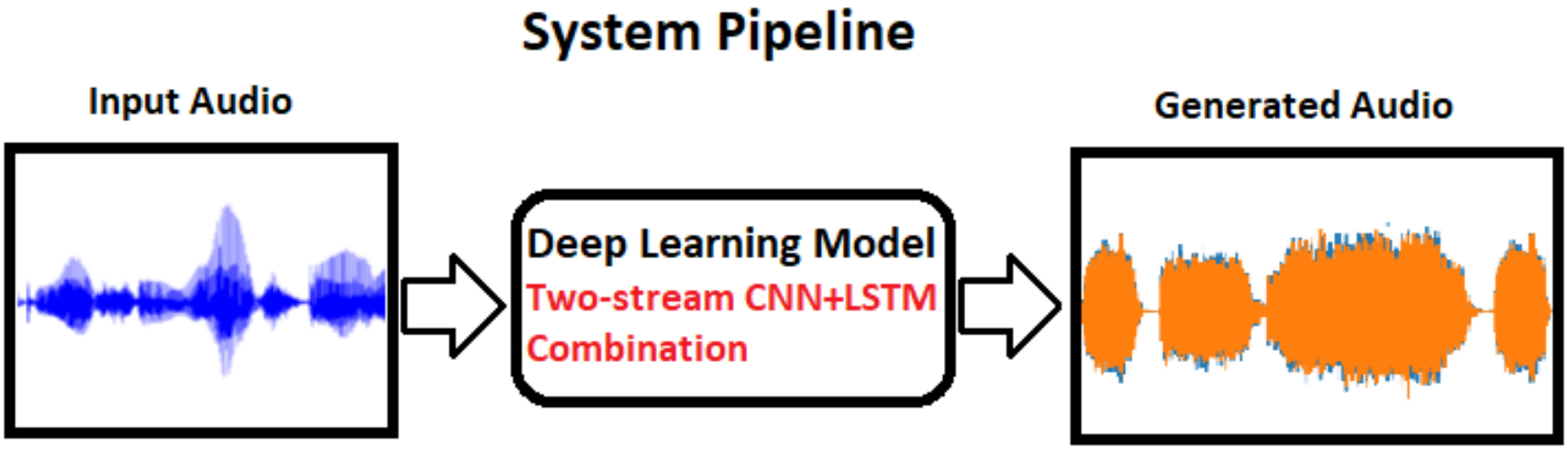
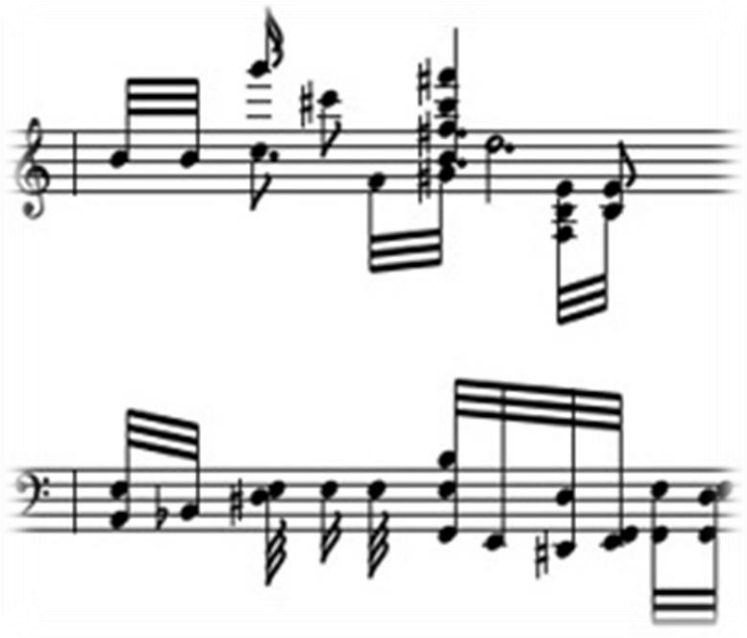
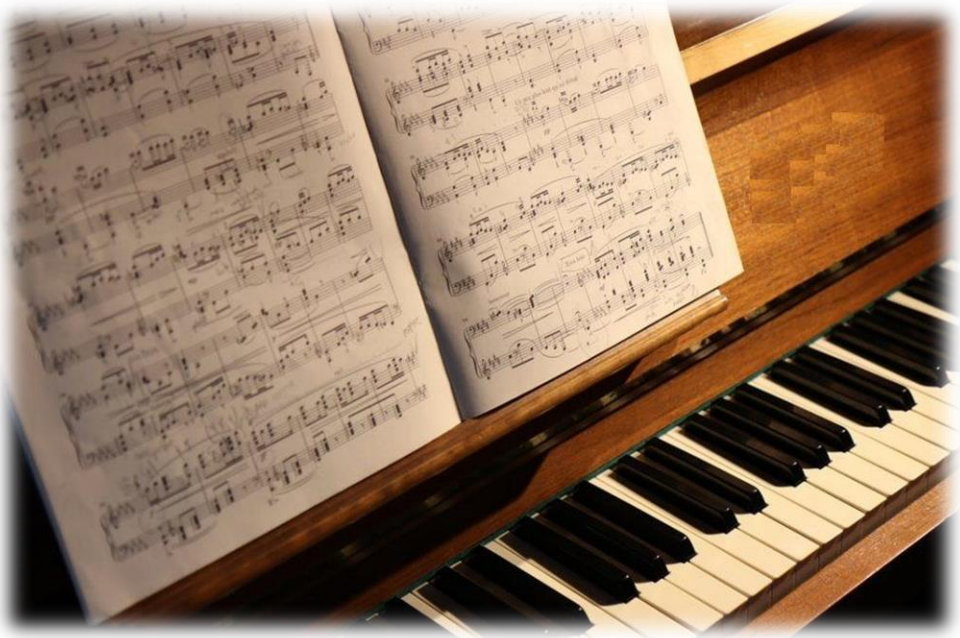
Outline



1) In this project, we produced melodies in the style of popular Turkish music, using deep learning methods.
2) We introduced a novel combination of CNN and LSTM networks to generate music.
3) We collected a dataset including piano versions of Turkish pop music.
4) A wide range of experiments is conducted on the newly generated Turkish pop music dataset and Nottingham dataset.
5) We evaluated the quality of the music produced by the new proposed model with a survey.

1) Abstract



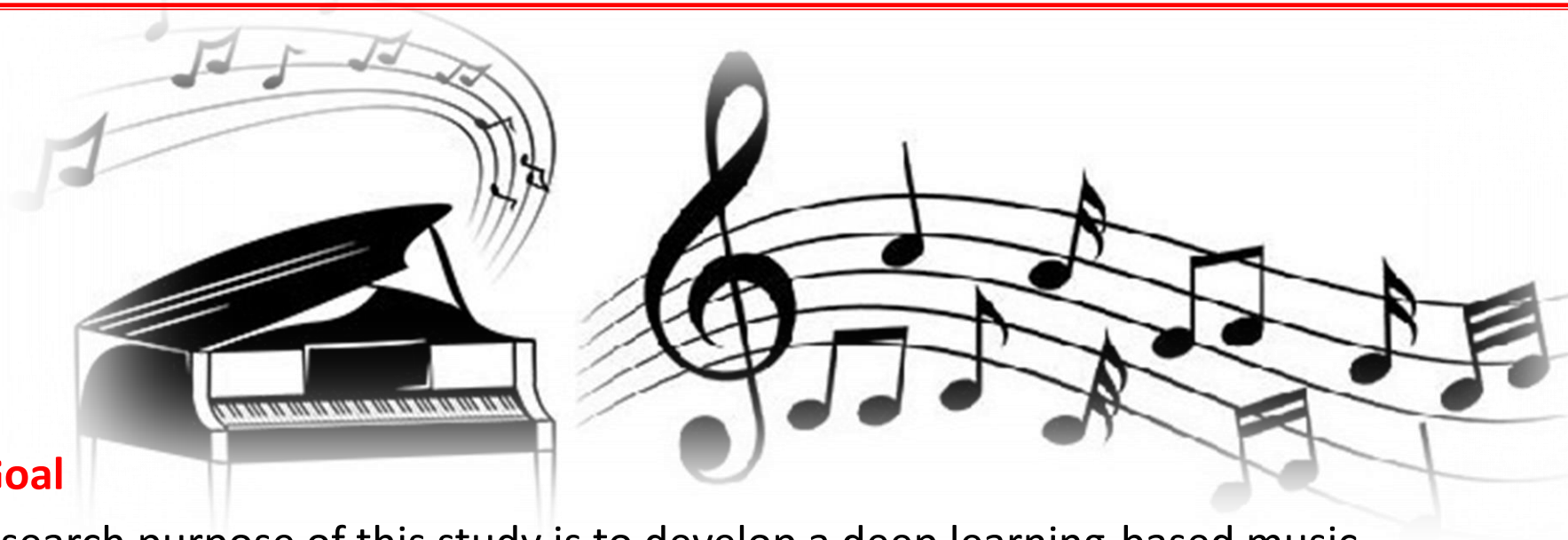


The developed automation system is trained with the given music dataset, it can generate new music files in the style of a specific music file given as input and choose the best among these music files.

In this way, we produced music in a specific style with deep learning methods and generated melodies close to the most popular Turkish music songs.

2.1) Introduction : The Importance of Research

- Artificial intelligence in all domains of human life and the music industry.
- AI in arts : Create paintings, write poems, compose music, and transfer a work of art in different ways.
- Progress in the AI-music field has rapidly increased in the past few years.
- In this study, we established and tested a deep learning-based automation system that imitates Turkish pop music songs that are followed with enthusiasm by a large fan base. The system can generate similar music to them.



2.2) Goal

Research purpose of this study is to develop a deep learning-based music automation system to compose music similar to Turkish pop music.

For this purpose, we introduced a novel combination of CNN and LSTM networks to generate melody. So, we collected a new dataset consisting of legendary Turkish soundtracks and Turkish pop music. Then, automation for style-specific music generation was implemented.

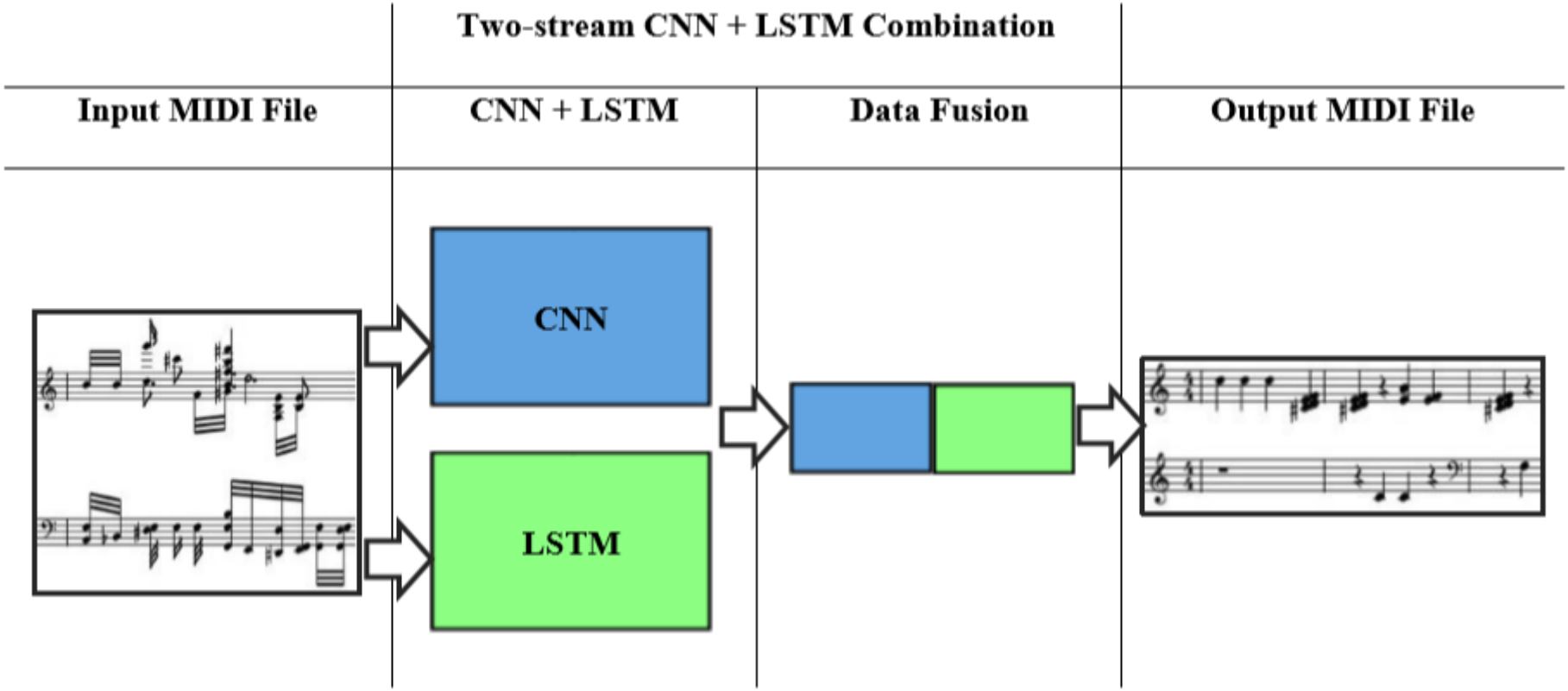
2.3) Problem Statement

One of the AI-generated artwork is to compose music. It includes music parts created autonomously by AI systems. For this purpose, we developed an AI-music automation system to compose style-specific Turkish pop music.

2.4) Benefits

- ✓ Royalty-free music to be used in our social media videos.
- ✓ Musicians : “human-machine collaboration”.
- ✓ AI-powered creative tool to assist musicians.
- ✓ To generate music for neurodegenerative diseases to be assisted in memory recollection.
- ✓ Video games, movies, and advertisement.

3) Proposed AI Architecture



Two-stream deep model : A new combined deep model is proposed to generate music. We merged the two models; CNN and LSTM model. In our experiments, we directly fed this two-stream deep model using the same data input.

Turkish Music Dataset

Nottingham Dataset

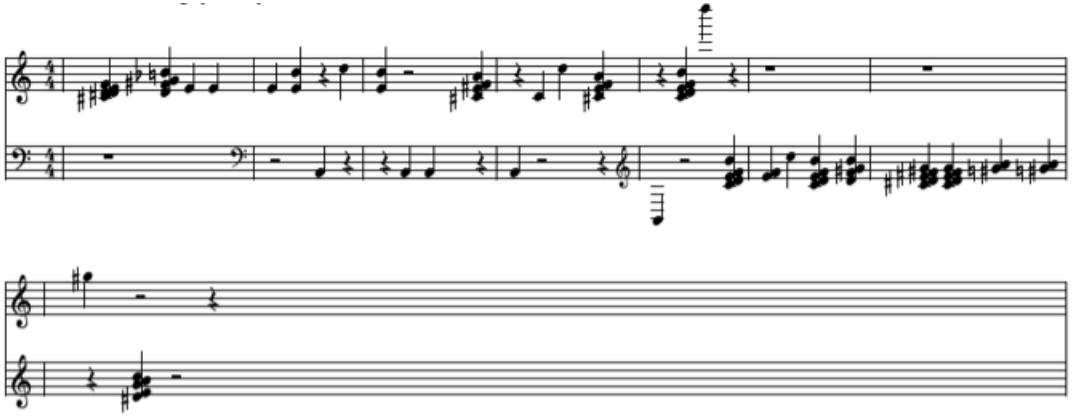
- We introduced a new dataset including piano versions of Turkish popular music data. Our new dataset contains 68 MIDI files.
- We chose 68 files from Nottingham Dataset and convert them into MIDI file format

- To construct this prototype, we used Keras functional api and Tensorflow on GPU for the purpose of deep learning-based music generation.

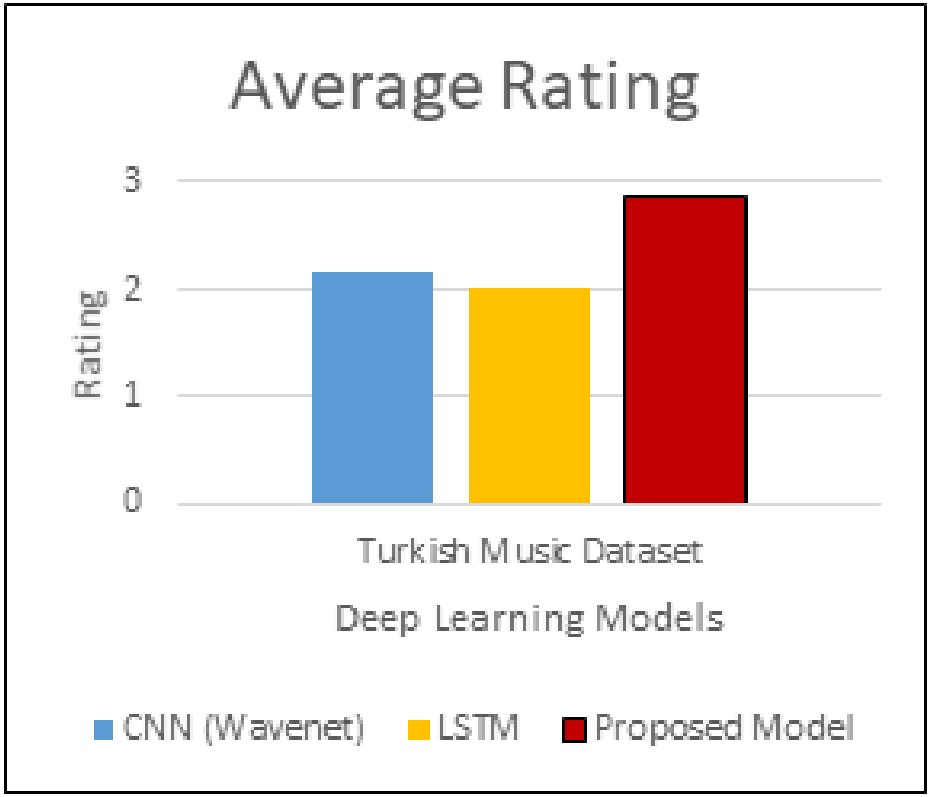
The number of quality music file generated in 400 compositions

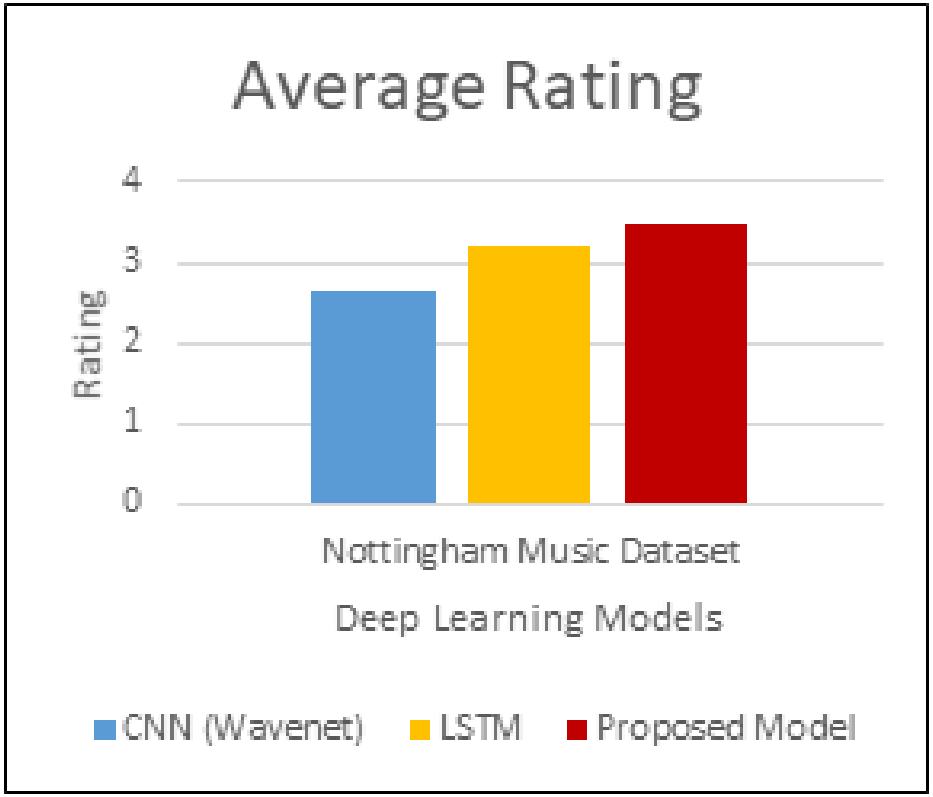
Deep Model	Dataset			
	Turkish Music Dataset		Nottingham Dataset	
	Number of Files	Ratio	Number of Files	Ratio
CNN	31 items	7,75%	100 items	25%
LSTM	4 items	1%	9 items	2,25%
Proposed Model	43 items	10,75%	179 items	44,75%

A sheet music example of output file generated by proposed deep model via Turkish pop music dataset



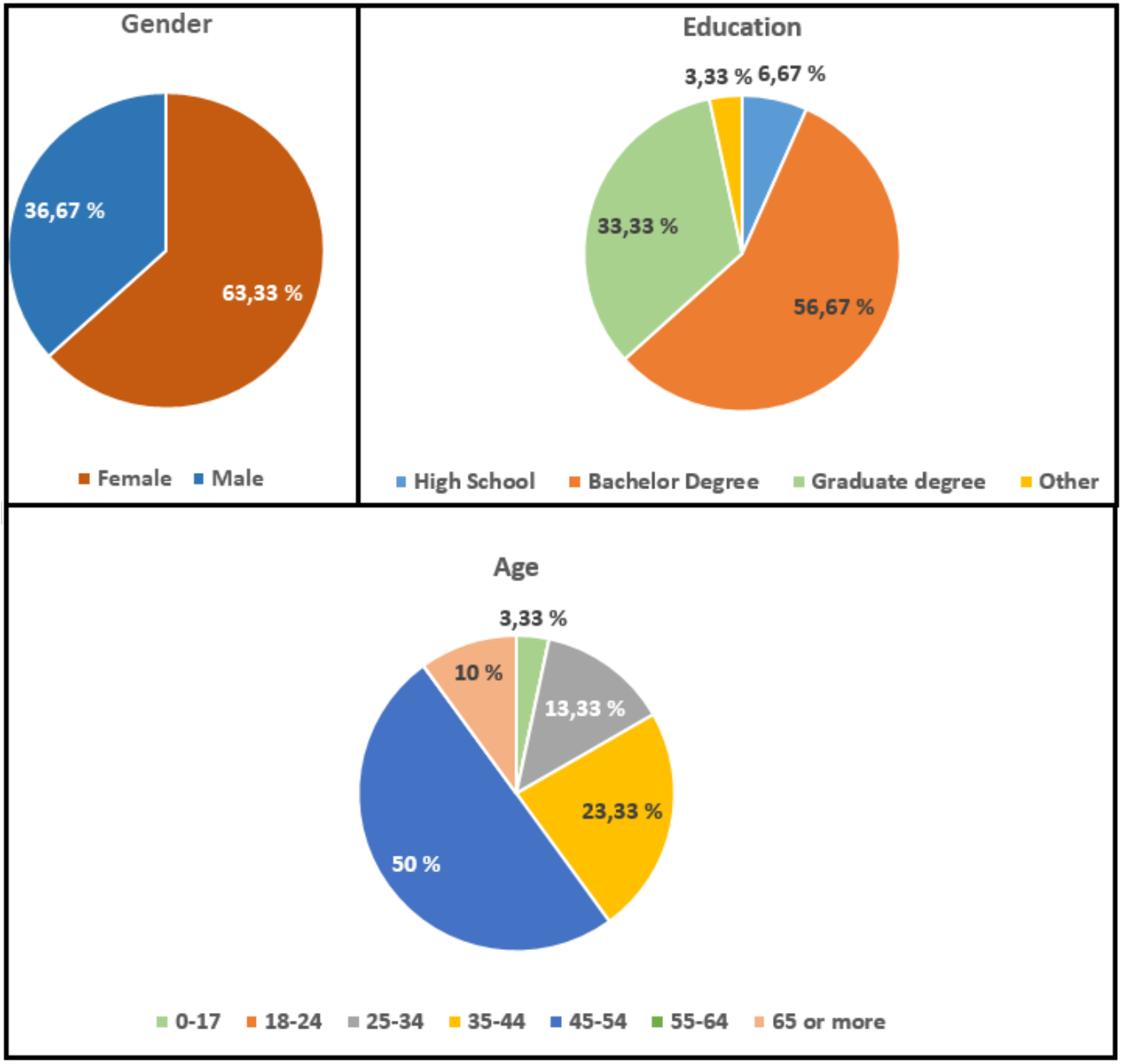
4.4) Experiments : Survey





- We conducted a survey of 30 participants and compared their scores.
- We have 3 deep models : CNN-only model, LSTM-only model, and proposed deep model.
- We used customer journey score (CJ) as a measurement method.
- Survey consists of 12 sample songs in 6 groups. Each group has two samples.
- Survey results show that our deep model produces better sounding music than others. The proposed deep model can be used as an alternative model to the CNN-only model and LSTM-only model.

4.4) Experiments : Survey

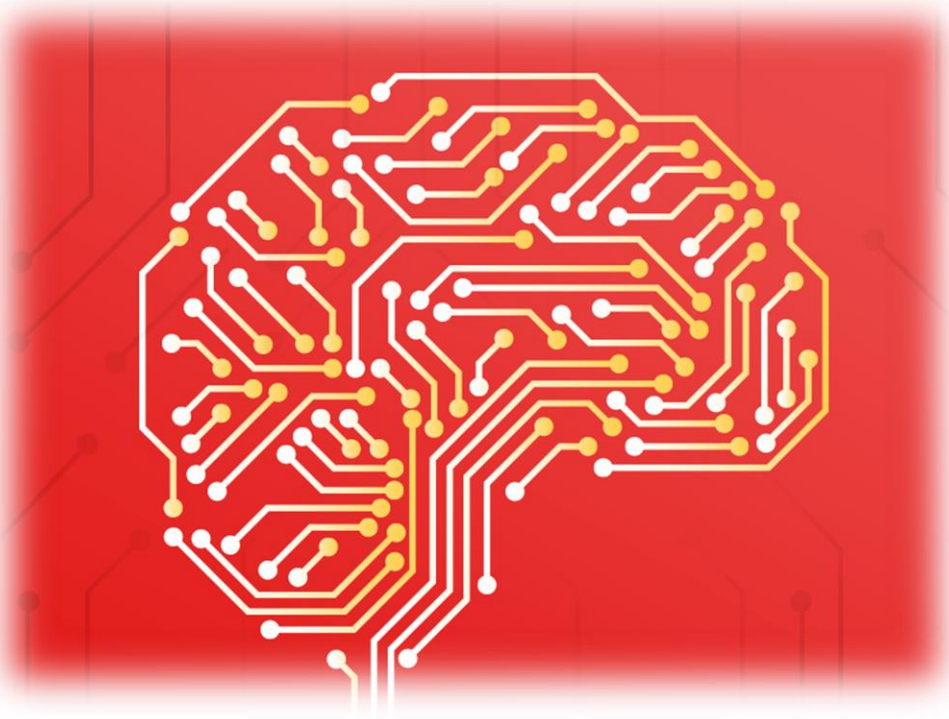


- Demographic Characteristics of Survey Participants.

5) Conclusion

- We implemented an automatic music generation system that learns from Turkish popular musical modal and produces new style-specific music.
- We introduced a novel deep model, that is a combination of convolutional neural network (CNN) in WaveNet architecture and long short-term memory (LSTM) network.
- We conducted a survey with the customer journey score(CJ) to compare three representative models for music generation generation : CNN only model, LSTM only model and our combined deep model.
- Survey results revealed that the melodies produced by the new combined deep model are more liked.
- As future work, we plan to enrich the Turkish music dataset and improve dataset quality.
- Additionally, we can generate music for neurodegenerative diseases like Alzheimer's and other forms of Dementia to be assisted in memory recollection.
- We also plan to develop an AI-powered tool to assist artists in their creations by simulating humans' creativity.

6) System Outputs and Audios



- A sample music generated by proposed deep model via Turkish pop music dataset:

- A sample music generated by proposed deep model via Nottingham dataset:

«**Music** produces a kind of pleasure which human nature cannot do without.»

Confucius

Thank you

for your attention...