ON THE CONSTRUCTION OF MACHINE LEARNING ALGORITHMS FOR PREDICTING LIQUIDITY FACTORS OF THE BANKING SECTOR

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At the present stage, approaches based on methods of machine learning are relevant for analyzing the liquidity factors of the banking system of the Republic of Belarus. There is an opinion that machine learning is inextricably linked with such a branch of science and technology as artificial intelligence. However, it should be understood that the use of artificial intelligence to solve machine learning problems is only one of the approaches.

The term machine learning itself was proposed by Arthur Samuel in 1959 in «Some Studies in Machine Learning Using the Game of Checkers» [1]. The formal and most popular definition of machine learning tasks in Western literature appeared in the work of the same name by Tom Mitchell in 1997 [2, 2]. According to him, the program learns some experience E to solve a certain class of problems T, if the performance indicator P, when performing tasks from T, improves with the advent of new experience E. From this definition, it should be understood that machine learning is any algorithm by which a computer program acting on this algorithm begins to solve the task set for it better.

The tasks of machine learning are divided into several broad areas. In supervised learning the algorithm builds a mathematical model of a data set that contains both input information (also called just inputs) and information about the required output parameters (outputs). For example, if the task was to determine whether the image contains a specific object, the data for supervised machine learning will include images with and without this object (inputs). In addition, each image will have a label (output) indicating whether the desired object is in the image. In special cases, the input may be only partially available or limited to special feedback. These algorithms with partial participation the supervisor received the name of semi-supervised learning. They develop mathematical models from incomplete data.

Classification algorithms are also examples of supervised learning algorithms. Classification algorithms are used when outputs are limited to a finite set of values. For a classification algorithm that filters emails, the input will be the incoming letter, and the output will be the name of the folder in which the email will be sent.

In unsupervised learning the algorithm builds a mathematical model of a data set that contains only inputs and does not require outputs. Unsupervised learning algorithms are used to search for a data structure, such as grouping or clustering data points.

The reinforcement learning algorithms receive feedback in the form of positive or negative reinforcement in a dynamic environment and are used in autonomous vehicles or in learning to play against a human opponent [3]. These algorithms teach the program a specific action iteratively based on whether it approached the expected result during previous attempts. Machine learning algorithms can be used to find the unobserved probability density function in density estimation problems. In addition meta-learning algorithms have recently emerged. They study the machine learning process itself in order to develop optimal approaches for solving certain problems based on previous machine learning experience.

Finally, we mention the regression analysis algorithm, which is one of the simplest methods of machine learning. However, it should not be argued that the simplicity of this approach indicates the senselessness of its use, because the result is ultimately important, and there is no objective reason to abandon the simple but effective approach. Based on this, the algorithm of regression analysis and forecasting of liquidity factors of the banking system of the Republic of Belarus has the right to exist.

Let us consider this algorithm in more detailed way. And start with the definition of regression analysis, which is the process of assessing the relationship between variables. In this case, it is supposed to build a certain type of functional dependence between independent variables (inputs) and dependent (outputs). This method is mainly used to predict and clarify the causal relationship between variables. The regression methods basically differ depending on the number of independent variables and the type of relationship between independent and dependent variables.

Simple linear regression is a type of regression analysis, where the number of independent variables is one, and there is a linear relationship between the independent (x) and dependent (y) variables. Based on the input data, we are trying to build a linear relationship that predicts the value of the dependent variable as accurately as possible. The line can be modeled based on the linear equation shown below.

$$y = \beta_0 + \beta_1 * x \tag{1}$$

The goal of the linear regression algorithm is to find the best values for β0 and β1. To assess the quality of the model, a cost function is used.

The cost function helps us determine the best values for β0 and β1, which would provide the best linear relationship between variables. To solve this problem, the search task is transformed into a minimization problem, where we want to minimize the error between the predicted value and the actual value. For this purpose, one of the many methods for estimating the predictive error is appropriate. By minimizing this function, we can get the values of β0 and β1 that best satisfy the original goal.

This simple idea can be implemented in an algorithm that optimizes the cost function by searching for dependencies between variables with minimal forecast error. It is obvious that more complex forms of the functional relationship between variables can be used.

Thus, using a dataset, the program, guided by the decision-making function of costs, can select the best functional relationship between variables, suggesting it for use by a human analyst.

List of sources

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ФИНАНСОВАЯ НАДЕЖНОСТЬ СТРАХОВЫХ КОМПАНИЙ НА РЫНКЕ СТРАХОВАНИЯ ЖИЗНИ ЧЕРЕЗ ПРИЗМУ МЕТОДИК ОЦЕНКИ

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Сегодня рынок страхования жизни в Украине характеризуется ростом основных показателей, объемом валовых премий и валовых страховых выплат, уровнем страховых выплат, активов, страховых резервов. 9 месяцев 2018 г. также демонстрируют положительную динамику показателей – страховыми компаниями собрано 2,7 млрд грн. валовых премий, выплачено страхователям 0,5 млрд грн., что больше аналогичного периода 2017 г. на 35,6 % и 29,8 % соответственно [1]. Несмотря на достаточно ограниченный ассортимент страховых услуг, наиболее привлекательными для населения остаются: накопительное страхование и страхование жизни, что составляет 54,9 % и 38,1 % общего объема валовых страховых премий. Вместе с тем, результаты развития рынка страхования жизни в Украине определяются