

# ***Construction of a new Generation Network Course Management System Based on Full Link Live Broadcasting Technology: A Preliminary Discussion***

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**Abstract:** With the development of China's 5G technology, it has developed to a quite mature and complete degree, and many technologies and applications are born. China's online course industry, Internet, is still hastily transformed on the basis of traditional TV broadcasting teaching, which is difficult to meet the needs of modern education at present and in the future. Therefore, in this paper, combined with many years of experience in the original education management, the new generation of online course management system with full-link live broadcast is an important engine to provide energy source for digital empowerment. After testing, under the application background of the post-epidemic era, the system runs normally, stably and has the best performance. Each functional module can meet the design requirements and meet the actual application requirements. Reasonable and reasonable directly affects the online teaching quality of higher education.

## **1. Introduction**

In recent years, with the development of 5G technology in China, the support of information technology to social development has been increasing. The progress of 5G technology cooperation with the Chinese government is obvious to all. 5G was officially put into commercial use in June 2019. By 2022, the number of 5G base stations in the Chinese market has reached more than one million. It should be said that this is the largest commercial 5G network in the existing 5G network construction in the world, accounting for about 70% of the total number of 5G base stations in the world. At present, one million base stations can basically achieve 5G coverage of all cities in China.

5G technology has three characteristics: high rate, low delay and Dalian junction. In the high-speed part, according to the peak rate requirements of 5G, it is necessary to download 20gbps and upload 10gbps. However, at present, the mobile phone products of 5G technology can only down-

load 7.1gbps and upload 1gbps. Although there is still a gap compared with the theoretical value, it is much stronger than before.

However, for the education industry, the online class industry is hastily transformed and launched from the traditional TV and radio teaching in a short time under the birth of the epidemic. The object of traditional TV broadcasting teaching is ordinary students, and the transformation object of 5G Industrial Education in the Internet era is enterprise users. For example, the business model in the era of educational Internet is the platform model, and the business model in the era of full link live online class system is the vertical model. Such a fixed impression of the industrial Internet finally makes many people's understanding of the new generation of online courses not comprehensive. Some even regard it as a reformer of ordinary TV broadcasting when talking about the full link live online course system.

The one-sided and isolated understanding of the relationship between industrial 5G mobile Internet and traditional audio-visual education will eventually make the two not only unable to better promote each other, but also have a negative impact on the existing students' online class system if they continue to operate and build the online class system in accordance with the original TV broadcasting mode. Over time, with the end of the epidemic, many regional exchanges will gradually open up, and the traditional online classes will gradually decline.

Combined with the influence of the PC era and the mobile Internet era in previous years, the mobile Internet itself has developed to a quite mature and complete level, and many technologies and applications have been bred. It can be said that people's food, clothing, housing, transportation and many other aspects are deeply and comprehensively related to the species consuming the Internet. China is the largest mobile Internet application country in the world and has accumulated countless kinds of big data. When people's behavior and habits in the mobile Internet are transferred from offline to online, people not only enjoy the huge dividend of traffic, but also accumulate a large amount of data resources. Thousands of people, thousands of faces and intelligent push represented by big data and cloud computing are based on the huge data resources in the era of consumer Internet.

So today, if we look back on this history and regard the advent of the Internet era of the education industry as a new development model dominated by digital empowerment, the new generation of online class management system of full link live broadcast is an important engine to provide energy source for digital empowerment. Without the data accumulation in the era of mobile Internet, teaching by using traditional TV broadcasting will encounter an extremely embarrassing situation. Therefore, when 5G new generation Internet is born and gradually improved, we should pay attention to how to make the full link live broadcast new generation online class management system give full play to the energy of 5G mobile Internet, and realize the transformation and upgrading of traditional online class system under the epidemic and 5G mobile Internet dividend.

## 2. Basic Theory and Core Algorithm

The construction of a new generation of online course management system for full link live broadcasting is generally divided into two categories. The full link system platform mainly has two core and top-level requirements: full service and full link.

Therefore, the combination of basic technology theory and core technology should also focus on two indicators.

### 2.1 Linearly Independent

$$\alpha_1 \mathbf{v}_1 + \alpha_2 \mathbf{v}_2 + \dots + \alpha_n \mathbf{v}_n = \mathbf{0}$$

It is called vector set  $V_1, V_2, \dots$ . In vector space  $\mathbb{V}$ ,  $\mathbf{v}_1, \mathbf{v}_2, \dots$ , Linear combination of  $\mathbb{V}$ .

The goal of multi interest is to find a candidate set for each user from the feature set  $I$  of hundreds of millions of scale. The candidate set generally has thousands of products, which are related to the current interests of the user. Historical data is particularly important. Current interest is strongly related to historical behavior. Each sample can be expressed as a triplet  $(I_u, P_u, F_i)$ .  $I_u$  represents the goods that have interacted with users in history.  $P_u$  is the basic feature of the user (age, gender, etc.), and  $f_i$  is the feature of the product name (itemid).

Map the historical interaction features and basic features of each user into multiple vectors:

$$\mathbf{V}_u = f_{user}(I_u, P_u)$$

$$\mathbf{V}_u = (\vec{v}_u^1, \dots, \vec{v}_u^K) \in \mathbb{R}^{d \times K}$$

Then map the features into vectors:

$$\vec{e}_i = f_{item}(F_i)$$

Finally, Ann recalled top n:

$$f_{score}(\mathbf{V}_u, \vec{e}_i) = \max_{1 < k < K} \vec{e}_i^T \vec{v}_u^k$$

The final interest vector, target vector and loss function are as follows:

$$\Pr(i|u) = \Pr(\vec{e}_i | \vec{v}_u) = \frac{\exp(\vec{v}_u^T \vec{e}_i)}{\sum_{j \in I} \exp(\vec{v}_u^T \vec{e}_j)}$$

## 2.2 Core algorithm

Offline, the materials that need to be pushed into the warehouse are predicted into vectors, and the warehouse in is carried out according to the vectors.

Online, integrate the query or user information into a vector, request the database to find the closest materials and sort them according to the similarity.

Therefore, there are actually two things here: predicting the vector of materials, predicting the vector of user information, and calculating the similarity. In general, we can use interactive models with high accuracy, but the two steps of predicting material vectors and predicting query vectors are separated, which requires us to use only representational expressions. The professional point is twin networks:

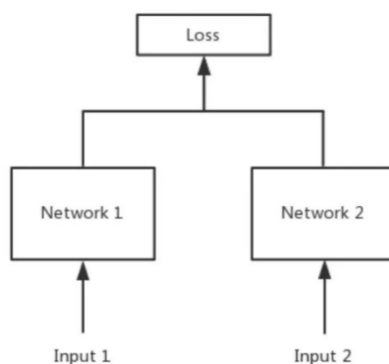


Figure 1: Twin-tower input structure

This is a complete twin-tower structure, involving two inputs, input1 and input 2. In search or dialogue, it is query and index query. In recommendation system, it is users and materials. We calculate the matching degree between them. We have two stages, training and prediction.

In the training stage, we mine samples in the form of input-input 2-label by tagging data or clicking data of users. With these three, we can complete the training of this model, namely network1 and network 2.

In the prediction stage, we have standard questions or materials offline, assuming that it is input1. At this time, we use network1 to predict. At this time, we can only get the output of input1, which is a vector and can be added to the vector index. On-line is the requested user query or user information, assuming that it is input 2. At this time, it can be predicted by network2, and the vector can also be obtained. This vector can request the vector index library to reach the vector closest to it, so we can think that it is to find input1 closest to input 2.

There are several points to note here:

Input1 and input 2 need to calculate the similarity after obtaining the representation vector through their respective network. Because of indexing tools, convenience and other reasons, we often choose simple forms such as cosine similarity and Euclidean distance as similarity measurement schemes.

The structures of network1 and network 2 may be the same or different, and the weights may or may not be shared. Generally, if input1 and input 2 are of the same nature and can be characterized in the same form, such as query, then the weight can be shared, that is, network1 and 2 are the same. Sharing here does not refer to interactive operations such as computer interaction matrix, but some building blocks can be shared in the prediction stage.

As for the specific model, it is actually a question of building blocks, and it is also related to the specific input content structure. In NLP field, it is word2vector, connected with CNN, LSTM or even transformer encoder and other operations, and the recommendation system has a more complex scheme combining with the characteristics. You can choose your own suitable building block combination according to the actual field.

### 3. Random Semantic Understanding Search Core Technology

#### 3.1 Microservice Architecture Technology

Happen along with Microservices and the popularity of architecture, services are split according to different dimensions, and a request often involves multiple services. Internet applications are

built on different sets of software modules, which may be developed by different teams, implemented by different programming languages, distributed in thousands of servers and spanning many different data centers. Therefore, we need some tools that can help us to understand the system behavior and analyze the performance problems, so that we can quickly locate and solve the problems when something goes wrong.

The whole-link monitoring component came into being under such a problem background. To understand the behavior of distributed systems in this context, it is necessary to monitor the related actions across different applications and different servers. Therefore, in a complex micro-service architecture system, almost every front-end request will form a complex distributed service call link.

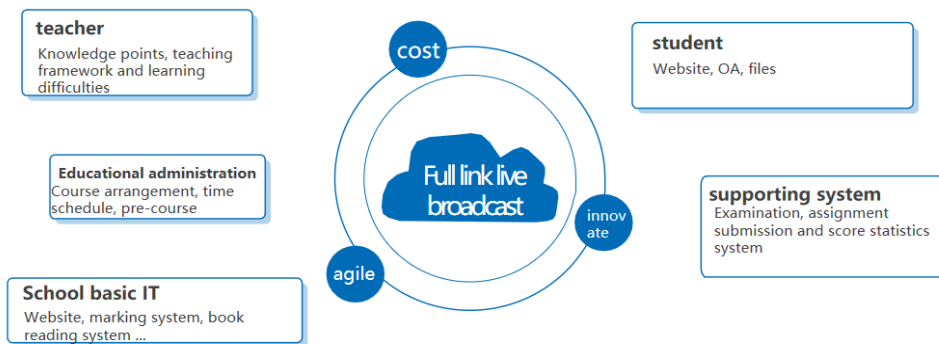


Figure 2: Microservice architecture

### 3.2 vector recall technology PDM for arbitrary targets

PDM (Point based Deep Match Model), a vector recall technology for arbitrary targets, can not only solve the problem of maximizing recall stage.

For the consistency of distribution between coarse-row model and fine-row model in coarse-row scoring space, here I propose the Whole Space Domain Adaptation Deep Pre-ranking Model (ESDM) model to solve this problem. For the problem of sample selection bias in precise arrangement, we can consider introducing external samples or exploring mechanism in this scene to obtain unbiased samples to solve this problem. Firstly, vector inner product maximization retrieval technology is introduced.

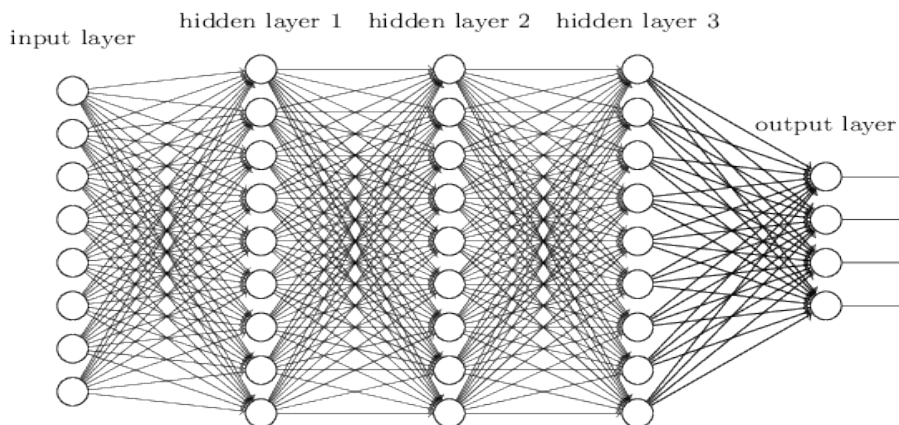


Figure 3: Multilayer neural network

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In addition, PDM framework has the following advantages:

Decouple pctr and bid. When the bid changes, a new vector can be generated by real-time bid weighting on the original vector without retraining the model or reproducing the vector, so as to realize the minute-level response. Improves the sensitivity of the recall stage to bid.

It can realize real-time regulation and control of policies, balance CTR and RPM by adjusting bid weight, and has strong controllability.

Various indirect targets of the back link can be explicitly aligned, and the interpretability is strong.

This greatly increases the system sudden optimization of unexpected events by the final schools and operators in the actual scene, approaching the daily needs and meeting the scene adaptation.

## **4. Characteristics and System Design of Online Courses**

### **4.1 Combined with the Overall Business Design Principles of Pedagogy Specialty**

In colleges and universities, the importance of course teaching has become increasingly prominent. How to implement the student-centered concept is a test of course teaching reform, and it is also an inevitable requirement to improve teaching evaluation methods and promote the modernization of teaching ability. This paper will sort out and design the current situation of college teachers' teaching evaluation, the analysis of the current situation of college teachers' teaching evaluation and the construction of "student-centered" college teaching.

The new generation network course management system is a tool of knowledge management. In the daily interaction between teachers and students, students and students, there are many generative resources, which will be recorded in the platform for students to use. After some summarization and combing, these generative resources can form knowledge. Building an integrated online teaching platform can not only provide students with abundant learning resources, but also make classroom information exchange more convenient with the help of advanced technology, which is conducive to students' autonomous learning. It can integrate abundant teaching resources with advanced and open network platform and provide a new way of "content plus platform", thus improving the core competitiveness of schools.

#### **4.1.1 Education Time Schedule**

Through practice, we find that the difference between online classroom and traditional classroom lies in that the former lacks peer groups in learning, while cooperation, discussion and inquiry among students are the core qualities of the course. In addition, if the online course teaching is arranged for 45 minutes, if the students do not preview in advance, it will be more likely to cause the students to be tired of attending the class, and the students will not know the important and difficult points in class. Without the influence of traditional classroom learning atmosphere, the efficiency of attending the class will be greatly reduced.



#### **4.1.2 Release Learning Objectives in Advance, and Discuss and Study in Groups**

Therefore, according to the design, we will divide 46 students in the class into 10 groups of 3-5 people, and set up discussion groups for online communication through the platform. In each group, the teacher will appoint a serious and responsible student as the group leader, who is mainly responsible for supervising and promoting group collective communication. The teacher will release 2-3 learning tasks before class, and the group leader will organize group members to discuss and explore, and report in turn.

#### **4.1.3 Pre-Download Control for Cloud Connection Student Interaction**

Due to the limited network environment of each student's C-terminal, the platform designed the technology of uploading and downloading in advance, and packaged and downloaded the required interaction and content in advance. During the network class teaching, only the key communication content was interacted according to the communication protocol, and most other content was calculated and displayed in the student terminal.

Interactive forms such as student presentation help to guide the reason why this class should be taught in this way — form and auxiliary number to solve problems, which reflects that the solution of problems comes from students' thinking, students' thinking and students' own knowledge system. In view of the introduction of form, the use of technology in presentation can be diversified, such as basic PPT presentation, geometric drawing board or GGB presentation, or even direct camera shooting and commenting, so as to make the interaction as accurate as possible.

#### **4.1.4 Consolidate Training to Seek Change, Data Feedback and Accurate Teaching**

Under the technical background, teaching will realize the deep integration of information technology and subject teaching based on the multi-media teaching environment with rich technology. Students will change from passively accepting knowledge to actively explaining the knowledge presented by teachers, and build their own knowledge structure subject by using rich learning resources on the basis of their existing cognitive level. However, it is difficult for traditional classrooms to realize a set of intelligent devices. At least the city where the author is located has not been realized. On the full-link management platform, students integrate resources, cooperate with each other, try to use technology to explore problems and take the initiative to show them, so that Internet learning breaks through the scope of schools and becomes a kind of cooperative learning under the general environment, which greatly promotes social learning and learning socialization.

Consolidation training is an indispensable link in mathematics teaching. Limited time can cultivate students' quick thinking ability and improve classroom efficiency; Then consolidate the knowledge framework repeatedly, check for missing information and fill in the gaps. In the era of big data, students and their weak points of knowledge can be accurately found. In the classroom, the platform can count the results of students' answers, help teachers to monitor the teaching effect, restate and count all the data in the whole course, and show them with the feedback of charts.

#### **4.1.5 Deliberately Train and Consolidate New Knowledge, and Personalize the Difficulties and Key Points of Recommending Students' Knowledge Points.**

The core algorithm of learning Xi Zhi is  $\text{success} = \text{core algorithm} \times \text{a lot of repeated actions}$ .

In the classroom, students have thoroughly understood the core algorithms, and only need to check for missing items individually. Of course, a large number of targeted repetitive actions are essential after class. In school teaching, teachers are surrounded by students to ask questions everywhere, but online classroom teachers and students are separated from each other, so it is difficult to answer questions and comment on homework after class. At the same time, the system provides a recording module, which can fully install the requirements of managers and simultaneously record the course locally and fully. Video of micro-class is recorded by the cloud blackboard from topic to knowledge point, and a video library is built. Students only need to choose their own knowledge to watch according to the path, which fully embodies the online principles of informationization, task-based, fragmentation and dynamics, and transforms the knowledge internalization in traditional classroom into step-by-step internalization, and changes the teaching center from teachers' teaching to students' learning.

In the 5G era, teachers, teaching materials and reference materials are no longer the only information sources of teaching content. Students can learn knowledge and acquire information much faster than teachers by using new technologies, so teachers must constantly update their knowledge structure. Improve their learning ability and change their role and position in teaching. A.L. Brown and A.S. Palincsar, American educational psychologists, put forward a teaching method aimed at improving students' self-learning ability, that is, interactive teaching. The "Internet+ Education" precise classroom model based on "cloud" fully abides by the principle of interactive teaching. In the classroom, teachers mainly play the role of organizer and facilitator by means of information technology, and design tasks for students. Students can improve their abilities in interaction through autonomous learning, cooperative learning and inquiry learning. With the influence of new technologies on education, the traditional teaching methods based on face-to-face teaching are changing to online learning and mobile learning. The teaching methods in primary and secondary schools should actively adapt to the development needs of the times, explore the deep integration of teaching methods and new technologies, and cultivate new talents that meet the requirements of the times.

## 4.2 Science Curriculum Management Module

The curriculum setting management module is mainly used for arranging and planning courses. The design idea is that before the formal arrangement of courses, it is necessary to automatically generate a class plan for each major teaching with the help of the system, and send the plan report to the teachers, which is convenient for the teachers to carry out teaching work according to the class plan.

### 4.2.1 Curriculum Setting Module

The course setting module is divided into two sub-functions. One function is to arrange a small number of classrooms planned to start classes before entering the course arrangement, and the other function is to locally control and adjust the schedule information according to the actual teaching needs after the course arrangement.

The specific design method is as follows:

- (1) Determine the priority of the class plan;
- (2) Find out the plan number corresponding to the course;
- (3) Using binary coding

Determine the specific time of class arrangement, etc.



## 4.2.2 Automatic Course Scheduling Module

As an important functional module of the system, the automatic course arrangement module mainly designs the automatic course arrangement function from the following aspects with the help of related algorithms in the concrete design.

- (1) Determine the semester start plan;
- (2) arrange the priority class plan;
- ③ The system automatically generates the initial population;
- ④ With the help of related particle swarm optimization algorithm, the final results are optimized;
- ⑤ Determine the corresponding time and classroom for class arrangement.

### 4.2.3 Curriculum inquiry module

The curriculum query module design idea is:

- (1) Determine the schedule information to be searched;
- ② With the help of class number, student number and teacher number, we can quickly inquire about the information of course plan and course arrangement. At this time, the system will automatically display the class number, classroom number and specific time schedule corresponding to the class, students and teachers, so that teachers and students can fully understand their actual course situation.

## 4.3 Design of High-Stability Live Network Teaching Platform

The platform integrates the advantages of high bandwidth and low delay of the network, and meets the requirements of fast load balancing of different channels in high-speed mobile state, thus achieving smooth mobile video transmission effect. The platform includes: integrating mobile low-loss video acquisition and compression (audio and video information is transmitted to the transmitter by video acquisition devices such as cameras, drones and cameras through HDMI or SDI interfaces)-multi-link adaptive transmission and assembly (after receiving audio and video information, the transmitter compresses and encodes it according to H.264 standard, and then transmits it to the receiving server through multi-link aggregation methods such as 5G or LAN); —— High-performance distribution engine (the server can quickly process the received IP stream and output standard UDP stream and RTMP stream in real time), —— whole process control (nanny-style live broadcast technology integrated service, self-built active page) —— multi-mechanism decoding and multi-link integration. Compared with the traditional live broadcast system, it is faster, more stable and multifunctional.

Real-time response environment of characteristic network teaching platform

Monitoring the speed of the network is like a crash in a certain lane, and the speed at which the vehicles behind avoid this lane. If the speed of avoiding is not fast enough, a series of accidents will happen, which will not only affect this lane, but also drag down other lanes. From the technical level, it is how to quickly monitor the network jitter and respond in time, which is called the biggest problem in the industry.

There are three popular schemes:

First, front-end feedback based on the data collected by the back-end;

The second is to return based on the congestion of the front end;

The third is to transmit some test data by technical means.

## 5. The use of the Platform and the Problems Found

## **5.1 Experimental Effect**

### **5.1.1 Teacher level: Save Time and Improve Efficiency**

The platform can save a certain amount of time, and teachers can spend more time on instructional design and scientific research to promote professional development. In the mixed teaching process, the knowledge points explained in the traditional classroom are put on the integrated online learning platform as the pre-learning content. In this way, the face-to-face teaching time can not only be used to organize students to carry out activities such as autonomous learning and group discussion, which reflects students' dominant position, but also can be used to focus on answering questions and individual tutoring, which fully reflects teachers' dominant position.

### **5.1.2 Student Level: Stimulate Enthusiasm and Improve Efficiency**

Platform, students internalize their knowledge by participating in various mutual learning and collaboration, which is conducive to all-round development. In the traditional classroom, some students are afraid to communicate with teachers, and the integrated learning platform can change this situation and encourage students to speak actively. Students are very interested in the teaching mode based on the integrated online learning platform. They can watch videos repeatedly after class to enhance the learning atmosphere. On the one hand, students can gain a sense of accomplishment by watching videos after class to further understand the key points and difficulties. On the other hand, it can improve students' interest in learning, and the two complement each other to form a virtuous circle.

## **5.2 Three Problems that can Not Be Ignored in the Experiment**

### **5.2.1 The Role of Teachers**

The platform has high requirements for teachers' information technology ability, which requires teachers to help students solve technical problems in time during the teaching process. On the other hand, the growing background of open education teachers easily leads them to teach open education students by the teaching methods of ordinary colleges and universities. Therefore, it is easy for open education teachers to ignore students' initiative, creativity and participation.

### **5.2.2 Students' Consciousness**

This platform requires learners' self-consciousness, so they need to prepare well, otherwise they will have little knowledge. Some students are not self-disciplined, and unconsciously browse websites or social software that have nothing to do with learning, so it is difficult to improve their learning efficiency.

### **5.2.3 Suitability.**

The platform needs a lot of configuration to meet all courses. For example, it is difficult to achieve the expected results by watching micro-courses to learn engineering courses, but for liberal arts courses, it can play a role in expanding knowledge and improving learning interest. In order to ensure learners' learning efficiency, it is necessary to analyze students' learning needs, learning styles and interests in order to provide targeted learning support services.

## 6. Conclusion

Through the construction and experiment, we found that the new generation online course management system of full-link live broadcast can optimize the original teaching effect. According to modern teaching theory, learning theory, communication theory and teachers' experience, an operable process of planning and arranging teaching activities includes learning needs analysis, learning content analysis, learner analysis, learning goal analysis, teaching strategy design, teaching material development, formative evaluation and summative evaluation, etc.

However, technology and platform are only learning resources and tools, and the real core is students. Therefore, teachers need to master the latest and most convenient teaching methods and put the cultivation of students' individualized thinking and high-level thinking at the core. Besides guiding students to make learning plans and learning paths suitable for individual students according to their characteristics, we also need to pay attention to students' psychological changes and learning progress. Make personalized diagnosis according to data analysis, push targeted exercises and courses, and let students improve their grades quickly.

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