Research on the Influence of Artificial Intelligence on Economy and Society

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Abstract. The history of social development is the history of technological progress. Social development provides a good external environment for AI, and AI promotes social development. This paper analyzes the social system from a macro perspective, and studies the impact of artificial intelligence on the economic, employment, legal, life and ethical issues in the social system, as well as the relationship between the various elements. The fuzzy cognitive map (FCM) model is constructed through expert investigation, and the evolution of reasoning simulates the changing trend of social state. Finally, the profound impact of the development of artificial intelligence on the society is elaborated from different perspectives, which provides reference for the government, enterprises and institutions and teenagers to cope with future challenges.

Keywords: artificial intelligence, social system, influencing factors, fuzzy cognitive map, expert survey.

1. Introduction
As the core driving force of the new round of industrial transformation, artificial intelligence will further release the huge energy accumulated in the previous scientific and technological revolution and industrial transformation, reconstruct various links of economic activities such as production, distribution, exchange and consumption, trigger major changes in economic structure, profoundly change the mode of production and living and thinking, and realize the overall leap of social productivity.

From the theoretical level, the relevant literature directors studied the impact of AI on the future society [1] [2] [3], social development [4], social application [5] [6], employment [7], etc. Fuzzy cognitive map is applied to strategic planning, policy analysis and other fields because of its strong fuzzy information and causal relationship expression ability, simple reasoning and good explanatory ability [8]. In this paper, through the method of text mining and expert survey, we build a fuzzy cognitive map model of system element relationship, objectively analyze and study the impact of artificial intelligence on social system, hoping to provide some new ideas for related research, and provide reference for the government, enterprises, institutions and teenagers to meet the future challenges.
2. Construct fuzzy cognitive map

2.1. Fuzzy cognitive map

Fuzzy cognitive map (FCM) is a ternary order group:

\[ <X,E,W> \]  

\[ X = \{X_1, X_2, \ldots, X_N\} \] represents a collection of N conceptual nodes in the FCM diagram. \( E = \{<X_i, X_j> | X_i, X_j \in X\} \) represents a directed arc with a causal association between all conceptual nodes in the FCM diagram. W represents the link matrix of the link weights between the concept nodes, and \( w_{ij} \) represents the interaction between the concept i and the concept j.

The state of the FCM model is determined by the value of the concept node after iterating t times. The mathematical model of FCM reasoning is as follows:

\[ X_j(t+1) = F(\sum_{i \in S} X_i(t)w_{ij}) \]  

\[ X_i(t) \] represents the state value of concept node \( X_i \) at time t; \( X_j(t+1) \) represents the state value of concept node \( X_j \) at time \( t+1 \); t is discrete time, \( t = 0,1,2,3\ldots T \); F is a transformation function, which can normalize the values of concept nodes to a proper range.

\[ F(x) = \frac{1}{1 + e^{-cx}}, c > 0 \]  

2.2. Expert Opinion Synthesis

This paper uses fuzzy cognitive graphs to build a model of the problem, taking into account both qualitative and quantitative factors, and tries to make a more scientific evaluation of artificial intelligence from various aspects.

Expert opinion synthesis needs to evaluate the credibility of each expert (article) and assign corresponding weight to its fuzzy cognitive map. Therefore, for experts 1 ~ k, the calculation method of the adjacency matrix of the final synthetic fuzzy cognitive map is as follows:

\[ E = \frac{1}{\sum_{i=1}^{k} w_i} (w_1E_1 + w_2E_2 + \cdots + w_kE_k) \]  

If it is not convenient to evaluate the credibility of experts, it can be assumed that the contribution proportion of each expert (article2) to the final fuzzy cognitive map is the same.

\[ E = \frac{1}{k} (E_1 + E_2 + \cdots + E_k) \]  

For example, from articles 1 and 2, we can see the impact of AI on the economy and jobs as follows:

\[ \text{Figure 1. Article 1-2 fuzzy cognitive map.} \]
The corresponding adjacency matrix is:

\[
W_1 = \begin{pmatrix}
1 & 1 & 1 & -1 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & -1 & -1 & 0 & 0 \\
0 & 0 & 0 & 0 & -1 & -1 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
\end{pmatrix}
\]

\[
W_2 = \begin{pmatrix}
0 & 1 & 1 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
\end{pmatrix}
\]

First, the concept nodes with the same meaning and different names, such as "job" and "unemployment", are transformed into consistency. Then, the adjacency matrix of the two fuzzy cognitive graphs is merged, and the corresponding combined fuzzy cognitive map is as follows:

Figure 2. Combined fuzzy cognitive map.

From the combined fuzzy cognitive map, we can see that when the number of intelligent factories built with artificial intelligence technology is increasing, production safety and product quality are significantly improved and production speed is also significantly accelerated, which will lead to cost reduction and output value increase. However, as computers are tireless and maintenance cost is lower than that of human beings, the salary will be paid. Expenditures will continue to decrease, which has resulted in the reduction of human jobs, but the reduction of costs will drive down the price of products, which will stimulate the increase of user demand and generate other new demands, which requires manufacturers to carry out a new round of product innovation and product development, so a certain number of jobs will be added. However, the number of new jobs will be less than those lost, and workers need to have higher quality, ability and creativity.

In addition, we build the expert views into a fuzzy cognitive map through interviews with relevant experts, and constantly adjust and merge them to get the final fuzzy cognitive map as follows:

Figure 3. Clustering fuzzy cognitive map.

3. Data Visualization And Analysis

3.1.1. Determine the initial state value of the indicator. According to the actual situation and the expert designation, the initial state value of the indicator is given as \(X(0) = (0.5, 0.2, 0.3, 0.6, 0.3)\).
3.1.2. Convergence analysis of index state. According to the FCM reasoning mechanism, the initial state is fuzzy reasoned by MATLAB software. After eight iterations, the stable state vector is obtained: \( X(8) = (0.5368, 0.5798, 0.6133, 0.5597, 0.5737) \).

Select several indicators with large state value changes to draw their iterative change chart as shown in the figure:

![Figure 4. Iterative change chart.](image)

It can be seen from the above figure that after deductive reasoning, the five indicators are all in an upward trend and finally reach a stable state, which is consistent with the initial prediction.

4. Analysis of the impact of artificial intelligence on society

4.1. Economics and obtain employment
Artificial intelligence systems have created considerable economic benefits. With the continuous decline of computer prices, artificial intelligence technology will be further promoted and produce greater economic benefits. The degree of automation will increase rapidly, labor productivity will increase by a factor of 100, and emerging industries will develop at an unprecedented speed and scale.

The social structure of man machine will eventually be replaced by that of man intelligent machine. Because artificial intelligence can take the place of human beings to do all kinds of mental work, such as using expert system instead of managers or doctors to make decisions, diagnose or treat patients' diseases. Therefore, it will make some people have to change their work type, and even cause unemployment.

4.2. Legal regulation and quality of life
For the negative impact of modernity caused by artificial intelligence, it is necessary to take risk measures, that is, preventive behavior and response system. Facing the future era, we should take the development and regulation of artificial intelligence as the theme to form a systematic and legalized social governance system, including the legal value goal with safety as the core, the social regulation system with ethics as the guide and the risk control mechanism with technology and law as the leading.

With the development of artificial intelligence, the mode of human activity has changed dramatically. Networking strengthens people's horizontal connection. In terms of the master-slave relationship, in the past, it mainly relied on the "pyramid management" from top to bottom, and now it highlights the "network management". In terms of equal connection, in the past, the connection frequency was determined by distance, but now it can transcend time and space and be determined by interests.

4.3. Ethical issues
Artificial intelligence may violate the privacy of human thinking. With the development of artificial intelligence, we hope to know what we think through the data of human brain thinking. It is undeniable that scientific research enables human beings to master the laws of nature and understand
the principles of things. The application of technology makes people's life more convenient and comfortable. However, science and technology have brought progress to human beings, at the same time, the invasion of human beings has been deepening.

5. Summary
In the future, with the continuous progress of various technologies, artificial intelligence will continue to face more and more challenges, including conceptual challenges. In real life, the expectations of the public for AI technology are often very high, but the progress of AI technology is not only limited by the constraints of software and hardware technology, but also by the constraints of human understanding and understanding. Therefore, in the future, AI technology will keep spiral development and progress in the process of existing constraints being solved and new constraints being formed Trend. And we have to admit that the current AI is still in a low development stage, which belongs to low-level development in general. There is still a big gap between the way of thinking of the real simulation of human brain, and there is still a lot of room for improvement in performance. But because of the development of artificial intelligence, a large number of algorithms and applications will inevitably have a profound impact on human production and life.

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