

Data Analysis Model For Expert System Development and its Structure

Anand Kumar Pandey¹, Rashmi Pandey², Shashikant Gupta³, Mayank kurchaniya⁴

¹Associate Professor in CSE
ITM University, Gwalior, M.P. India

²Assistant Professor in Comp. Applications
ITM Gwalior, M.P. India

³Associate Professor in CSE
ITM University, Gwalior, M.P. India

⁴Assistant prof. in CSE
ITM Gwalior, M.P., India

ABSTRACT

In this modern world, expert systems are one of the well-known research areas of artificial intelligence. Most of the expert systems are highly responsive, reliable, easily understandable, and high performance result oriented. This paper contains the design methodology, classification and development strategy of an expert system. Here we try to present some abstract analysis, structure of knowledge acquisition process with in the domain of expert system. We tried to review data analysis and express such kind of beneficial model that not only defend the innovative attributes of expert system but also described some of their constraint.

Keywords: Expert system (ES), machine learning, data analysis, artificial intelligence, Big Data.

1. INTRODUCTION

Every organization or industry is focusing on expertise modeling using individual expert system which is linked with big data. System review and data analysis are the mechanism for identify all the components, processes, contents and prominent entities of the proposed system. This activity is done by an expert person known as content review analyst. In this modern world, most of the organizations, industries and corporate offices appointed content review analyst. Content review should be performed by an analyst using machine learning approach in a systematic manner on structured big data as per the requirement. The main objective or goal of the content review process is to encourage the learning activity, knowledge extraction, professional development and increase the productivity of the expert system.

An expert system (ES) is kind of computer system that have the assessment and decision making ability in certain situation. Most of the users of modern computer system prefer to use different tactics and strategies to improve the decision making skills relevant to ES or artificial intelligence system [3]. In this modern technical world every researcher is talked about machine learning, data science, artificial intelligence and expert system (ES).

Most of the content review analyst reviews the content of ES in four steps:

- *Selecting Appropriate contents:* The data analyst use his system knowledge and experience to certify the appropriate contents that should be presentable and informative according to analysed results.

- *Literature Search:* The analyst should use his literature survey skills to identify the most current topics, with explanation and suitable arguments of ES.
- *Formatting and layouts:* The data analyst has to verify and validate the formatting and layout contents of the system with predefined guidelines.
- *Media and Links:* Here we will make sure that the data media in the contents is properly link to each other.

2. CLASSIFICATION OF EXPERT SYSTEM

An ES is a kind of artificial intelligence based computer system with ability of machine learning and deep learning for certain operations. As per our content review analysis of ES, it can be classified into four groups: The rule based ES, Fuzzy logic based expert system, Frame based ES and the expert system based on Neural Network [1]. We have also analyzed about model structure of all above types of expert system.

- **The Rule Based ES:** It is also known as production system, in these kinds of systems the knowledge is represented as a set of principles, rules and prototypes. It is also known as earliest kind of ES which is most commonly found for data analysis. The framework for this type of ES is usually consisting of three main components: The database, production rules and control strategies. The suitable example for rule based ES is domain specific expert system that applied different rules to make decisions.
- **The Fuzzy Logic Based Expert System:** Also known as Fuzzy Expert System (FES), it uses fuzzy logic instead of Boolean logic. It is a kind of regulation based structure of artificial intelligence with a compilation of correlated functions and rules with specific motive about data analysis. Fuzzy logic based methodologies compile fuzzy set theory with fuzzy statistical parameters, data reasoning for ES and mostly used in operation research, modelling and simulation and in optimization techniques.
- **The Framework Based Expert System:** At first famous American mathematician and computer scientist of MIT Marvin Lee Minsky introduced the theory of data structure that describes a concept “Frame” that used to illustrate the modern instance. These kinds of ES describe the layer viewpoint of the system. Most of the framework consist the appropriate extent such as: application interface, content metrics, assessment techniques, data flow and tool support that could be the essential components of ES.

The framework oriented ES uses the structure in the record to hold the exact issues of input and output recent information during the implication engine. The individual frame can belong to numerous sub frames at the same time, it can also inherits the attributes and properties of main frame.

- **The Neural Network Based Expert System:** The neural network models are non linear models used to recognize blueprint in records and the association between unprocessed and processed values. The neural network obtains information by design using knowledge illustrations. Whatever the unprocessed values we have and from which we need a neural network to be capable to mine or predict required information [2]. The ES provides the suitable examples and anticipation of result, the neural network based learning algorithm continuously adjust the relevant distribution of the networks; accomplish the constant result after analysis.

3. METHODOLOGY OF THE EXPERT SYSTEM

ES are machines that think and reason as an expert would in a particular domain with artificial intelligence. The research in an ES is determined for the designing, planning and implement for such kind of automated and deep learn based computer programs that can imitate, emulate and able to decision making for human activities. The basic requirement for developing appropriate system and proper representing for the ES using suitable methodology is still very challenging task [3]. For different types of ES methodologies can be little bit differ as per the situation, but most of the ES uses common structure.

The structure of an ES has essentially of six components: The user, user interface, knowledge base, decision maker, explanation system, knowledge base editor and an expert as shown in Figure 1.

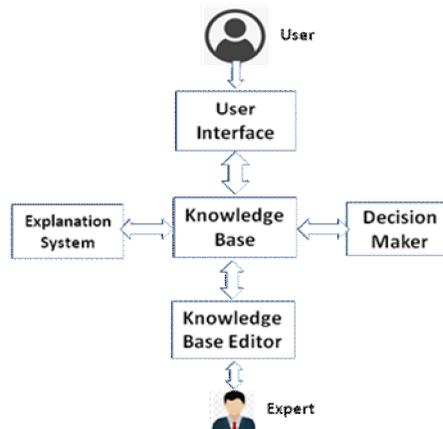


Figure 1 Structure of an Expert System

The user can be end user or analyst who interacts with the knowledge base system with the help of appropriate user interface. The suitable user interface is requisite for dealings between user and knowledge base system. Different ES can have different types of user interfaces. Knowledge base is kind of big data or database which includes all kind of data, information and facts, that available for inference engine to take decision [2]. The factual information, knowledge and structured data need to be pre-processed for decision maker. The explanation system describes all those rules, principles, policies, logics and protocols which are used to apply on knowledge base during processing and mining the information by expert algorithm [8].

The explanation system is also work just like the inference engine, which responsible for data analysis based activities. When we go through the pre-defined and self driven type of ES, then the concept of explanation system can be optional [5]. The knowledge base editor is a kind of embedded application that helps to structure the contents of knowledge base. It also used to design some parameters for knowledge base properties. ES structure based models are computer systems that improve the decision making capability of human experts.

4. DEVELOPMENT TECHNOLOGY OF EXPERT SYSTEM

Since 80 decades, the concept of an ES and techniques of artificial intelligence use in various applications. No one ES can be developed, without any proper information, knowledge database, strategic planning and appropriate management and control [4]. Every ES is developed and designed to extract knowledge by applying data mining and data analysis using knowledge extraction process as shown in Figure 2.



Figure 2 Knowledge Extraction Process

During the process of ES development various types of expert resources are required, such as domain expert, knowledge engineers, and end users. Developing an ES relies on the techniques and tools developed in the ground of AI. Every ES

development process is a iterative and step by step process shown in Figure 3. The strategy of development process followed by top to bottom approach.

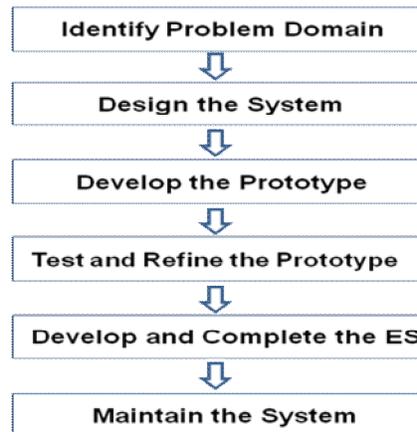


Figure 3 Steps of Development Process of ES

The knowledge acquisition, knowledge engineering, knowledge data base, knowledge elicitation and knowledge presentation are the basic components of every development process of ES. As you can see, the development process of ES follows top to bottom approach and strictly follows step by step process. Until the specific and suitable problem for ES will not be identified the next step design the system cannot be initiated. After design the system, the expert will develop the rules, policies and prototypes to obtain the domain knowledge from the ES [7]. In the next step the knowledge engineer will use the suitable types of test cases to analysis the prototypes. After completion of development of ES, we have to keep the record of all the documentation in proper way and also train the user to use it as per the guidelines. During maintenance, we have to remain the knowledge base up to date by expected reviews.

5. CONCLUSION

In the field of data analysis and AI there are so many types of methodologies like rule based, prototype based, knowledge based etc, that have been used in the development of ES for over five decades. Each methodology has their own pros and cons and number of steps for development also. Most of the ES are developed, uses and analyzed towards the real problem solutions. During formalization the process of development of ES all kind of selected knowledge base, knowledge engineering has been applied to acquire the suitable and expert knowledge from the ES. In this paper we have discussed the analysis and review of development of ES and its classification.

References

- [1] Chastikov A.P. Gavrilova T.A. Belov D. L. (2003) Development of expert systems. CLIPS environment. SPb.: BHVPetersburg, 2003. – 608 p.
- [2] Giarratano, J. G., (2002) , Expert Systems Principles and Programming USA: PWS publishing.
- [3] I. Bratko, I. Mozetic and N. Lavrac, Kardio (1989): a Study in Deep and Qualitative Knowledge for Expert Systems. MIT Press, Cambridge, MA (1989).

- [4] Liao, S.H. (2005), Expert System Methodologies and Applications – a Decade Review from 1995 to 2004 Expert Systems with Applications, 28(1), pp 93-103.
- [5] Minsky, M. (1975). A framework for representing knowledge. The psychology of the computer vision, 73, 211-277.
- [6] Anand Kumar Pandey, Rashmi Pandey (2019), Data Modeling and Performance Analysis Approach of Big Data, published in the ELSEVIER-SSRN Digital Library in the International Conference SUSCOM-2019.
- [7] Anand Kumar Pandey, Rashmi Pandey (2015), Role of Multi Agent System Methodology in System Design, published in IEEE International conference IndiaCom-2015 at BVICAM New Delhi.
- [8] Niwa, K., Sasaki, K. and Ihara, H. (1988) An Experimental Comparison of Knowledge Representation Schemes, in Principles of Expert Systems, (Eds A., Gupta and E.B., Prasad), IEEE Press, New York (pp. 133–140).