



MATHEMATICAL MODELING AND ARTIFICIAL INTELLIGENCE IN THE MEDIA AND ADVERTISING INDUSTRY



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ABSTRACT

Nowadays, artificial intelligence has a huge role in business. Almost in every industry artificial intelligence knowledge and usage is crucial. Artificial intelligence in business simply involves the use of intelligent computer software with human-like capabilities to increase efficiency, improve customer experience and drive business growth and transformation. I wanted to explain what artificial intelligence is, what artificial intelligence branches are and how to use them, mathematics in machine learning and how to use it, and finally, what is applications of artificial intelligence in media and advertising industry is mentioned.

WHAT IS ARTIFICIAL INTELLIGENCE?

Artificial Intelligence can be defined as the development of computer systems that are capable of performing tasks that require human intelligence, such as decision making, object detection, solving complex problems and so on.

Types Of Learning In Artificial Intelligence

- Artificial Narrow Intelligence
- Artificial General Intelligence

Types Of Artificial intelligence

Types of Artificial Intelligence systems categorized based on their functionalities.

AI can be categorized into the following types [9]:

- Reactive Machines AI
- Limited Memory AI
- Theory Of Mind AI
- Self-aware AI

The Branches of Artificial Intelligence

- Machine Learning
- Deep Learning
- Natural Language Processing
- Robotics
- Expert Systems
- Fuzzy Logic

Machine Learning Algorithms

Linear Regression

Regression is a key ingredient of classification algorithms.

It is used to estimate real values (cost of houses, number of calls, total sales etc.) based on continuous variable(s). Here, we establish the relationship between independent and dependent variables by fitting the best line. This best fit line is known as the regression line and is represented by a linear equation $Y = aX + b$.

Logistic Regression

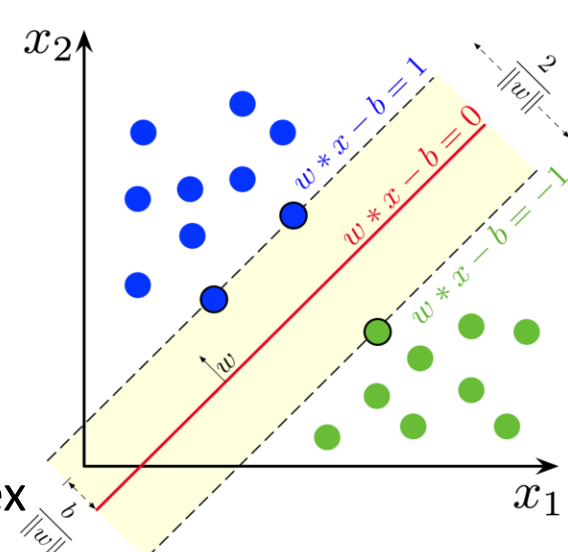
Logistic regression estimates whether something is true or false, instead of estimating something continuous like weight. So, it is used to predict a binary outcome based on a set of independent variables. Binary outcome (0 or 1) can be predicted by using logistic regression. Since values are in the range 0 and 1, the logistic function is used.

Decision Tree

The Decision Tree method is one of the most popular tasks of machine learning, which is used in both classification and regression problems. Decision trees are simple to understand and simple to visualize. The decision tree is a recursively process as it is seen from the name of the subject a tree structure is used. It starts with a single node a branching out to new results. When the algorithm starts the entered value moves in a certain way according the nodes and gives a conclusion .

Support Vector Machine

It is one of the very effective and simple methods used in classification. For classification, it is possible to separate the two groups by drawing a boundary between two groups on a plane. The place where this boundary will be drawn should be the farthest place from the members of both groups. SVM determines how this boundary is drawn



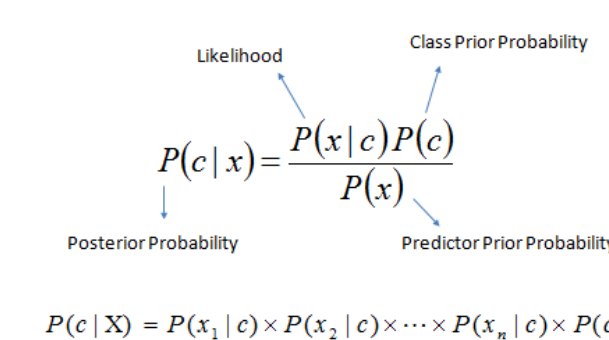
$$y = \begin{cases} 0 & \text{if } w^T \cdot X + b < 0 \\ 1 & \text{if } w^T \cdot X + b \geq 0 \end{cases}$$

- W is a weight vector
- x is input vector
- b is bias

There are two different classes in the table, blues and greens. Main purpose in classification problems is to decide in which class the future data will take place. In order to make this classification, a line is drawn that separates the two classes. The yellow region between $[-1, +1]$ of this line is called margin. The wider the margin, the better the separation of two or more classes

Naive Bayes

Naive Bayes classification algorithm is a classification algorithm named after mathematician Thomas Bayes. The way the algorithm works is it calculates the probability of each state for an element and classifies it according to the highest probability value. If there is a unobservable value in the set, p-value returns 0. So it cannot predict.



$$P(c|X) = P(x_1|c) \times P(x_2|c) \times \dots \times P(x_n|c) \times P(c)$$

- $P(c|x)$ is the posterior probability of class (target) given predictor (attribute).
- $P(c)$ is the prior probability of class.
- $P(x|c)$ is the likelihood which is the probability of predictor given class.

kNN is an algorithm that used in regression and classification problems. It classifies the data according to its proximity with the previous data. k-NN is a non-parametric algorithm, that means it doesn't make any assumptions.

How does kNN work

- K value should be selected.
- Find points close to K. (Euclidean is the most commonly used measure. However, Manhattan and Minkowski distances can also be used depending on the situation.)
- Determine how many of each class there are among neighbors close to the K value.
- Determine which class this k value belongs to.
- Assign the new data points to that category for which the number of the neighbor is maximum.

Camberra:

$$d(x, y) = \sum_{i=1}^m \left| \frac{x_i - y_i}{x_i + y_i} \right|$$

Chebychev:

$$d(x, y) = \max_{i=1}^m |x_i - y_i|$$

Manhattan:

$$d(x, y) = \sum_{i=1}^m |x_i - y_i|$$

Minkowsky:

$$d(x, y) = \left(\sum_{i=1}^m |x_i - y_i|^p \right)^{1/p}$$

Euclidian:

$$d(x, y) = \sqrt{\sum_{i=1}^m (x_i - y_i)^2}$$

ARTIFICIAL INTELLIGENCE IN BUSINESS

With the increasingly vast amount of data available today and the constantly evolving preferences and complexity of customers, businesses can no longer rely on traditional business methods to drive growth. These radical changes have opened up new realm of possibilities, with AI, to drive business growth through actionable insights generated from customer data. Artificial intelligence in business simply involves the use of intelligent computer software with human-like capabilities to boost revenue, improve customer experience, increase productivity and efficiency, and drive business growth and transformation.

Media And Artificial Intelligence

Business operations have now been modified. Through predictive models and enhanced data collection, industry leaders can understand their customers' desires on a more granular level. Personalization has become expected and the shift to facial recognition technology has improved security. Almost every industry is applying AI tools, including eCommerce, healthcare, and banking, but AI has been a game changer in the media industry. For example, Google's Magenta project is an outstanding example of an AI melody composer, using artificial intelligence to create musical compositions. Now, AI is sweeping the TV entertainment industry. Global mass media and entertainment conglomerate, Warner Bros., has set an example as a media giant incorporating AI into its film and budget management. AI automates repetitive tasks, filters and circulates news, streamlines captioning, and much more .

How AI is improving the media and entertainment industry:

- Improved Marketing and Advertising Landscape
- Personalized user experience
- Real-time Streaming
- Applications of AI and Machine Learning in Media
- Content personalization and Recommendations
- Digital Advertisement and Target Audience
- Content Classification and Categorization
- Meta Tagging Subtitles & Automated Transcription
- Personal Virtual Chatbots
- Identifying Fake Information
- Using Social Media For Sentiment Analysis
- Reporting Automation
- Streaming Quality
- Search optimization

Advertising And Artificial Intelligence

Artificial intelligence (AI) evolving every day, the advertising industry is also growing. With advances in AI, companies can target ads more accurately and create more engaging content. It has led to a rise in new marketing techniques such as chatbots and natural language processing. The use of artificial intelligence for advertising also allows companies to measure the effectiveness of their advertising campaigns in real time.

Benefits of Using AI in Advertising

Artificial intelligence is still a relatively new technology, but its potential applications are endless. Furthermore, how ai is used in advertising is proving to be particularly useful for the advertising industry. Some benefits of using AI in advertising include:

- Target Your Ads More Effectively Through Data
- Helps Optimize Your Campaigns for Better Results
- Helps Save Money and Time With Increased Sales
- Reduce the Risk of Losses in Ads
- Improving Customer Experience
- Reach More Customers With Your Ads
- Defining Customer Journey

Challenges of Using AI in Advertising

- Accuracy of the Data
- Data Privacy
- Customer Behavior Changes
- Poor IT Infrastructure
- Lack of Trust
- Low Investment in AI

KAYNAKÇA

<https://www.analyticsvidhya.com/blog/2017/09/common-machine-learning-algorithms/>

<https://www.wowza.com/blog/top-5-applications-of-ai-in-the-media-industry#the-impact-of-ai-on-the-media-industry>

<https://www.iienstitu.com/blog/bulanik-mantik-nedir-nasil-uygulanir>
An Introduction to Linear Regression Analysis

[Mathematics For Machine Learning Book.pdf](#)