Innovation and Practice of Music Educationpath in Colleges and Universities Under the Popularization of 5g Networks

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Research Article

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Abstract

Music education is among the most significant subjects covered in providing high-quality education in Chinese universities and colleges. College music education is critical for colleges and universities in China to provide high-quality education to students. It contributes significantly to the development of pupils' creative inspiration, inventive capacity, and personality development. In the field of music education, innovation is very significant. It has the potential to provide excellent outcomes in music instruction and foster students' original thinking and comprehensive abilities, therefore supporting the overall development of high-quality education. With the expansion of the educational system, it is becoming more vital to teach pupils a high level of musical literacy. With the arrival of the fifth generation (5G) of mobile communication, 5G mobile communication will play a significant role in future Chinese education, and 5G technology will also become one of the key technologies in Chinese music education. These findings provide an innovative framework for music education based on an examination of 5G technology to encourage the expansion of musical education in Chinese colleges and institutions. In the beginning, we normalize the musical dataset to prepare it for further processing. The characteristics of the song are retrieved using a technique called spectrum-based feature extraction (SBF). Bi-Recurrent Neural Networks are used to classify objects in space (Bi-RNN). The Improved TCP Congestion Control Algorithm (ITCCA) is proposed for efficient data transmission between the 5G networks. To enhance the performance of the transmission protocol, we employ Honey Bee Optimization Algorithm. The suggested system's performance is examined and contrasted with that of the currently used approaches. College music education might benefit from the successful integration of new 5G technologies by providing students with rich and diversified teaching materials and flexible instructional formats.

I. Introduction

A considerable push has been given for contemporary teacher learning by current scientific and technical breakthroughs, notably the rapid growth of computer technology indicated by "Music education + 5G." Modern curriculum reform has raised the bar for teachers' abilities to teach to new levels, resulting in increased expectations for them. Traditionally, education has been delivered via schools, and individuals have only had a few options for learning. However, as "Music education + 5G" continues to develop, more channels and methods of disseminating knowledge are becoming available, and significantly altered has been the method through which individuals are educated. In recent years, the continual growth and strengthening of "Music education + 5G" has steadily shattered the monopoly of schools on information distribution, facilitating the shift from a limited to an accessible educational system. When "Music education + 5G" is developed, people will receive education on campus and the 5G platform in the future. The 5G platform will be covered in the lessons taught by the teachers, Five-generation (5G) education will be provided for kids, we'll provide educational materials and propagation on the 5G network. As a result, the positive growth trend of actual learning complementing and expanding online education is realized. "Music education + 5G" is currently being developed. The overall development trend is positive. With the ongoing growth of "Music education + 5G," so far, new types of music training, including catechism,

mobile Applications then WeChat, have helped to provide the groundwork for future growth and research in music education [1].

It is expected that 5G technology, also known as next-generation mobile cellular technologies, will significantly impact our everyday lives shortly. The introduction of 5G will bring about significant improvements over present network technologies in terms of increased capacity, more dependable service, and a greater density of devices, as explained below. Because of their unique qualities, these features can affect or even change a wide variety of human activities, from business to entertainment, by improving presently accessible services and introducing whole new ones. This will be possible through the enhancement of current services offered and the initiation of entirely new services. Therefore, it is believed that 5G will influence educational experiences as well. We'll focus on music education since it's an area where having a lot of bandwidth is critical for exchanging high-quality multimedia streams. We should keep latency in bidirectional connection to a minimum, ideally in the millisecond range [2]. During the Fifth Mobile 5G Expo, first introduced the concept of "5G+music education" in China, to integrate 5G as a means with all walks of life, boldly innovating and promoting the fast growth of China's economy benefiting people via this platform. "5G Plus" is a hub that unites people from all areas of life via network information and communication technology, which establishes a new field and allows for new developments in that sector [3].

Ii. Related Works

In this research [4], the Urban Forest Consortium's WRF-Chem model is used to conduct a numerical model analysis on the air and dust pollutants in the mountain city of L. The model, developed by the Urban Forest Consortium, is called the WRF-Chem. These two models were tested and determined to have a better simulation function when used in conjunction with each other. The model is used to simulate pollution levels in the city L center or analyze the effects of the urban canopy on the distribution of dusty pollutants and impacts in the atmosphere. The implementation of 5G technologies in an educational setting is the subject of this research [5], which focuses on VR- Virtual Reality and AR- Augmented Reality technology-based activities. Following the introduction of certain scenarios using augmented and virtual reality technologies, we will outline the major features of 5G and propose an application in various fields of music education as an example. "distance education" refers to a relatively new educational approach in the network era that primarily relates to the network learning of network multimedia information systems between teachers and learners. The development of modern distant education is an essential tool in developing a lifelong learning system for individuals in the information age. Using current distant education as the primary method of communication, it blends face-to-face education, communication education, self-study, and other educational modes. It employs multiple media to communicate with professors and students and communicate the course's content [6]. [7] According to this study, the legitimacy of values in music education is examined to prepare students for admission into China's new 'knowledge society,' which is the People's Republic of China in the global era. There is a discussion of how values education connects to the teaching of musical and non-musical meanings in the twin contexts of nationalism and globalization and some of the difficulties that value education encounters in

school music classes [8]. With the conceptual approaches of musical authenticity and two tenets of modern liberal theory, equivalent concern and based on culture neutrality, the study aims to understand how the Chinese ethnic minority's musical and cultural traditions are represented in government-designed national K1–9 music textbooks. [9] For the purpose of realizing speech and music recognition, this work makes use of the distinct principles of the magnitude of new information in the signal sequence of speech and music, as well as their changing range, to accomplish the intended effect. The novelties are divided into two categories. i) Baseband is utilized in the general software radio technique, a generally used software method that simulates reality by utilizing a simplified channel model. The channel coding theory is then employed to offer a robust model in this approach. ii) When designing the program, start with the broad class of serial data transfer, to maximize the benefits of certain object-oriented programming while also increasing the program's adaptability. "[10] This study examines the importance of assessing music teaching ability before summarising the use of neural network and deep learning technologies in music teaching ability evaluation. After that, it creates an assessment model using a compensating fuzzy neural network technique and tests its correctness. It then looks into the reasons for attempting to produce anomalous output by looking into the model's algorithm's general dimensional requirements and presents a way for evaluating music teaching competence in a classroom context. [11] A power iteration-based technique of system resource allocation is proposed in this work. The unloading system's throughput is defined as an optimization challenge, with the best allocation of regular power achieved via an iterative method of the optimal solution. A heterogeneous network that depends on network edge is constructed to compensate for edge servers' loss efficiency and resource consumption to discover the best technique for ensuring that the Nash equilibrium point is maintained. [12] Using multidimensional connection feature fusion and clustering algorithms, this study presents an optimal fusion approach for an "offline and online" mixed music education model in the context of 5G times. [13] This article provides a historical overview of popular music in China throughout the twentieth century, both in the community and in school music. First and foremost, it examines how, since the beginning of 2000, reforms in music education have included popular songs into the curriculum. "The developed system is split up into three sections: the multiple data mechanism that will help, the server manager module, and the database administration module" [14]. The genetic algorithm is used to integrate the data after the synchronization multimodal voice learning data are processed by the synchronized multimodal vocal education information processing. [15] As a result of mixing big data with customized recommendation algorithms based on the Collaborative Filtering Recommendation System in this work, a hybrid recommendation algorithm is developed (CF). To acquire the user assessment matrix, huge quantities of data must be employed. The Pearson correlation coefficient is used to determine user similarity. May construct the closest neighbor set, the k nearest set of target users, and the subscriber recommendations set. As part of this process, a questionnaire is created to gather the actual assessment ratings of each user on the audio contents. The questionnaire results are utilized for model testing, with 20% of the data going to this purpose and the remaining 80% to model training. [16] Students at the Art University, both music majors and non-music majors were asked to participate in a survey presented in this article. N=50 of them are classified as professionals, while the remaining 50 are classified as non-professionals. When it comes to practical instruction, the professional courses employ computer music

technology, while the non-professional classes use traditional music to educate. As a result of the experiment, researchers and analysts looked into and examined the degree to which the two classes had mastered their respective music professional knowledge and their acceptance of computer music teaching and conventional music teaching techniques.

Iii. Proposed Work

A substantial transformation in music education will be brought about by the launch of the 5G network. Compared to existing network technologies, 5G will provide considerable gains in terms of bandwidth, service dependability, and device density. Furthermore, we will focus our efforts on arts education, a field in which having a huge capacity is vital for sharing high-quality multimedia streams, and two-way communication latencies should be maintained to a low, in the milliseconds' range is essential. A simplified illustration of the suggested technique is shown in Figure 1.

A. Description of the dataset:

We picked the GTZAN dataset since it's been used in much earlier research and would enable us to assess the model more correctly. The dataset of GTZAN contains 100 distinct specimens for every genre, and ten various kinds of music are used [21].

B. Pre-Processing using Normalization:

Since the incoming data has not been processed, it may contain duplicated sequences and incomplete data. A thorough cleaning and high-level processing have been performed to remove recurring and duplicate occurrences, as well as gaps in the data. Since the datasets for the education systems are extensive, they must use sample reduction methods to ensure that the data is representative. Because of the enormous range of features in this database, approaches for extracting features are required to exclude characteristics that are not important. During the pre-processing stage, it may normalize the information. Equation (1) describes how the s-score is generated in the first step of the normalizing procedure.

$$U = \left[\frac{Tu - \omega}{\alpha} \right]$$

1

Here,

ω - data mean

δ- Standard

U may be written as,

$$U = \frac{Tu - \overline{Tu}}{UUK}$$

2

Here,

$\overline{Tu}$ - Sample means, UUK- sample standard deviation.

The randomized sample is made up of the following individuals:

$$U_a = \beta_0 + \beta_1 Tu_a + \epsilon o_a$$

3

Where,

ϵo_a denoted error depends on α^2

Next, the errors must be independent of each other and, as indicated in the following section.

$$\tilde{t_a}^{\sqrt{V}} \frac{t}{\sqrt{t^2 + v - 1}}$$

4

t_i -Random variable

In the next step, the standard deviation is utilized to normalize the variations in the variables.

It is possible to estimate the moment scaling deviation by using the given equations:

$$FUK = \frac{\lambda^{fuc}}{\varphi^{fuc}}$$

5

Where,

fuc denotes a Scaling moment.

$$\lambda^{fuc} = Exp(Ti - \alpha)^F UC$$

6

Where,

Exp represent Expected value

Ti represent random variable

$$\emptyset^{fu} = \left(\sqrt{Exp(Ta - \alpha)^{F} UC}\right)^{2}$$

7

$$t_c = \frac{fuc}{\overline{Ta}}$$

8
Where,

t_c represent coefficient variance

By changing the values of all parameters to 0 or 1, the feature scaling process is brought to a halt. The unison-based normalizing technique is the term used to describe this process. The following is an example of how might write the normalized equation:

$$Ti^{'} = \frac{\left(t - t_{min}\right)}{\left(t_{max} - t_{min}\right)}$$

9
The data range and irregularity of the input may remain unchanged after it has been normalized. To reduce delay, this step is completed. Next, the normalized data may be utilized as an input to the following phases in the procedure.

C. Spectrum Based Feature Extraction:

a. Centroid of the Spectral Spectrum

Spectral centroid (also known as the frequency spectrum centroid) is a statistic used in digital signal processing to describe the frequency band. The letter 'a' designates the location of the "centroid" of the frequency range. It seems to have a close link with the intensity of the noise source. Put another way: The lower this number, the greater the amount of power focused in the low-frequency region. Because the spectral centroid better represents the brightness of the sound, it is based on digital audio and musical signal analysis. It's a tool for evaluating music's timbre. It is a musical term. Here's what it looks like mathematically defined:

$$D_s = \frac{\sum_{a=1}^{A} B_s[a] * a}{\sum_{a=1}^{A} B_s[a]}$$

10

Here,

$B_s[a]$ denotes Fourier transform magnitude

A-frame in the frequency group 'a' that is in the s-th frame.

b. Flux Spectral

The flux spectral is a broad term that refers to the pace at which the signal spectrum changes. It is determined by calculating the current frame spectrum to the range of the previous frame. The 2-norm among two normalized spectrums is often used to compute it, which is more exact. The spectrum flux computed in this method does not depend on the period since the spectrum has been normalized. To compare two signals, their amplitudes need to be known. It is common practice to employ flux spectral to identify the timbre of an audio source or whether or not to pronounce it. Here's what it looks like mathematically defined:

$$U_s = \sum_{a=1}^{A} (A_s[a] - A_{s-1}[a])$$

11

c. Contrast in Spectral Range

Spectral contrast is a property that is used to categorize different types of music. Spectral contrast is described as the variation in decibels between both the ridges and valleys of a frequency range, which may illustrate the relative spectral features of different types of music and sounds.

d. Cepstral Coefficients at Mel-Scale Frequencies

Because the cochlea contains filtering qualities, it may map various frequencies to different places on the basilar membrane, which allows for more accurate mapping. As a result, the cochlea is often referred to as a filter bank. Psychologists were able to acquire a set of filter banks comparable to the cochlear effect via psychological research, which they named the Mel frequency filter bank, based on this characteristic. Because the sound level experienced by the human ear is not linearly proportional to the frequency of the sound, researchers have developed a new notion known as Mel frequency to account for this. The Mel frequency scale is better following the acoustic qualities of the human ear than the Richter frequency scale. The following is the connection between Mel frequency and the integer u:

$$u_{mel} = 25955g\left(1 + \frac{u}{700}\right)$$

12

Here u_{mel} denotes Mel frequency conversion

u denotes frequency

For starters, the audio signal is separated into frames and pre-emphasized before being windowed. After that, a short-time Fourier transform is conducted to acquire the frequency spectrum of the audio signal. Next, set the Mel - frequency bank of the L channel to the Mel frequency by adjusting the Mel filter bank of L stations. The N value is calculated when the signal has reached its most significant frequency, which is usually between 12 and 16. Each Mel filter has the same spacing on the Mel frequency as the previous one. The following diagram depicts the connection between the three frequencies of neighboring triangle filters:

$$d(l) = h(l-1) = o(l+1)$$

13

Assume,

$d(l)$ denotes Centre frequencies

$h(l)$ denotes upper frequencies limit

$o(l)$ denotes lower frequencies limit.

The output of the filter get through the Mel filter are,

$$y(l) = \sum_{k=o(l)}^{h(l)} V_l(k) \left| X_b(k) \right|, l = 1,2, \ldots, N$$

14

The filter's frequency characteristics are as follows:

$$V_l(k) = \begin{cases} \frac{k-o(l)}{c(l)-o(l)}, o(l) \leq k \leq d(l) \\ \frac{h(l)-k}{h(l)-c(l)}, c(l) \leq k \leq h(l) \end{cases}$$

15

The discrete cosine is transformed to MFCC by taking the natural log of the filter's actual output. This is the expression:

$$MFCC_{MFCC}(a) = \sum_{l=1}^{L} lgy(l) * \cos\left[\pi(l-0.5)\frac{a}{L}\right]$$

16

Here, $a = 1, 2, \ldots, N$

D. Classification Using Bi-RNN (Recurrent Neural Network):

Over time, RNN may detect the inherent structure buried in the sequence. The audio signal may be thought of as a time sequence in and of itself. The spatial dependency of the audio signal in the time dimension may be captured by using RNN to process music. In the temporal dimension, the sound spectrum is likewise widened. Because the feature map after one-dimensional convolution can be thought of as a temporal feature sequence, the usage of RNN to analyze sound spectrum information may also be considered in this way. This research employs Bi-RNN to describe the music sequence to better represent the multidirectional dependency in the time dimension and get closer to the brain's perception of music. Bi-RNN takes into account both the previous and subsequent inputs, which may aid with data modeling.

The construction of Bi-RNN is seen in Figure 2. In the estimate of the future, $\vec{Z}^{a}$ is connected to $\vec{Z}^{a-1}$, and in computation in reverse, $\overleftarrow{Z}^{a}$ is connected to $\overleftarrow{Z}^{a+1}$, and $\overleftarrow{Z}^{a}$ indicates the hidden layer's current condition. Z6's calculating formula is as follows:

$$\overleftarrow{Z}^{a} = u\left(V' X^{a} + M' \overleftarrow{Z}^{a+1}\right)$$

17

To get the final network output, combine the forward and rear of each network step:

$$T_{a} = M\vec{Z}^{a} + M'\vec{Z}^{a}$$

18

E. Improved TCP congestion control Algorithm:

Live broadcasts would be out of place with this protocol designed for on-demand access to an extensive music collection. If a customer wants to upload a song, they'll need to have the whole track on their computer. So, it simplifies things by not indicating which portions of a track a client owns anymore. The drawbacks are minimized due to the small size of the tracks. Instead of using UDP, which is the most common streaming app transport protocol, Spotify uses TCP.

To begin with, having a dependable transportation protocol makes protocol plans and easy implementation. Second, TCP is suitable for the network because congestion management is favorable, and Stateful firewalls benefit from explicit relationship signaling. Finally, since streamed content is shared through a mentoring network, re-sending missing packets is beneficial to the program. A single

TCP connection is utilized between two hosts, and messages are multiplexed via the protocol specification. A client maintains a TCP connection to a Spotify server while it is active. Priority-ordered is buffering and sorting application layer messages before being delivered to the operating system's TCP buffers. Messages required to allow interactive surfing, for example, are prioritized above bulk traffic.

F. Honey Bee Optimization Algorithm

For both functional and combinatorial optimizations, the Honey Bees method uses random search and neighborhood search. The fundamental goal of this method, as illustrated in Figure 3, is to identify an optimum solution using honey bees' natural foraging activity. In general, scout bees (n), chosen sites in visited websites (m), resting criterion, best places in sample locations (e), starting patch size, which includes the network's size and its surroundings, bees for selected sites, bees for sites are needed. The fitness of bees is assessed after they are randomly put in an area. The honeybees with the best fitness levels are chosen, and the bees who visit the places are selected for the neighborhood search. Now it's time to recruit bees and assess their fitness at the desired locations. The fittest bees from each patch are chosen. The fitness of the remaining bees is evaluated after they are allocated to a search area at random. The stages are then repeated until the condition for halting is fulfilled. The bees method is utilized in various applications, including clustering techniques, neural network pattern matching, and construction. In sensors, nodes near the sink must transfer their data and data received nodes further away, depleting the energy of nodes near the sink. The network isolation issue, also known as the HOT SPOT problem, is caused by the surrounding nodes' energy depletion. It Will significantly alleviate this issue if sink mobility is used since the energy consumption of neighboring nodes will be balanced. Biological methods are also utilized to improve the Packet delivery ratio, throughput, and delay.

Iv. Performance Analysis

In this section, we analyze the performance of the proposed method and compare it with existing methods Figure 4 (a,b,c,d) shows that the real data and simulated data curves agree, indicating a good model fit. The amount of negative emotion decreases, whereas the neutral and positive mood indexes increase, showing that the populace is less suspicious and concerned than when "Music education + 5G" was initially introduced after a year of practice and investigation. 5G users started to think more critically about the issues that arose throughout the "Music education + 5G" process, and they expressed a favorable attitude toward "Music education + 5G" and a more accurate description of "Music education + 5G."

Figure 5 demonstrates that pop music is more popular among college students because it is closer to their lives. However, there are plenty of students who like classical, instrumental, and traditional music. The majority of pupils have a rudimentary understanding of music and can read pentatonic and short scores, and they learn music and associated basic information via many methods.

Figure 6 shows that 71.14 percent of students feel that music electives are required, while just 5.67 percent say they are not, and the remainder are undecided. This is because the majority of pupils feel that music education may help them develop emotion and control their mood (55.20 percent and 39.28 percent, correspondingly), as well as the fact that music education may aid in the development of intellect, provide entertainment, and improve life (35.16 percent). Students fully comprehend and agree with the uses and benefits of music, yet many have qualms about music's various learning activities at school.

On the one hand, as shown in Figure 7, universities are increasingly focusing on 5G music education and introducing new music classes and actions; however, due to a lack of publicity, the 5G music teaching method is not well-known, and educators' overall participation is low, resulting in the majority of students not participating in school music activities.

Network Performance

i) Throughput

It is defined as the number of data packets received by destination at a certain time, as indicated by,

Figure 8 shows the throughput comparison between the present and suggested approaches. The graph clearly shows that the recommended strategy has a higher throughput than traditional techniques.

ii) Average delay

It's the amount of time it takes a packet to travel from its origin to its destinations.

Figure 9 depicts a side-by-side comparison of the average delay for the present and proposed techniques. The graph shows that the suggested process transmits data with the least latency compared to conventional methods.

iii) Packet delivery ratio

It is calculated by dividing the obtained data packets by the transmitted data packets, used to determine routing effectiveness.

$$Packetdeliveryratio = \frac{Rs}{Ss} \times 100$$

19

Where,

Rs denoted Received data packets

Ss denotes Sent data packets

The comparison of packet delivery ratios for the current and recommended approaches is shown in Figure 10. The graph clearly shows that the proposed technique has a higher packet delivery ratio than the existing methods.

V. Conclusion

5G is employed in every part of our lives, including learning, education, and work. Through the 5G platform and information systems, many new models of voice instruction have been developed and associated with teaching practices. Discipline will undergo an unprecedented shift with the arrival of 5G technology. The concept of correlation in "GTZAN and 5G music education" is being used to connect the gaps among computer, digital media, and software programs and the learning system with a new approach that better reflects students' learning styles. It supports and encourages the entire growth of every student with "music education + 5G" and guarantees that every student may comprehend the worth of life. It fosters the overall development of every student's knowledge, emotion, and cognition. Because of the changes brought about by "5G," the way people get music education is changing, propelling the fast growth of the overall music education business.

References

1. Cao, H., 2021. Innovation and Practice of Music Education Paths in Universities under the Popularity of 5G Network. Wireless Communications and Mobile Computing, 2021.
2. Baratè, A., Haus, G., Ludovico, L.A., Pagani, E. and Scarabottolo, N., 2019. 5G Technology for Music Education: A Feasibility Study. IADIS International Journal on Computer Science & Information Systems, 14(1).
3. Gu, D. and Li, F., 2020, September. The Exploration of the Application of VR Technology in Music Education under the Background of 5G+. In 2020 International Conference on Modern Education and Information Management (ICMEIM) (pp. 9-12). IEEE.
4. Xu, L., 2021. Air dust pollution and online music teaching effect based on heterogeneous wireless network. Arabian Journal of Geosciences, 14(16), pp.1-14.
5. Baratè, A., Haus, G., Ludovico, L.A., Pagani, E. and Scarabottolo, N., 2019, June. 5G technology for augmented and virtual reality in education. In Proceedings of the International Conference on Education and New Developments (Vol. 2019, pp. 512-516).
6. Fu, W., 2021. Random network calculation under the background of 5G network in remote piano music video teaching application. Journal of Ambient Intelligence and Humanized Computing, pp.1-15.
7. Law, W.W. and Ho, W.C., 2009. Globalization, values education, and school music education in China. Journal of Curriculum Studies, 41(4), pp.501-520.
8. Zhang, W., 2017. Multicultural ethnic music education in Communist China. International Journal of Multicultural Education, 19(3), pp.65-84.

9. Lin, Y., 2021, March. Design of Intelligent Distance Music Education System Based on Pan-communication Technology. In 2021 International Conference on Artificial Intelligence and Smart Systems (ICAIS) (pp. 415-418). IEEE.
10. Chen, X., 2021. Compensated Fuzzy Neural Network-Based Music Teaching Ability Assessment Model. Computational Intelligence and Neuroscience, 2021.
11. Sun, J., 2020. Research on resource allocation of vocal music teaching system based on mobile edge computing. Computer Communications, 160, pp.342-350.
12. Yuqing, X., 2021. Study on the reform of “online and offline” mixed music education model under the 5G of the times. The International Journal of Electrical Engineering & Education, p.0020720920986070.
13. Ho, W.C. and Law, W.W., 2012. The cultural politics of introducing popular music into China's music education. Popular Music and Society, 35(3), pp.399-425.
14. Zhang, H.L. and Yu, P.J., 2021. Design of multimedia vocal music education data integration system based on adaptive genetic algorithm. Security and Communication Networks, 2021.
15. Li, T., 2021. Selection of audio materials in college music education courses based on hybrid recommendation algorithm and big data. In Journal of Physics: Conference Series (Vol. 1774, No. 1, p. 012019). IOP Publishing.
16. Zhou, Y., 2020, October. Research on Music Education Model by Using Computer Music Technology in Colleges. In Journal of Physics: Conference Series (Vol. 1624, No. 2, p. 022053). IOP Publishing.
17. Liu, J., Han, Z. and Li, W., 2019. Performance analysis of TCP new reno over satellite DVB-RCS2 random access links. IEEE Transactions on Wireless Communications, 19(1), pp.435-446.
18. Patriciello, N., 2017, June. A SACK-based Conservative Loss Recovery Algorithm for ns-3 TCP: A Linux-inspired Proposal. In Proceedings of the Workshop on ns-3 (pp. 1-8).
19. Guan, S., Jiang, Y. and Guan, Q., 2020. Improvement of TCP Vegas algorithm based on forward direction delay. International Journal of Web Engineering and Technology, 15(1), pp.81-95.
20. Wheeb, A.H. and Kanellopoulos, D.N., 2020. Simulated performance of SCTP and TFRC over MANETs: The impact of traffic load and nodes mobility. International Journal of Business Data Communications and Networking (IJBDCN), 16(2), pp.69-83.
21. Ceylan, H.C., Hardalaç, N. and Kara, A.C., 2021. Automatic Music Genre Classification and Its Relation with Music Education. *World Journal of Education*, *11*(2), pp.36-45.

Figures

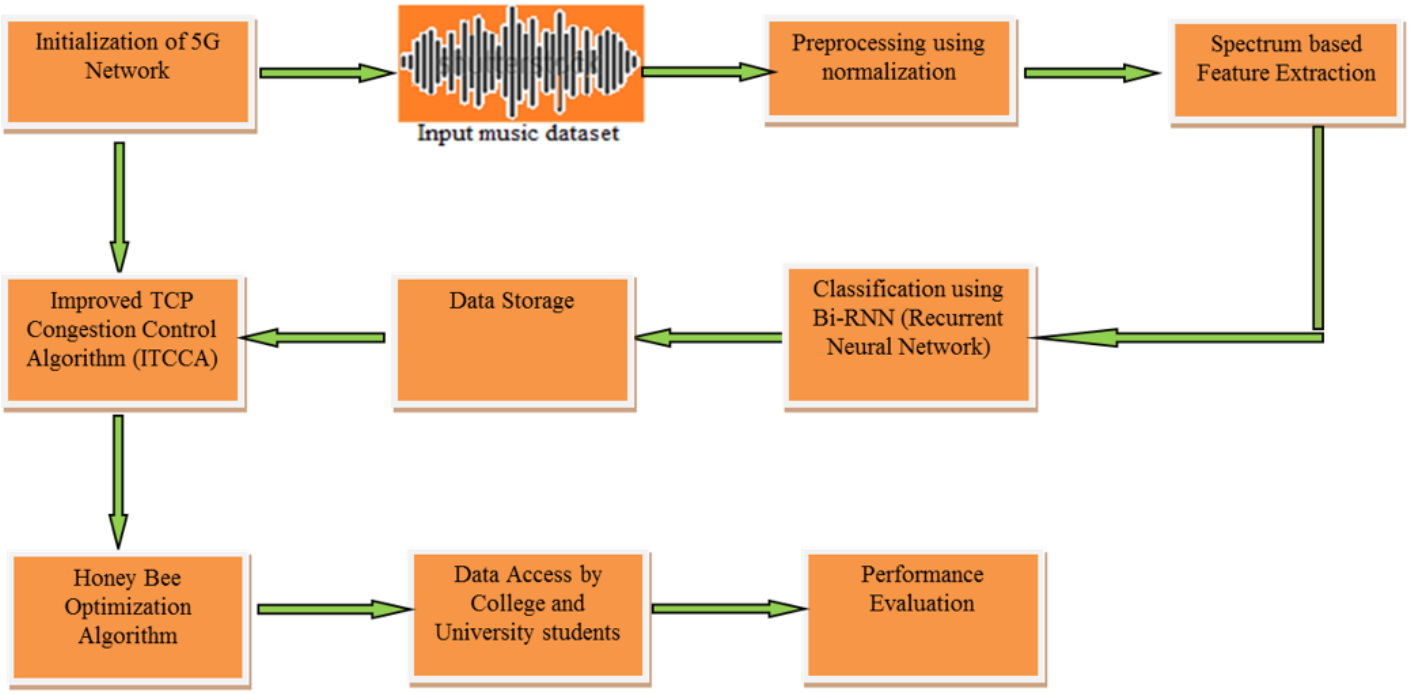

Figure 1

Schematic representation of proposed flow work

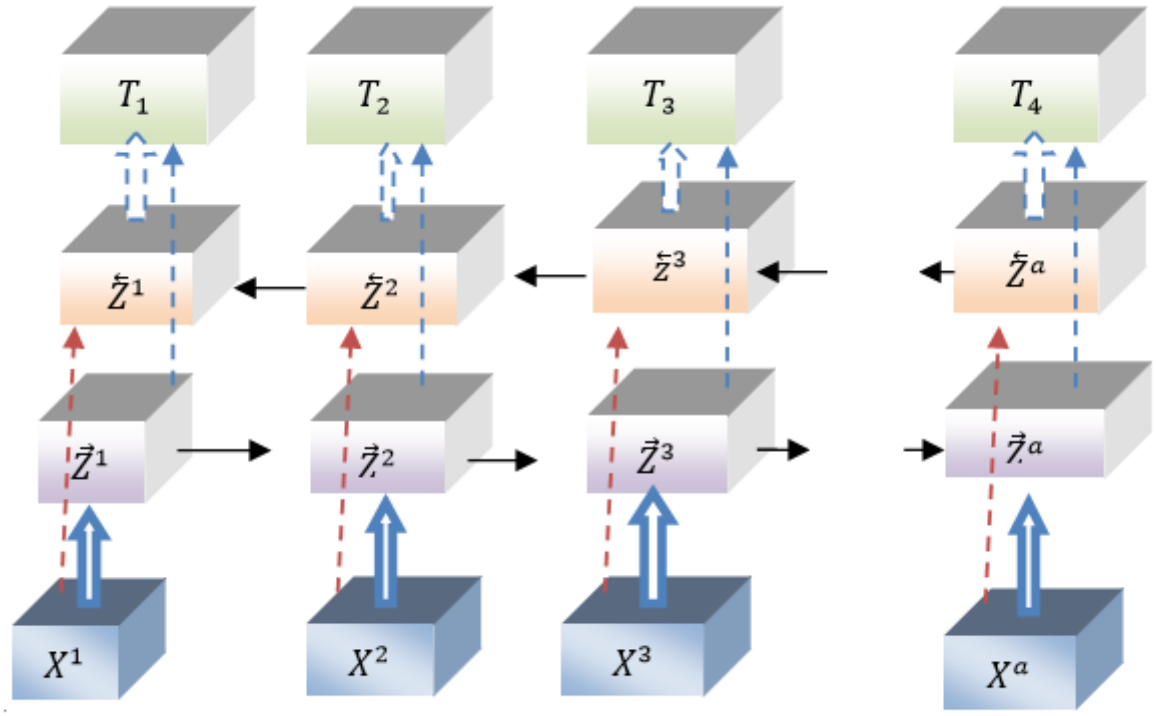

Figure 2

Classification process using Bi-RNN schematic diagram

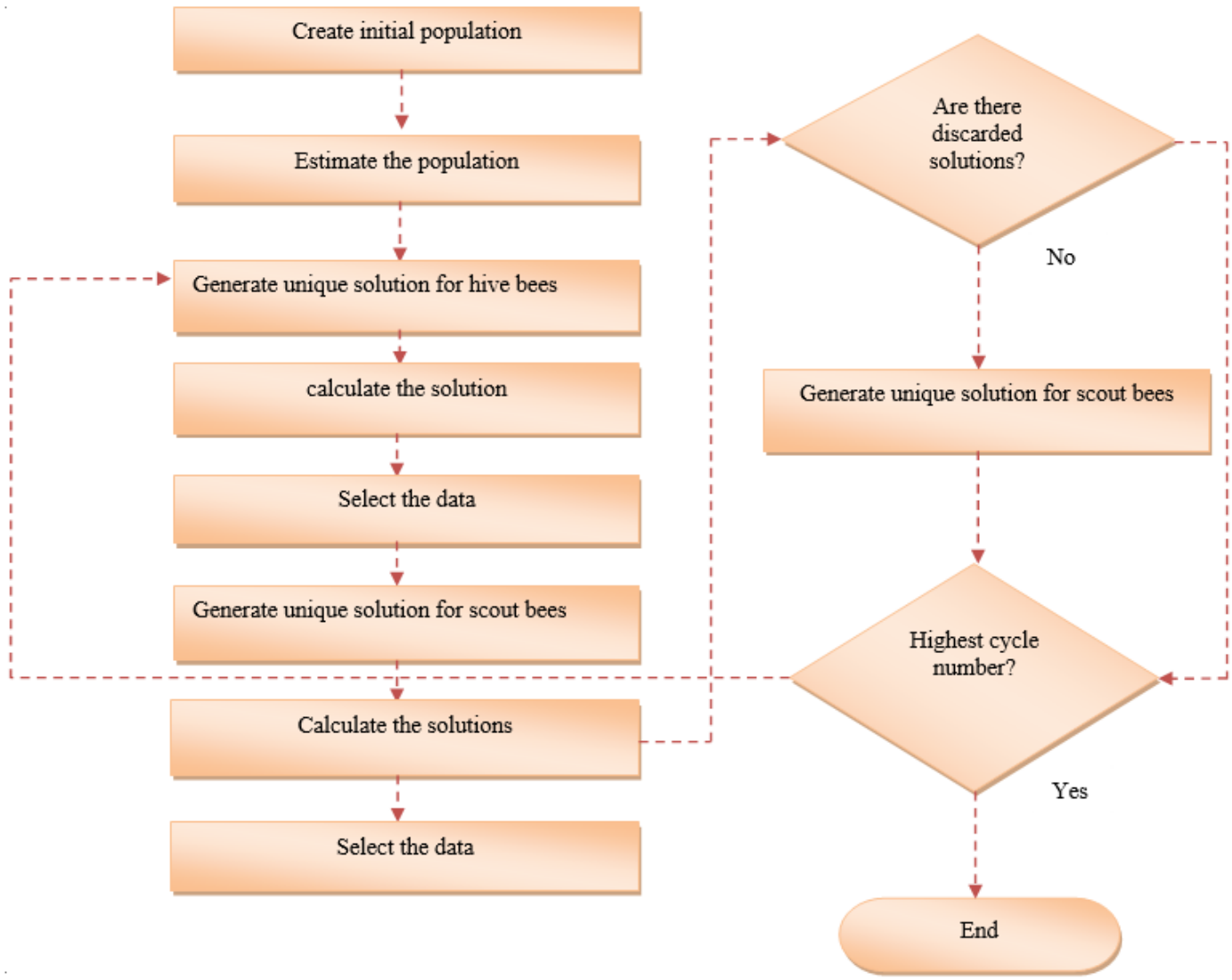

Figure 3

Flow chart of honey bee optimization

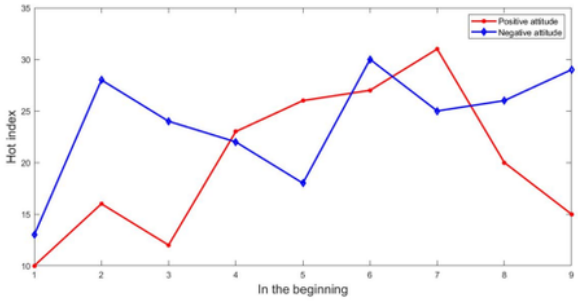

Figure 4 (a)

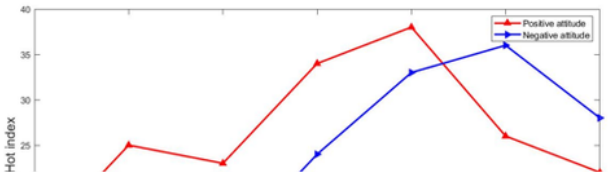

Figure 4

a,b,c,d. The constantly shifting hot index of music education + 5G

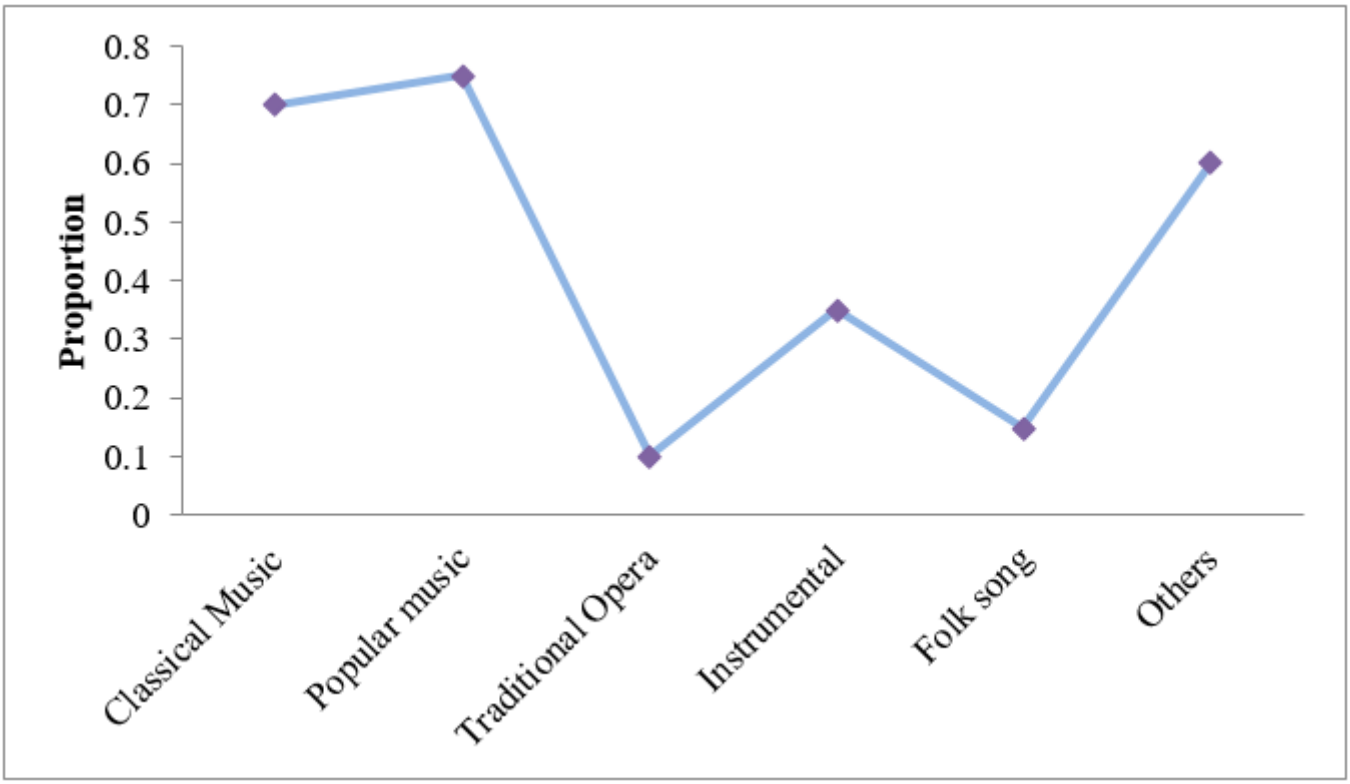

Figure 5

Different types of music

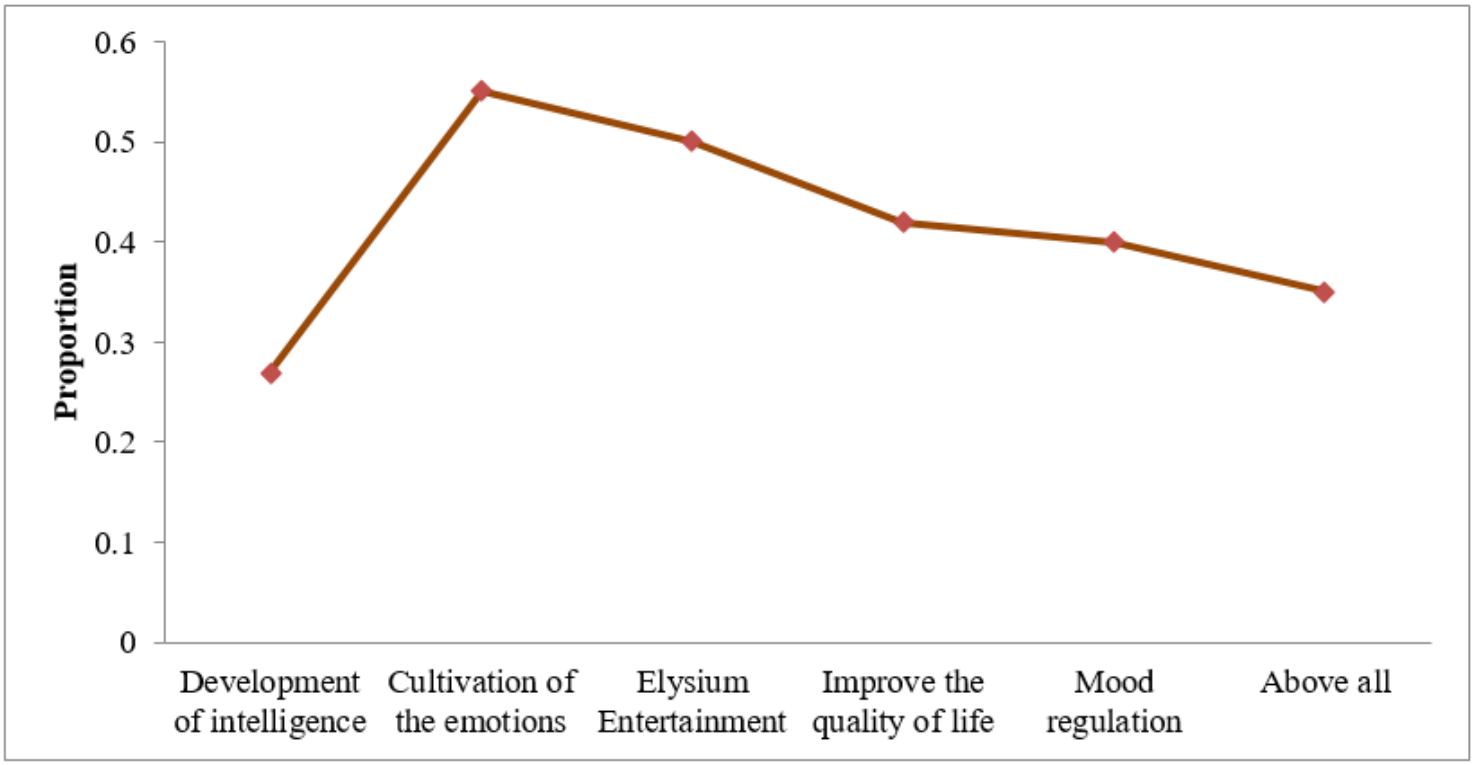

Figure 6

Different types of music education in 5G

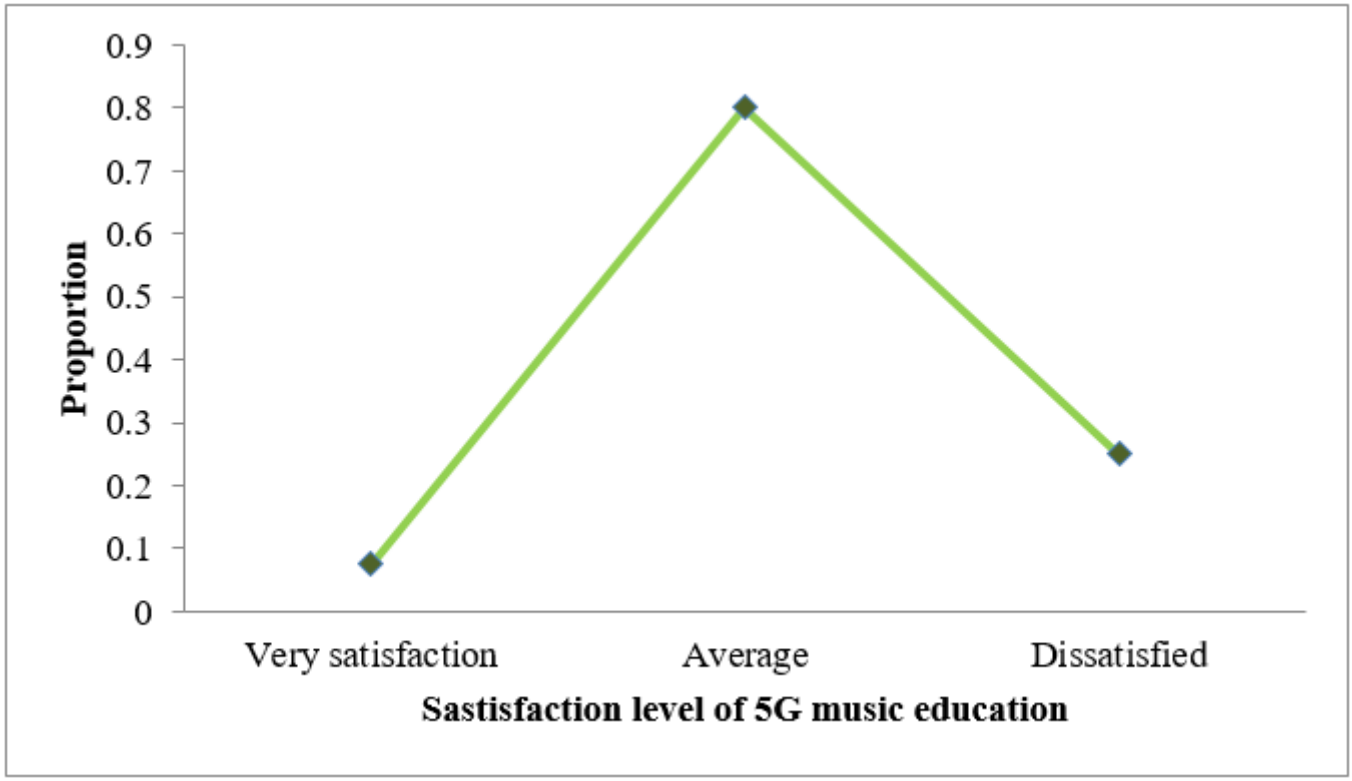

Figure 7

5G Music education satisfaction level

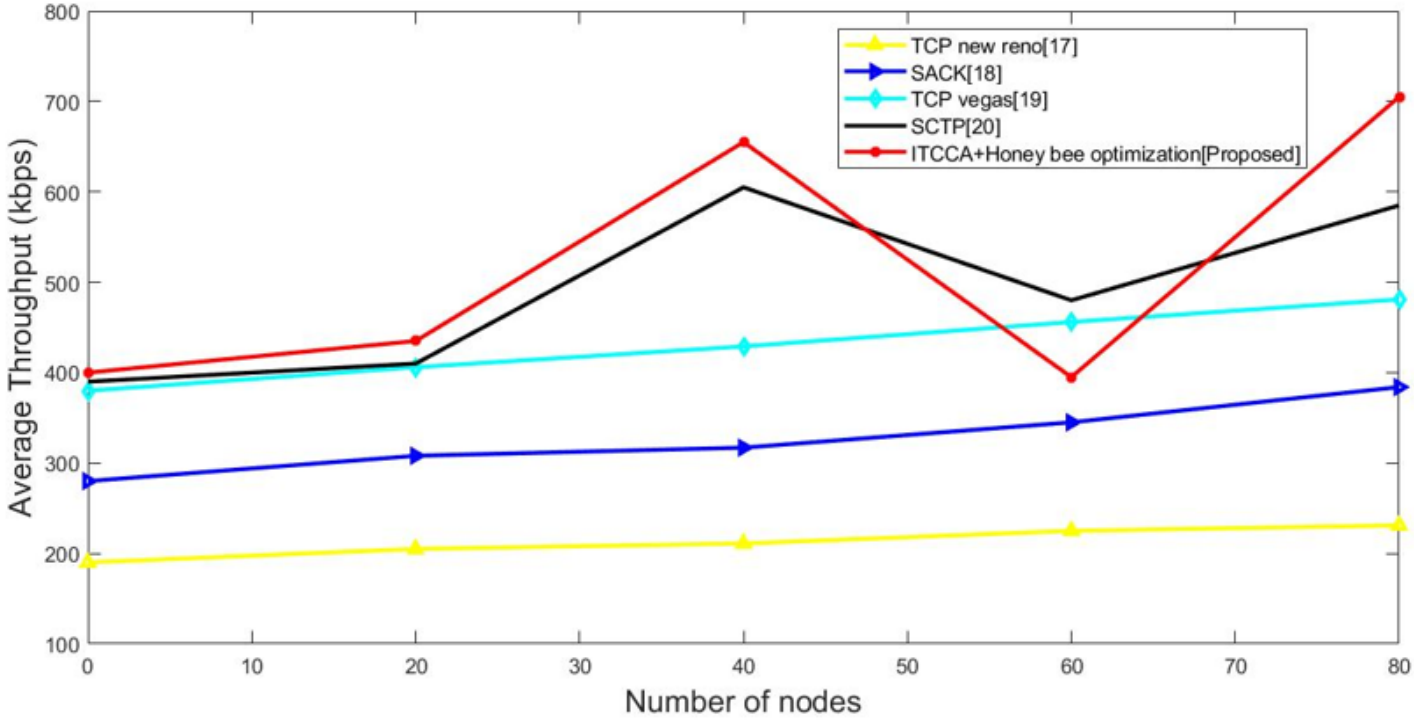

Figure 8

Throughput vs. number of nodes

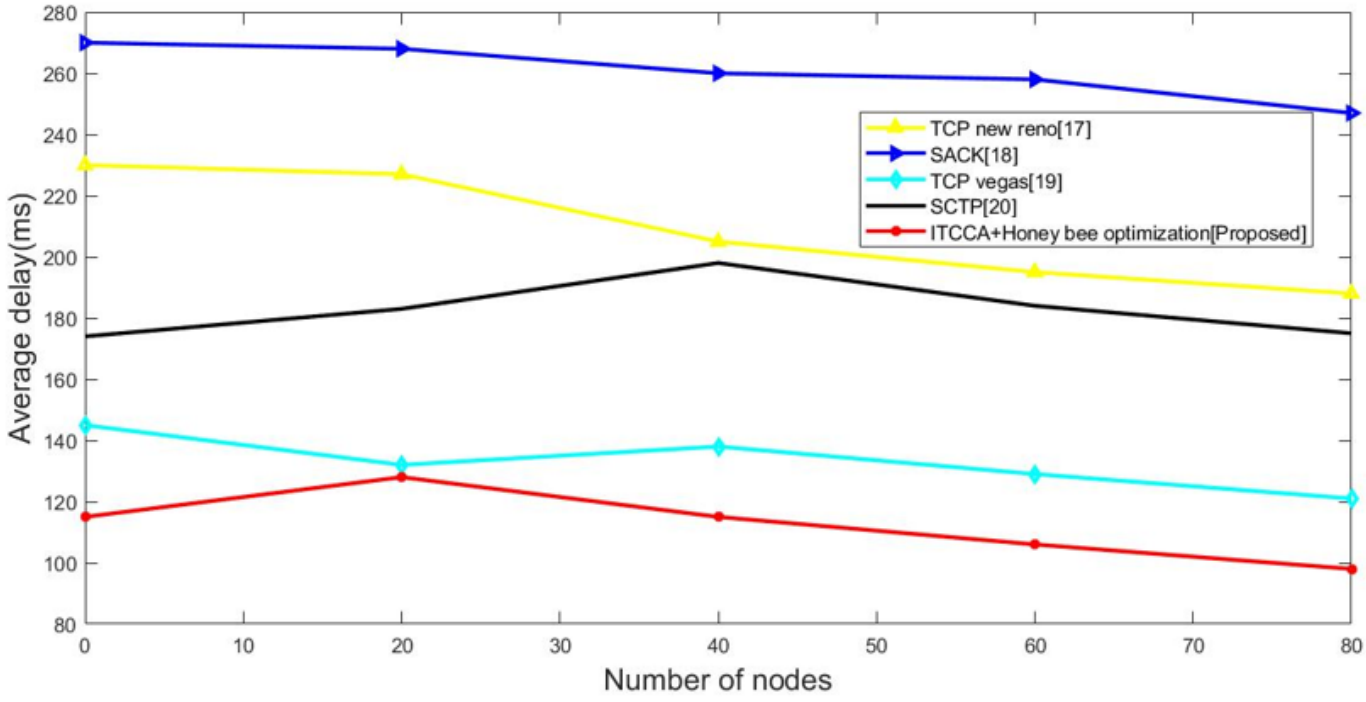

Figure 9

Average delay vs. number of nodes

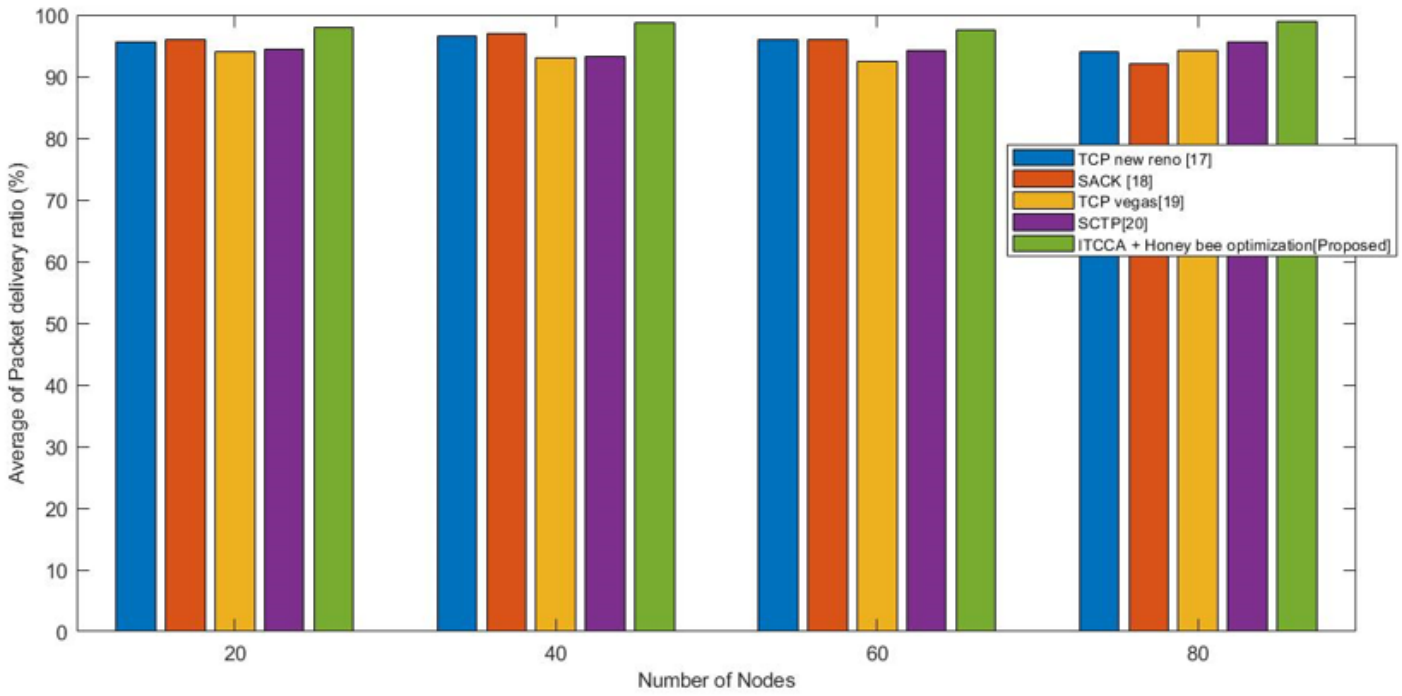

Figure 10

Average packet delivery ratio vs. number of nodes