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THE CONSTRUCTION OF UNDERGRADUATE MACHINE LEARNING COURSE IN THE ARTIFICIAL INTELLIGENCE ERA

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Abstract: AI innovation has been incredibly evolved in the most recent decade, which makes man-made consciousness arrive at a progressive advancement and lets us truly see the capability of man-made brainpower in changing human existence. To improve the agreement and application capacity of man-made consciousness, doing the comparing AI course is of importance for the understudies during the undergrad period. This paper tests into the showing content, encouraging structure and different parts of the undergrad AI course dependent on this issue and proposes a training strategy driven by application situations to control the college understudies to comprehend the turn of events, current circumstance and boondocks innovation of AI. In the trial plan, the understudies' hypothetical information is completely thought of, the functional inquiries are improved, and the understudies' capacity to think and tackle issues is likewise raised, to lay a hypothetical and down to earth reason for additional investigation of AI.

I.   Introduction

With the prevalence and development of mobile internet, big data and large scale parallel computing and the reduction of computational cost, artificial intelligence has become an area with many practical applications and many hot research topics. Its application domains include pattern recognition, computer vision, natural language processing, data mining, business intelligence, unmanned driving and so on. With the development of artificial intelligence technology into all aspects of people's lives, its research prospects are more and more brilliant. In July 2017, the State Council announced a new generation of artificial intelligence strategic planning. And this plan proposed: as of 2020, China's artificial intelligence industry scale will

exceed 150 billion yuan, the relevant industry scale driven by this will be more than 1 trillion yuan; to 2030, China will reach a leading level in the world in terms of artificial intelligence theory, technology and overall application scale and China will become the world's main artificial intelligence innovation center with an artificial intelligent industry scale reaching more than 1 trillion yuan and a scale of the related industries driven reaching more than 10 trillion yuan [1]. Artificial intelligence market has been unprecedentedly active, as a result, Google, Facebook, Microsoft, Baidu, Ali, Tencent and other global IT giants are now regarding it as the breakthrough for the next generation of science and technology revolution, and are putting a lot of human and material resources to accelerate their deployments. The potential of artificial

intelligence technology is undoubtedly magnificent. As the most widely used technology possessing the highest theoretical research value in artificial intelligence, machine learning plays an important role in many fields, such as computer vision, pattern recognition, data mining, natural language processing, etc. [2]. The new generation of information technology represented by mobile Internet, large data and IoT technology is closely related to machine learning technology. Why does it need to set up the machine learning course? The ability to collect, store, manage and process data has been greatly improved in recent years, so it is urgent to need data analysis technology. Under this circumstance, machine learning is able to meet such needs of this era, so it becomes particularly important. Early machine learning courses are mainly set up for postgraduate students with majors of Computer and Artificial Intelligence. With the advent of the artificial intelligence and big data age, it is necessary to set up machine learning courses in undergraduates.

Machine Learning Is The Core Technology In The Era Of Artificial Intelligence: In recent years, with the rapid development of artificial intelligence technology, more and more artificial intelligence products have come into people's daily life, such as sweeping robot, educational robot, etc., which have brought great convenience to human life and made great contributions to the development of human society [3]. At present, the definition of artificial intelligence (AI) mainly refers to a discipline in which the computer program is applied for simulating some of human thought processes and intelligent behaviors and to produce a novel intelligent system that can respond in a way similar to human's intelligence. It also refers to a scientific field focusing on whether such an intelligent system can be implemented and how to achieve it.

II. RELATED REVIEW

Artificial intelligence development can be divided into three stages: the first stage is between the 1950s and 1960s, this artificial intelligence within this period mainly studies the inference and search domain, including how to use the search tree for the robot to plan its action process as well as the chess game inference; the second stage is between the 1980s to 1995, the artificial intelligence within this period mainly studies the representation of knowledge, i.e. how to describe the knowledge of a particular field as the information that computer can recognize and process, so as to build an expert system; the third stage is from 2000 to the present, machine learning has become the core of artificial intelligence research, i.e. how to let the machine learn through the artificial intelligence program, so as to make judgments. This stage of artificial intelligence is also defined as a discipline about knowledge [4], namely the technology about how to acquire and express the knowledge and convert it into practical applications. It is a discipline about studying how to make the computer simulate some of the human thinking processes and intelligent behaviors, including the principle of how to make the computer achieve intelligentization and how to manufacture computers with intelligence similar to that of human brain, so that the computer can be involved in a higher level of application. The basic pattern of artificial intelligence is to study the behavior and thinking characteristics of

human beings and study how to acquire knowledge, express knowledge and use knowledge by taking the knowledge as the subject and the intelligent devices as carriers. B. What Is Machine Learning Machine learning refers to the computer's acquisition of a kind of ability to make predictive judgments and make the best decisions by analyzing and learning a large number of existing data. The representation algorithms include deep learning, artificial neural network, decision tree, enhancement algorithm and so on. The key way for computers to acquire artificial intelligence is machine learning. Nowadays, machine learning plays an important role in various fields of artificial intelligence. Whether in aspects of internet search, biometric identification, auto driving, Mars robot, or in American presidential election, military decision assistants and so on, basically, as long as there is a need for data analysis, machine learning can be used to play a role. Machine learning is a multi-disciplinary and interdisciplinary subject which has arisen in the past more than 20 years, involving probability theory, statistics, approximation theory, convex analysis, algorithmic complexity theory and many other disciplines [5]. The theory of machine learning is mainly about how to design and analyze some algorithms that enable the computer to "learn" automatically. That is, it is about the algorithm by which the computer can figure out the law from the data via automatic analysis, and then can use the law to predict for the unknown data. Definition 1: "Machine learning is a study of computer algorithms that can be automatically improved through experience". Definition 2: "Machine learning is a kind of science that allows a computer to react correctly without the need to explicitly program in advance."

III.   TEACHING CONTENT DESIGN

Basic Ideas Machine learning is a multidisciplinary field involving computer science, statistics, intelligent science and other interdisciplinary areas, and is subject to a joint evolution with data mining, artificial intelligence and other subjects. The content of it may be overlapping with that of others, but it also has its own discipline characteristics and is constantly developing new theories and methods. Therefore, the teaching of machine learning course during undergraduate period should choose appropriate teaching contents and optimize them, so as to let the students understand the basic concept of machine learning, common machine learning model and common learning algorithms, and let them can use the key technology of machine learning to analyze practical problems and understand the current development of machine learning [6]. Considering the experimental teaching content, it will design corresponding application scenarios according to different machine learning methods, so as to let the student ponder and analyze questions in the application scenario and apply the learned methods to solve the problems, thus exercising their ability of independent thinking and practice. B. Theoretical Teaching Content Design 1) Overview on Machine Learning This paper introduces the related concepts and application scenarios of machine learning, and explains what machine learning is based on practical cases and how to learn it. The classification of machine learning algorithms is described and they can be divided into supervised learning and

unsupervised learning. Supervised learning involves statistical classification and regression analysis; unsupervised learning involves clustering and association rules. It introduces the implementation process of machine learning, that is, the feature extraction is firstly performed from the original sample set, and then the feature sample set is preprocessed to obtain the training set and the validation set. Next, the model is trained with the machine learning algorithm, and the validation set is used for evaluation purpose. 2) Deep learning the concept of deep learning is derived from the study on artificial neural networks, and its typical example is multilayer perceptron (MLP). Artificial neural Network (ANN) is a mathematical model for simulating the thinking mode of human brain, and perceptron is the first artificial neural network designed and implemented. The perceptron is a dichotomous linear classification model, whose input is the eigenvector of the instance and whose output is the class of the instance. This paper introduces the models of perceptron, then describes the learning strategy of the perceptron, especially the loss function, and finally introduces the original form and dual form of the perceptron learning algorithm, then proves the convergence of the algorithm.

K-nearest Neighbor Method K-nearest neighbor (k-NN) method is a kind of basic classification and regression method, which uses a method of measuring the distance between different feature values for classification. That is, given a training dataset, for the new input instance, the nearest k instances are found in the training data set. If the majority of these k instances belong to a class, then this input instance is classified into this class [7]. This part introduces the K-nearest neighbor algorithm, model and three basic elements, including selection of k value, distance measurement and rules of classification decision. 4) Decision Tree Decision tree is a kind of inductive classification algorithm, which uses the learning of training set to excavate useful rules for predicting new sets [8]. This paper focuses on the application of decision tree for classification, and focuses on using the decision tree algorithm to represent the result of data classification in tree structure. This part introduces the basic concept and feature selection of the decision tree, and the generation algorithms of decision tree learning ID3 and C4.5 and pruning of decision tree. 5) Naive Bayes The classification algorithm based on Bayes theorem is called Bayes classifier algorithm, among which naive Bayesian classification is the simplest and most common method in Bayes classifier. The basic assumption of naive Bayes is that the attributes of the items to be sorted are independent of each other. The principle, processing flow, learning and classification and parameter estimation of the algorithm are introduced. 6) Support Vector Machine Support vector machines (SVM) are a dichotomous classification model. Its goal is to find a hyperplane, so that the hyperplane can be used to separate the two types of data points as many as possible, while the two types of data points being separated are farthest from the classification surface. This part introduces third class of support vector machines and kernel functions, including: linearly separable support vector machines, linear support vector machines and nonlinear support vector machines. 7) Boosting Method: AdaBoost Algorithm The boosting method is to improve the performance of classification by changing the weights of

training samples, learning multiple classifiers, and combining these classifiers linearly. This part introduces the basic idea of boosting method and the representative boosting algorithm AdaBoost, discusses why AdaBoost can improve the learning accuracy and introduces concrete examples. 8) Hidden Markov Model Hidden Markov model (HMM) is a statistical learning model which can be used in labeling problems and has been widely used in speech recognition, POS automatic tagging and other fields. This paper introduces the basic concept of the hidden Markov model, then introduces three questions in the hidden Markov model, and then introduces the corresponding three basic algorithms, namely probability calculation algorithm, learning algorithm and prediction algorithm. C. Experimental Design This course will help students understand the basic theory and methods of machine learning, and also will let them pay attention to the cultivation of their practical ability [9]. With the acquisition of theory part of knowledge, the students are able to solve some specific problems, which will enable them to deepen the understanding of the working principle of the algorithm in the problem-solving process, and will inspire their interest with the intervention of application scenario. Experimental language: Python. Experimental method: The teacher gives the general steps and data sets of the experiment. The experimental process is completed by the students and presented with an experimental report. 1) Using Perceptron for Classification Experiment content: present the original form and the dual form of the perceptual machine learning algorithm, and use it to classify the input data. 2) Using K-NN to Recognize Handwritten Numerals Experimental

content: the data set in the text of "Optical Recognition of Handwritten Digital Data Sets" is provided. In order to facilitate understanding, the image needs to convert into text format. It needs to design handwriting recognition system based on the K-nearest-neighbor classifier, and the recognition ability suitable for number 0-9 will be qualified. 3) Using Decision Tree to Predict Contact Lens' type Experiment content: by providing a text file of the contact lens' dataset and using ID3 algorithm to produce a decision tree, it can judge the type of lens that the patient needs to wear. 4) Using Naive Bayes to Filter Spam Letters Experiment content: by providing the text file of the mail data set and resolving the text file into the term vector, it can construct a test set and training set and a naive Bayes classifier which can filter the spam message is able to be trained. And it also needs to calculate the classification error rate. 5) Using SVM to Recognize Handwritten Numerals Experimental content: Using support vector machine algorithm to construct a handwritten numeral recognition system, the results will be compared with those of the Knearest neighbor algorithm.

IV. TEACHING MEATHODS AND MEANS

Using Application Scenarios to Drive the Teaching For the development of machine learning theory and methods, the ultimate aim is to solve the practical problems in production and life. For example, in the first part of the theory teaching, i.e. the introduction of machine learning, it introduces the machine learning technology by the news in May, 2017: AlphaGo beats the World championship. It doesn't directly present the content of the theory and

algorithms, because for undergraduates, it is a little difficult to understand these theories and may result in their psychological aversion for the relevant curriculum. According to the characteristics of undergraduates, it should increase the introduction of application scenarios suitable for machine learning technology, such as the industrial unmanned driving, artificial intelligence assistant, Taobao commodity recommendations, so that these students can be interested in the content of the course and their enthusiasm to participate in the curriculum can be enhanced. After this, the students are guided to analyze the questions in the corresponding scenario. By introducing the concept of related algorithms, giving the necessary derivation and proof for each algorithm and providing a simple example, the students will be easier to master the basic content of the method, understand the essence of the method and use the method accurately. For the relevant in-depth theories, they will be summarized, and the relevant reading materials and references will be provided to meet the needs of students for further study. 2) Improve Teaching Effect via Analysis and Discussion According to the teaching content, it can reasonably design questions about theoretical knowledge and case applications and provide references and learning materials, inspire these students to think and organize them to discuss, so as to promote their understanding of machine learning related technologies and cultivate their learning and thinking ability. Because there are more than one machine learning methods that can be used to solve questions about practical application, the students can be guided to think what algorithm can be selected. For example, after learning the algorithms of K-neighbor

algorithm and support vector machines, it can guide the students to compare these two methods through the experiment based on these two algorithms for handwritten numeral recognition and let them figure out whose effect is better and which is more efficient. Through the experiment reports, the students can be organized to participate in group discussion, thus deepening their understanding of practical questions and machine learning models and algorithms and exercising their ability to analyze and solve problems. The teaching means of this course includes two aspects: On one hand, online learning is recommended. It can create chatting groups with the topic of curriculum for students, so as to recommend them courseware, course videos, paper resources, data sets, open source toolbox and so on. In addition, the micro-blogging, MOOC and other emerging network platforms can be used to communicate with students, so as to provide them with more access pathways to information. On the other hand, offline classroom discussion is also recommended. It can exercise the students' independent pondering ability and encourage them to express their own opinions. By fully listening to the views of students, the scientific adjustment on the depth and breadth of teaching content can be made to ensure the quality of teaching.

V. CONCLUSION

If the data are the carrier and the intelligence is the goal, then the machine learning is the technology, method and pathway for transformation from the data to the intelligence. Therefore, machine learning is the core of data science and the essence of modern artificial intelligence. In recent years, more and more

colleges and universities at home and abroad are developing specialized courses about machine learning for Computer, Software, Artificial Intelligence and other majors. The machine learning course for undergraduates introduces the basic concepts and methods of machine learning. The course uses the application scenario to drive the teaching practice, gradually helps the students to understand the basic theory of machine learning and simultaneously pays great attention to the training of practical ability. By introducing the common algorithms of machine learning, the course also needs to give necessary derivations and proofs for these algorithms and provide the matching experiments, so as to help the students to master the basic content of these algorithms, grasp the essence of these algorithms and use these algorithms correctly.

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