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Web Mining Techniques on Artificial Intelligence

Dr.C.Sangeetha[1], Mr.N.Krishnan[2], Mrs.P.R.Saranya[3]

[1]*Assissant Professor, Department of Computer Science, Rathinam College of Liberal Arts & Science @ Tips Global Kovilpalayam, Coimbatore,Tamilnadu, India*
[2]*Assissant Professor, Department of Computer Science, Rathinam College of Liberal Arts & Science @ Tips Global Kovilpalayam, Coimbatore,Tamilnadu, India*
[3]*Assissant Professor, Department of Computer Science, Rathinam College of Liberal Arts & Science @ Tips Global Kovilpalayam, Coimbatore,Tamilnadu, India*

Abstract— *Web mining relies heavily on artificial intelligence (AI), which makes it possible to analyze enormous volumes of unstructured data and identify important patterns and insights. Tasks like content recommendation, user analysis, and web page classification are automated with Artificial Intelligence techniques like machine learning and natural language processing. This allows businesses to personalize user experiences, improve website design, and identify potential customers.*

Keywords— **Classification, Machine Learning, Natural Language Processing, content recommendation.**

I. Introduction

Web mining has been greatly impacted by artificial intelligence (AI), which offers more effective and potent methods for knowledge extraction, analysis, and application from the massive and ever-changing amount of information available on the World Wide Web..

II. Artificial Intelligence Techniques in Web Mining

A. Machine Learning (ML)

Patterns in web data, including user browsing patterns, click stream data, and search queries, are found using A branch of machine learning called "deep learning" uses artificial neural networks to analyze data in order to make predictions. Supervised learning, unsupervised learning, and other machine learning algorithms are among the many reinforcement learning. The algorithm in unsupervised learning doesn't act on classified data without any direction. The training data, which is a collection of an input item and the intended output, is used in supervised learning to infer a function. Machines utilize reinforcement learning to determine the best option that should be considered and to take appropriate actions to increase the reward.

B. Natural Language Processing (NLP)

Web pages text content can be analyzed using natural language processing (NLP) techniques to extract important information and determine subjects and sentiment. This is very helpful for tasks like sentiment analysis and content categorization. The way that computers are programmed to process natural languages is through their interactions with human language. Natural language processing uses machine learning, a dependable technology, to extract meaning from human languages. In NLP, a machine records the audio of a human conversation. The audio-to-text exchange follows, and after that, the text is processed to turn the data into audio. The machine then reacts to people using the audio. Natural language processing is used in word processors like Microsoft Word to check text for grammar errors, IVR (Interactive Voice Response) programs used in contact centers, and language translation programs like Google Translate.

C. Image and Video Analysis

Web images and videos are analyzed by AI algorithms, particularly deep learning models like convolution neural networks, for content analysis, object detection, and facial recognition.

D. Recommender Systems

In order to provide relevant material, goods, or services, AI examines a user's tastes, past actions, and an item's attributes.

III. APPLICATIONS OF Artificial Intelligence in Web Mining

A. Personalization

Algorithms powered by artificial intelligence sift through user data in order to personalize website content, offers, recommendations, and suggestions to each individual.

B. Web Usage Mining

Understanding how people engage with a website, finding popular pages, and improving navigation are all goals of user behavior analysis.

C. Content Recommendation

Making relevant product or service recommendations to the user depending on their interests and past actions while using the site.

D. Fraud Detection

Internet fraud detection through the study of user actions, financial transactions, and other data points.

E. Sentiment Analysis

Analyzing social media posts, user reviews, and other textual data to determine how the general public feels about a brand, product, or service

F. Search Engine Optimization (SEO)

Analyzing user behavior and web content to raise a website's position in search engine rankings.

IV. Web Mining categorization

A.Web content mining

Information Extraction: AI-driven methods are excellent in locating and obtaining particular information from unstructured or semi-structured web content (such as text, photos, and videos), especially those that are based on Natural Language Processing (NLP). This includes tasks such as:

i. Named Entity Recognition :

Identifying and categorizing key entities (people, organizations, locations, products, etc.).

ii. Relationship Extraction:

Identifying connections between the items that were retrieved, such as which products are connected to which features or who is connected to whom.

iii. Sentiment Analysis:

Identifying the emotions or emotional tone that the writing expresses

iv. Content Summarization:

The amount of reading necessary can be decreased by using AI algorithms to automatically create summaries of web documents that highlight the key points.

v. Classification and Clustering:

Web pages can be categorized into specified classes (such as news articles or product pages) or grouped together according to their content using AI techniques like machine learning.

B. Web Structure Mining

Finding structural information on the World Wide Web is the main goal of the web structure mining subfield. In order to identify linkages and trends, it mainly examines the internal organization of documents and the link structure of hyperlinks between web sites. This includes tasks such as:

i. Link Analysis: In order to analyze the link structure of websites and online pages, artificial intelligence techniques are essential.

ii. Identify important pages:

Ranking pages based on their importance or authority within the web graph (e.g., Page Rank algorithm).locating clusters of linked web pages according to how interconnected they are.

iii. Discover communities:

Locating clusters of linked web pages according to how interconnected they are.

iv. Understand relationships: Identifying the connections between related materials and drawing conclusions about associations or content similarities.

v. Web Site Analysis: Artificial Intelligence (AI) can produce structural summaries of websites, comprehending their hierarchy and arrangement, which can be helpful for navigating and contrasting various website structures.

C. Web usage mining

A subfield of web mining called "web usage mining" is devoted to learning from web server logs and other sources of information about user interactions on the Internet. It entails using data mining tools to find trends in the way visitors interact and browse websites.

i. Pattern Discovery:

Using information such as server logs, artificial intelligence (AI), and more especially machine learning algorithms, are used to find recurrent patterns and trends in user behavior on websites. This helps in:

ii. Personalization:

Making recommendations to people about products, services, or information that are specific to them based on their browsing habits and previous interactions.

iii. Website Design and Optimization:

Recognizing opportunities for enhancements in the layout, positioning of information, and general user experience of websites, as well as comprehending user navigation paths.

iv. Corporate intelligence:

Gathering information on market trends and consumer behavior to help guide corporate strategy and decision-making.

v. User Modeling:

AI is able to create user profiles, anticipating their requirements and interests in order to further customize their online experience.

Table -1 Experiment Result

Web Mining Type	AI Techniques Utilized	Examples
Content	Natural Language Processing (Sentiment Analysis, Text Classification, IE)	Categorizing articles, analyzing reviews for opinions, collecting product information.
	Computer Vision (Image Analysis, OCR)	Extracting information from scanned forms and identifying brands on e-commerce websites
Structure	Graph Algorithms (PageRank, HITS,Link Analysis)	Ranking search results based on link popularity, identifying influential websites.
Usage	Clustering, Classification, Association Rule Mining, Sequential Pattern Mining	Grouping users by interests, predicting customer churn, recommending products based on browsing history.

Table 1 shows the Web mining types & AI techniques used with examples.

IV.CONCLUSION

Web mining have its many uses and features, we might decide to continue with artificial intelligence. Given the advancement of AI, does this mean that the world of the future will be increasingly artificial In the upcoming years and decades, artificial intelligence (AI), a really groundbreaking aspect of computer science, is expected to become a fundamental part of all contemporary software. Both a threat and an opportunity are presented by this. AI will be used to support cyber operations, both Offensive and defensive.

Furthermore, new cyber attack techniques will be developed to exploit the unique flaws in AI technology.

Finally, AI's thirst for vast volumes of training data will increase the significance of data, changing the way we require Consider data security. To guarantee that this game-changing technology will result in widely shared safety and wealth, prudent global governance will be necessary.

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