# Research on the Application of Artificial Intelligence Machine Learning Technology in Enterprise Information System

Haiying Cheng*
Wuchang Shouyi University, Wuhan, Hubei, 430064, China
chenghaiying@wsyu.edu.cn

## ABSTRACT

The article systematically analyzes the connotation of enterprise informatization construction, and discusses the key technologies of enterprise informatization system. This paper analyzes the problems in the information system of manufacturing enterprises, and on this basis, puts forward the goal of building an information system for artificial intelligence machine learning algorithms, and discusses the basic framework of the enterprise information system with ERP as the main tool, planning and design the network topology and system function structure of the information system are described.

## CCS CONCEPTS

• **Computing methodologies**; • **Artificial intelligence**;

## KEYWORDS

Artificial intelligence, machine learning algorithm, enterprise information management, information system

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## 1 INTRODUCTION

Enterprise information system modeling is a hot topic of current research. A good model will give a strict definition of the nature of the system to be constructed or analyzed, and it will also provide a basis for the realization and verification of these systems. In order to describe the system behavior of different levels, different subsystems, and different aspects of a complex system, people have developed and studied a variety of models and methods, hoping to use these models and methods to promote the solution of problems [1]. The more commonly used models and methods include Markov chain, neural network, GA, queuing theory and Petri net (PN), etc. Enterprise informatization usually takes the implementation of ERP as a breakthrough, based on ERP system and gradually expanded to computer-aided design and manufacturing (CAD/CAM), CRM, decision support system (DSS) and expert system (ES). Designing a general information system based on ERP is of great significance for accelerating the informatization process of manufacturing enterprises.

*Corresponding author.


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## 2 ARTIFICIAL INTELLIGENCE MACHINE LEARNING ALGORITHM

### 2.1 BP neural network algorithm

Suppose a three-layer BP network, input nodes, hidden layer nodes, and output nodes. The network weight between the input node and the hidden layer node, and the network weight between the hidden layer node and the output node. When the expected value of the output node, the calculation formula of the model is as follows:
Error of output node

$$E = \frac{1}{2}\sum_{l}(t_l - z_l)^2 = \frac{1}{2}\sum_{l}(t_l - f(\sum_{j} v_{lj}y_j - \theta_l))^2 \quad (1)$$

The derivative of the transfer function f(x)
S-type function $f(x) = \frac{1}{1+e^{-x}}$.
But

$$f'(x) = f(x)(1 - f(x)) \quad (2)$$

$$f'(net_k) = f(net_k)(1 - f(net_k)) \quad (3)$$

Output node

$$z_l = f(net_l) \quad (4)$$

$$f'(net_l) = z_l(1 - z_l) \quad (5)$$

Output node

$$y_j = f(net_j) \quad (6)$$

$$f'(net_j) = y_j(1 - y_j) \quad (7)$$

There are two methods to find the function gradient: incremental and batch processing. The incremental mode is to recalculate the gradient and adjust the weight for each additional input sample; the batch mode is to use all the input samples to calculate the gradient and then adjust the weight.

### 2.2 Exponential smoothing

Exponential smoothing is one of the most commonly used forecasting methods and is a deterministic time series analysis technique. For a group of observational data $x_1, x_2, \cdot sx_t$, in an orderly manner in time, the average calculated from the observations for n consecutive periods can be used as the predicted value for the next period, that is, t+1 period, that is, $F_{t+1}$ represents

$$F_{t+1} = \frac{1}{n}\sum_{i=t-n+1}^{t} x_i \quad (8)$$

This prediction method is called moving arithmetic average method. Its advantage is simple calculation, but its disadvantages are: 1. There are more historical data to be saved. For example, there are a lot of forecasting projects. A large amount of historical data must be saved; 2. It treats all data equally, and from an intuitive and empirical point of view, we are predicting the closer you are to the current data, the more important it is; 3 It can only be used for time series with a horizontal trend [2]. When the time series has an obvious trend of increase or decrease, the moving arithmetic average method cannot quickly adapt to this change. The exponential smoothing method evolved from the moving arithmetic average method. In fact, from equation 8) we know

$$F_t = \frac{1}{n}\sum_{i=t-n}^{t-1} x_i \tag{9}$$

Equation 10) minus (11) is

$$F_{t+1} - F_t = \frac{1}{n}x_t - \frac{1}{n}x_{t-n} \tag{10}$$

Let $F_t$ replace $x_{t-n}$ , $a = \frac{1}{n}$ in the formula, we can get

$$F_{t+1} = ax_t + (1-a)F_t \tag{11}$$

$$F_{t+1} = F_t + a(x_t - F_t) \tag{12}$$

This formula can be understood as the predicted value at the next moment is equal to the predicted value at this moment plus an error correction term. This is an exponential smoothing method. Compared with the moving arithmetic average method, it has the following advantages: (1) There is no need to store the historical data of the past n times. When predicting the value $F_{t+1}$ at time t+1 at time t, you only need to know the actual value $x_i$ and the predicted value $F_t$ at time t; (2) unequal weight processing is performed on the data at different times. Sequentially, the expression of $F_t, F_{t-1}, \ldots F_2$ is introduced into the formula to obtain

$$F_{t+1} = ax_t + a(1-a)x_{t-1} + a(1-a^2)x_{t-2} + \ldots a(1-a)^n x_{t-n} \tag{13}$$

It can be seen from the above formula that the weight of $x_t$ is a(1-a), because 0<1-a<1, the increase of these weights gradually tends to zero. This is the origin of exponential smoothing, and it also conforms to the principle that the closer the data is to the present, the greater the impact on future forecasts.

# 3 THE CONNOTATION AND KEY TECHNOLOGY OF ENTERPRISE INFORMATION SYSTEM

## 3.1 Connotation of information system

Enterprise informatization involves the whole process of enterprise production, operation and management. For manufacturing enterprises, it mainly includes the informatization of production process control, management, and supply chain.

1) Informatization of production process control

The informatization of production process control is the development and sublimation of control technology automation, and it is a key link in the informatization of manufacturing enterprises, especially mass production assembly line operation methods [3]. Its main content is to comprehensively use automatic control technology, simulation technology, microelectronic technology, computer and network technology to monitor and control the whole production process, and improve product quality and production efficiency. The focus of informatization of production process control is product development and design, production process flow, workshop site management, quality inspection and other design and production links.

2) Informationization of enterprise management

The informatization of enterprise management is the most important, difficult, and widely used field in the construction of enterprise informatization, involving various businesses and levels of enterprise management. The informatization construction of enterprise management is based on standardizing basic management work and optimizing business processes, and effectively collecting, processing, organizing, and integrating information resources through information integration application systems, improving management efficiency, and providing management information and decision-making dynamically in real time information.

3) Informationization of enterprise supply chain management

Under the conditions of the modern market economy, enterprise production is no longer a separate, isolated, and closed mode, and the production and management activities of the enterprise have been extended and delayed. From the procurement, transportation, storage, processing and manufacturing, sales of raw materials and parts to the final delivery and service to customers, the company has formed a line consisting of upstream suppliers, intermediate producers and third-party service providers, and downstream sales customers. The chain structure, this is the supply chain. The production activities and management processes of manufacturing enterprises are restricted and affected by this supply chain. Therefore, the informatization of enterprise supply chain management is a very important part of manufacturing enterprises [4]. The focus is to use technical resources such as corporate local area networks, Internet, databases, and e-commerce to integrate internal management and external supply, sales, and services through the information management and coordination of suppliers, third-party service providers, and customers. Together, improve the market adaptability of manufacturing enterprises.

## 3.2 Key technology

Enterprise information system includes enterprise network, office automation system, enterprise resource planning (ERP), management information system (MIS), decision support system (DSS), product data management (PDM) system, electronic commerce (EC) system, information security The core technology of the prevention system (ISS) is ERP, PDM, SCM, CRM, and the internal network of the enterprise is the supporting platform for resource sharing. Among them, ERP is an important means to improve the efficiency of enterprise management. It is not only the application of software systems, but also a brand-new management concept. It is the core of enterprise informatization. All other systems need to be designed with ERP as the center; PDM is the management of all and Product-related information (including part information, configuration, documentation, CAD files, structure, authority information, etc.) and all product-related processes (including process definition and management) technology help the company's production line personnel to achieve production plans, material requirements and

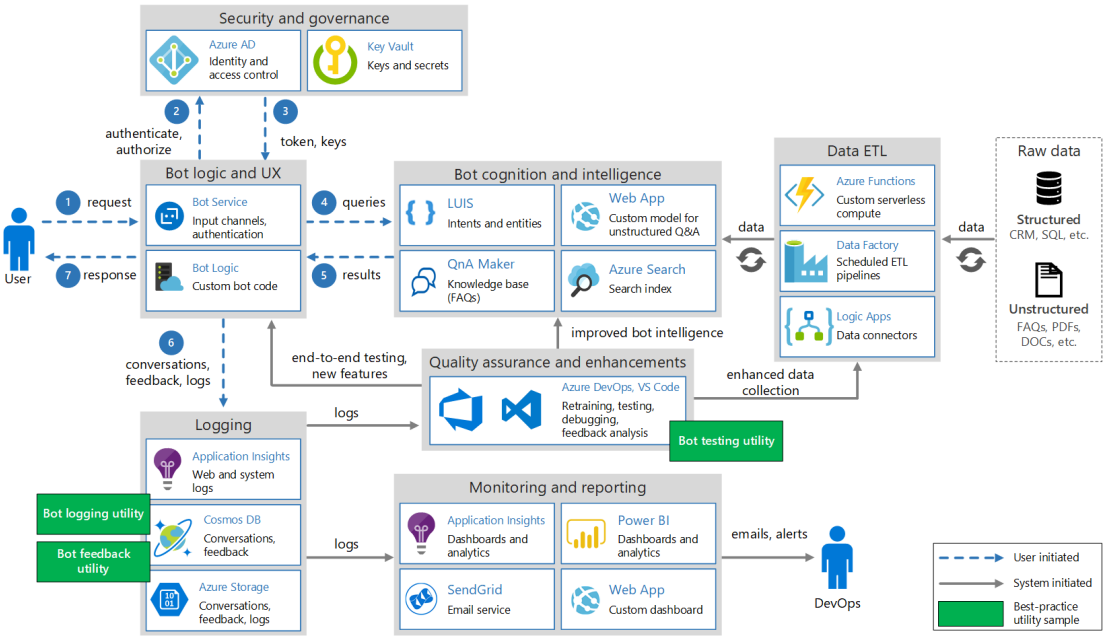


**Figure 1: Internet-based enterprise information system architecture**

Summarization, inventory material balance, production statistical analysis, production status query, report generation, cost control, establishment and maintenance of basic data required for the production process such as bill of materials, material settings, demand types, and factory calendars; SCM is based on ERP Developed, it merges the company's manufacturing process, inventory system, and data generated by suppliers, and displays various influencing factors in the product construction process from a unified perspective. It is mainly a system that integrates the entire supply chain information and planning decisions, and automates and optimizes the information infrastructure [5]. The goal is to achieve the optimization of the entire supply chain. It is a new decision-making intelligent software that covers all on top of the supply chain company's ERP and transaction processing system; the CRM system starts from receiving the customer's service request, and tracks the execution of the service task throughout the process, forming a complete customer relationship chain composed of suppliers and customers.

## 4 INFORMATION SYSTEM DESIGN

### 4.1 Overall structure

The Internet-based enterprise information system architecture can be divided into 4 layers, as shown in Figure 1

The first layer: the interface layer, used to realize the data transfer between the ERP system and the banking system, communication system, internal departments and customers of the enterprise. Compared with the original management model based on the internal network of the enterprise, it uses the Internet as the transmission basis, and its security The performance is far more complicated than traditional ERP, so all users participating in data communication must be authenticated by the certification center (CA) and obtain the corresponding authorization before logging in to the system.

The second layer: the database management layer, composed of the data center and central database of the ERP, SCM, PDM, EC system itself, used to realize data collection and classification storage, the data comes from the application layer, and at the same time responds to the interface layer through the software interface Request and feedback results are stored in the log file of the central database.

The third layer: Application layer, is the specific application of enterprise information management system, including ERP (Enterprise Resource Planning System), SCM (Supply Chain Management System), PDM (Product Data Management System), EC (E-Commerce System), various systems Complete its own data processing tasks, and realize data transmission through the Internet network to form a complete information management platform [6]. The storage of its data is undertaken by the respective data center, and it is output to the enterprise internal and external at the same time.

The fourth layer: the output layer, which is output by the enterprise information management system to the inside and outside of the enterprise. Its forms mainly include account books, reports, and query results. It can be output in the form of files, printouts, or through websites. System users can also receive important data on mobile terminals such as mobile phones or handheld computers through WAP (Wireless Transmission Protocol).

### 4.2 System flow

The Internet-based enterprise information system takes ERP as the core, PDM, SCM, and CRM complete their respective information processing, and input the corresponding data into the ERP system through the corresponding interface, and use the Internet to realize

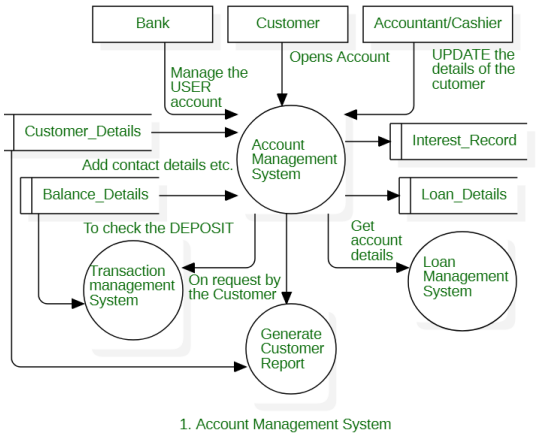


**Figure 2: Data flow chart of Internet-based enterprise information system**

the sharing of data and equipment. The process is shown in Figure 2

## 4.3 System function

The enterprise information system is very huge, involving all aspects of production, operation, management, and decision-making. It is composed of multiple internal subsystems within the enterprise and is closely connected with the external environment of the enterprise. It is an open system with a high degree of cohesion. Therefore, when the system function planning is carried out, it is necessary to organize in the way of modules (subsystems), according to the relatively independent modules of the high aggregation within the modules, and only design the low coupling principle of one data entry and one data exit between the modules to minimize the cost of system upgrades and maintenance. Taking supply chain management (SCM) as an example, its business model is shown in Figure 3, and functions are divided accordingly.

(1) System initialization: Mainly used for basic data setting and user management. (2) Manufacturing management: Realize functions such as production order, production plan, dispatch/completion, production log, blanking/requisition, product assembly management, working hours management, statistical analysis, schedule analysis, and subcontracted processing management. (3) Purchasing management: realize the management of purchasing plan, production and sporadic purchasing. (4) Warehouse management: realize three-level warehouse management of raw material warehouse, semi-finished product warehouse and finished product warehouse. (5) Sales management: Invoicing management for the finished product warehouse. (6) Fund management: mainly includes functions such as accounts receivable and payable, fund planning, fund execution, and comprehensive statistics. (7) Product quality management: to realize the quality supervision and control of the whole process from raw material procurement to product generation. (8) Equipment management: realize the functions of equipment account, overhaul and maintenance, and accident management. (9) Customer relationship management: to realize the management of clients, suppliers and other dealing units. (10) Cost accounting: including fixed cost management, actual cost report, cost comparison analysis and other functions.

## 4.4 Planning of the database system

Database is an important part of enterprise information system. It is responsible for storing basic data, permanent data and temporary data in the system. It is also the basis for cost analysis and information output. Commonly used database systems include MS SQL Server, Oracle, DB2, Sybase, etc., each with its own advantages. Information systems must comply with two principles when choosing a database system: one is the unified principle, that is, each subsystem uses the same database system to meet the needs of data conversion between different databases; the second is the performance principle, that is, the query speed should be fast Because of the huge amount of data in the information system and strong real-time performance, database performance tends to become one of the bottlenecks of the system.

## 4.5 System process optimization

The system uses a distributed database to store data. Each subsystem has its own sub-database. A central database is set up in the financial department. Each subsystem transmits to the financial department while calculating internally. The automatic processing of data is realized through the trigger engine mechanism. At the same time, the B/S structure is adopted, and each user logs in to the system on the browser, and uses account numbers and permissions to distinguish different user types. According to the company's main business, optimize the restructuring business process, and design the processing procedures separately with the application as the main line. The supply chain management ERP subsystem business after process optimization is shown in Figure 4

# 5 CONCLUSION

Taking the enterprise cluster as a large system, using multi-level distributed computer systems to establish an enterprise local area network, and integrating the parts ERP system into the enterprise local area network so that the enterprise cluster can share, this will greatly improve the production efficiency of the enterprise cluster. This design mode is undoubtedly the most novel design idea today. The process of enterprise informatization usually starts from the implementation of ERP, and then gradually introduces various professional processing systems, and integrates them into ERP through the interface provided by ERP to make up for the comprehensive ERP system but the lack of professional processing capabilities to achieve production and operation., Management Informa ionization. However, enterprise informatization is a huge systematic project, which requires not only excellent management software, but also advanced management concepts and professional talents. The simultaneous improvement of technology and management can maximize its advantages.

# REFERENCES

[1] Chatterjee, S. Kar, A. K. & Mustafa, S. Z. Securing IoT devices in smart cities of India: from ethical and enterprise information system management perspective. Enterprise Information Systems, vol. 15, pp. 585-615, April 2021.

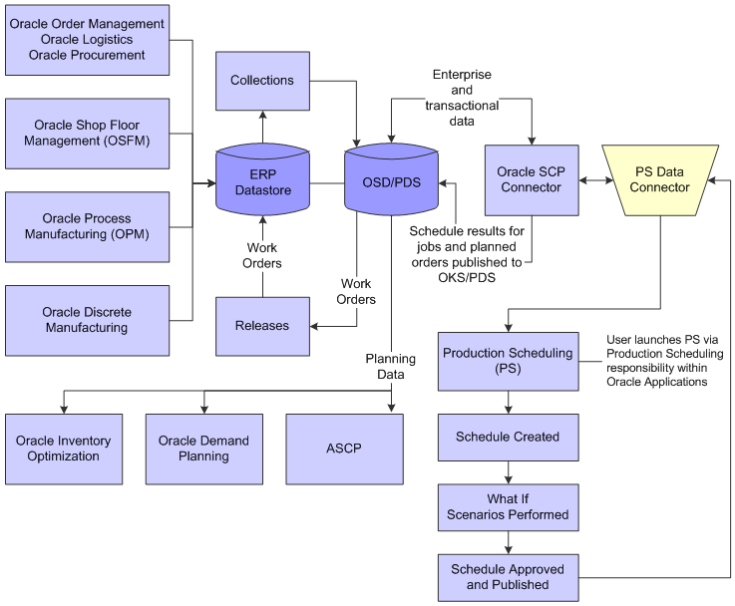


**Figure 3: Supply chain management business model of manufacturing enterprises**

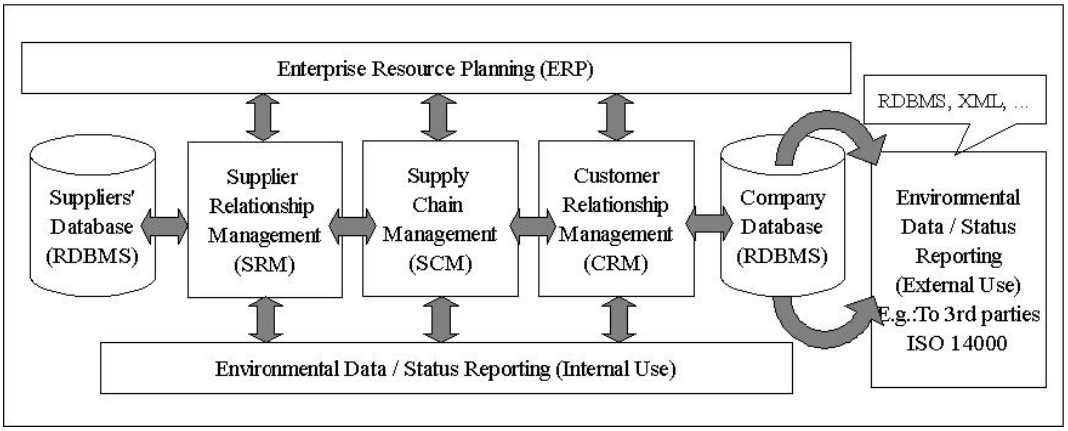


**Figure 4: The business process of the ERP subsystem in the supply chain**

[2] Anthony Jnr, B. Managing digital transformation of smart cities through enterprise architecture–a review and research agenda. Enterprise Information Systems, vol. 15, pp. 299-331, March 2021.
[3] Qu, Y. Ming, X. Ni, Y. Li, X. Liu, Z. Zhang, X. & Xie, L.An integrated framework of enterprise information systems in smart manufacturing system via business process reengineering. Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture, vol. 233, pp. 2210-2224, October 2019.
[4] Cui, C. Li, F. Li, T. Yu, J. Ge, R. & Liu, H. Research on direct anonymous attestation mechanism in enterprise information management. Enterprise Information Systems, vol.15, pp. 513-529, April 2021.
[5] Jia, G. Zhu, Y. Han, G. Chan, S. & Shu, L. STC: an intelligent trash can system based on both NB-IoT and edge computing for smart cities. Enterprise Information Systems, vol. 14, pp. 1422-1438, September 2020.
[6] Moisescu, M. A. Sacala, I. S. Dumitrache, I. Caramihai, S. I. Barbulescu, B. & Danciuc, M. A cyber-physical systems approach to cognitive enterprise. Periodicals of Engineering and Natural Sciences (PEN), vol. 7, pp. 337-342, January 2019.