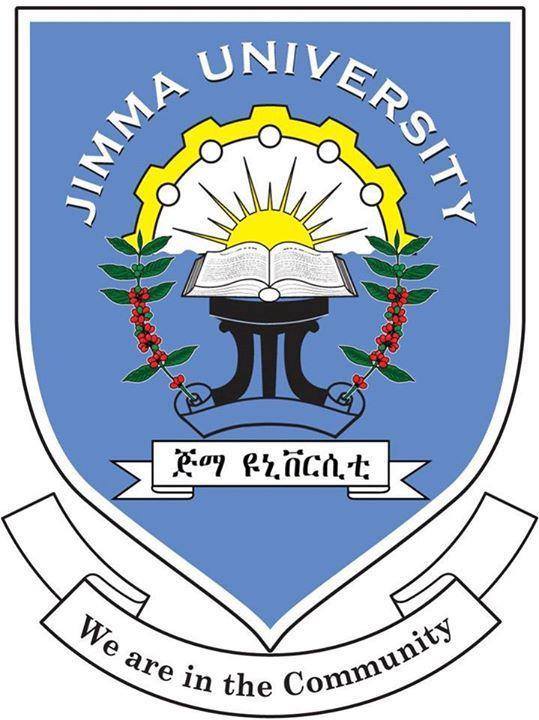
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**Section 2**

# **Search And Optimization (Gradient Descent) and Adversarial Search**

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Abstract

This article discusses the application of artificial intelligence in the activities of Search and Optimization (search and optimization). Artificial intelligence is segmented into three methods: evolutionary computation, fuzzy logic, and classifiers and statistical models. Based on this division, the author seeks for scientific articles that describe the forms of application of artificial intelligence in search and optimization in the literature. Result obtained a number of prototypes such as Polidoxa, Fuzzy Inference System, commercial packages (SPSS Clementine and SearchDex Hyperloop), Support Vector Machine application, and the application of K-Nearest Neighbor Algorithm. Search efforts are constrained by the confidentiality of the algorithm used by SEO companies as well as from the search engines themselves.

Keywords: - search engine optimization; algorithm; artificial intelligence.

# **Search And Optimization (Gradient Descent) and Adversarial Search**

# **1. Search and Optimization (Gradient Descent)**

## **1.1 Introduction**

Artificial intelligence has immersed into various aspects of human life today. Artificial intelligence is used in education, health, investment, court purpose, cyber security, as well as in domestic life and transportation. The development of artificial intelligence that was initially feared to make man no longer has control over his life actually bring AI as the personal secretary to help people in control of their daily lives Even Steve Wozniak, founders of Apple, withdraw his words that artificial intelligence will one day replace humans on earth.

One field of application of artificial intelligence are cyberspace searching. Artificial intelligence has helped people to obtain reliable and contextual information as their wishes on the Internet through optimization on search engines. However, there are concerns related to the application of artificial intelligence in search engine optimization. Although this application successfully helps people in getting information on the Internet, contextual based search mechanisms made computers actually learn something undesirable by modern humans such as racism, ageism, and sexism.

## **1.2 Artificial Intelligence and Search and Optimization**

Artificial intelligence discourse starts to develop around 1950 in an effort to teach computer how to solve intellectual problems without human help and instead of human. This computer is thus referred as an intelligent machine. During its development, intelligent machine is sensed as an intelligent computer system, a system which has the characteristics associated with intelligence in human. This called a system for realization that computers can be arranged as such to produce a system that has greater intelligence than the combined individual computers. This system is known as Multi-Agent System (MAS), which is "loosely-coupled network of entities that work together to find solutions for the problems the which are beyond the knowledge of a single entity”. Each individual computer is referred as an agent, element of a group of minds in the form of a process that collectively compose a mind, which in turn compose a group of minds".

In line with this, artificial intelligence is defined as the science and engineering of making intelligent machines. More details, artificial intelligence is defined as "a part of computer science dealing with intelligent computer systems design". A system is said to be intelligent if it managed to escape from the Turing test, formulated by Alan Turing in 1960.

The use of AI in the context of developing a multiagency in line with the increasing use of the Internet network. Scientists try to find parameters that allow a system of multi-agent exhibiting some desired behavior. One of these efforts is the development of XML (Extensible Markup agent exhibiting some desired behavior. One of these efforts is the development of XML (Extensible Markup Language), a set of rules which another infinite set of rules can be created. Because it gives unlimited possibilities in building rules, XML allows the creation of languages and provide explicit descriptions about this language that can be translated into other languages based on XML.

In contemporary times, AI already has many versions and applied to various purposes. Some versions of AI models include:

* Evolutionary computing model. These models mimic evolution in living beings to boost the ability of the machine. This model uses swarm intelligence algorithms or evolutionary algorithms. Swarm intelligence algorithm including ACO (Ant Colony Optimization) and PSO (Particle Swarm Optimization), while evolutionary algorithms include GA (Genetic Algorithm), GEP (Gene Expression Programming) and GP (Genetic Programming) [15].
* Fuzzy Logic Models. These models based on fuzzy system, which is a system of mathematical logic that works in an environment of uncertainty using observations on linguistic values. Alternative form of fuzzy logic is gray theory, which is also dealing with incomplete information and uncertain. Gray theory using AGO (Accumulated Generation Operation) to reduce the randomness in the data.
* Classifiers and Statistical Learning Models. These models use statistical-based learning approach. AI models belonging to this category includes NN (Neural Network), kernel methods (e.g., SVM Support Vector Machine), k-nearest neighbor algorithms (e.g. SOM - Self-Organizing Map), Gaussian mixture models, decision tree, and Naive Bayesian classifier.

AI development at present, although it has been quite advanced, but it is considered by most observers are still far from the goal to replace humans. In this effort, proposed a general theory of artificial intelligence. The general theory of artificial intelligence developed is more oriented to the classifier models and statistical learning. This theory consists of a number of axioms, among others:

1. analogous to the nervous system of man.
2. the basic functional unit of the nervous system of intelligent systems is the artificial neurons (neural-like units).
3. all data-free neural-like elements are novel neural-like units,
4. all neural-like elements that carry certain pieces of information are equivalent neural-like elements.
5. at the lack of information on the receptors of the novel neural-like elements they continue in the mode of light arbitrary background excitation.
6. background excitation is a fluctuating arbitrary excitation value of the neural-like element. Claims that the exploration into this theory will allow the study of artificial intelligence bring in various imitation of human behavior, including motivation, purposeful behavior, thought, awareness, personality, and so on .

**Search and Optimization** is a set of techniques and practices that enable a site to get more traffic from search engines .This is done by raising a key word or phrase in search engines rankings .In line with this, the behavior that is commonly used is to improve the structure and content of the site in accordance with the rules and standards of the search engines to more in line with the search engines . This allows the site has high visibility in search engine results. In general, the technique is referred to as "white hat" Search and Optimization, while alternative, "black hat" Search and Optimization is the use of elements of metadata deliberately so that the search engines misinterpret the sites content, such as including keywords that are not related to the content of the site or falsify dates to make it looks newer. Search and Optimization is generally done by the site owner with hiring a consultant that modify the characteristics of site so that it may be received by the search engine algorithms.

## **1.3. Application Of AI In Search And Optimization**

The development of artificial intelligence allows search engine managers to continuously improve their algorithms with the techniques from the latest artificial intelligence. This is a challenge for designers of Search and Optimization to pursue and understand search engine algorithms so they can respond appropriately. The search engines themselves apply various artificial intelligence methods to obtain the correct data and as the user desires. These includes Support Vector Machine, Self-Organizing Map and Forest Generation Algorithm Moreover, search engines use many factors to determine the ranking of a website on the internet. Google, for example, uses more than 200 undisclosed factors Even if all of these 200 factors are known, the weight and the algorithms used to assess each of these factors are unknown. More recently, Google confirmed they have used Rank Brain, an artificial intelligence that serves to build their rank on the search engine.

In an effort to optimize the position in the search engines, Search and Optimization practitioners using traditional methods. Big Search and Optimization company can use artificial intelligence to enhance its position in the Google index. Indeed so, the algorithm, of course, is a company secret that cannot be disclosed to the public. As a result, efforts to find the application of artificial intelligence in Search and Optimization should rely on a number of commercial products and the results of academic research which is still a prototype.

Here are some of the applications of artificial intelligence in search engine optimization which is found in the literature:

### **1.3.1 Polidoxa**

Develop Polidoxa, a trust-based search engine algorithms that exploit the behavior of the network users, as well as a social network based on trust and holonic system for social security and privacy Polidoxa developed with the principles of swarm intelligence that mimics the behavior of colonies of insects in a collaborative community. Polidoxa use swarm intelligence to achieve collective intelligence of social networks. Polidoxa is claimed to accelerate in links evaluation, an evaluation of links coming from other pages, from a matter of months to just a matter of minutes, depending on network activity. The relevance of information is decided by social network users that cannot be influenced by Search and Optimization which is run by another party.

Polidoxa users have the opportunity to be aware of the activity of the trusted network but still have to use their critical thinking to evaluate the information. This should give the opportunity to the “deep Web” (all that information not crawled by search engines) to eventually reach the Web surface. The Polidoxa ranking increases the quality of information, facilitates the discussion and could improve the lifestyle of participants simply exchanging information and sharing knowledge. Looking at the data of seo-scientist.com (http://www.seo-scientist.com) we discover that about 80% of the users just click the first three results given by a search engine. As a consequence, ranking of information is of extreme importance and offering a trust ranking based on the users’ activities is fundamental to offer qualitatively better results because that means improving the first three positions according to the user priorities and preferences. With Polidoxa the user and his/her trusted network influences the ranking and everybody has the chance to receive a customized and configurable ranking.

### **1.3.2 Fuzzy Inference System**

Develop a web-based fuzzy logic to improve the ranking of Persian-language objects in the search engine. This system allows the search engine produces the Persian-speaking subjects from the internet The main purpose of this system is to make readers can obtain Persian language site despite using the Google search engine.

Rather than strive for keywords that can be indexed higher in search engines, using a fuzzy inference system to improve site conversion, i.e., improving the results obtained from the traffic such as signups, downloads, purchases, and so on It is based on user habits at a site, which are usually based on a series of pages loading and repetition of contents. Fuzzy inference system developed to identify the characteristics of the audience and choose a way to ensure the impact of certain strategy to conversion rates. Using inference model, we can obtain knowledge about the relation between inputs and output and the fuzzy approach helps to cover decision space using limited empirical data.

Results show that if the difference between t and t−1drops to a minimal value in range of −4 for both c2 and c, we obtain a drop in conversion rates to the level of 1%.These 1 changes where represented by changing the thumbnail image background from animated to light blue and text version from persuasive, were less influential on users. If together with the background, changes were performed in the text we obtained an increase in the conversion from 1% up to 1.7% and this is represented by maximal changes for c1 and c from 1 to 5.

### **1.3.3 Commercial Packages**

SPSS Clementine is an IBM software developed with ANN for data mining SPSS Clementine (Fig. 2) has six web analytics application modules: Search and optimization, user segmentation and automated visits, analysis of user behavior and site activity, the activity of the homepage, activity series analysis, and trend analysis. SPSS exploit internet database and allowing it for an analysis of a number of different marketing campaigns conducted by a Search and Optimization analyst to obtain high positions in search engines Other Search and Optimization commercial packages based artificial intelligence is SearchDex SDX Hyperloop.

### **1.3.4 K-Nearest Neighbor Algorithm Application**

Which is a part of Microsoft Internet Information System (IIS) Manager for data acquisition. Search and Optimization Toolkit navigate through the structure of a website and retrieve data relating to the performance. This lets administrators increase their online presence while compliance with SEO standards. Next, using a K-Nearest Neighbor algorithm to simulate the efficiency of various approaches to internet presence of several banks.

|  |  |  |
| --- | --- | --- |
| No | Name | Result of the AI Methods |
| 1 | Polidoxa | Polidoxa use swarm intelligence to achieve collective intelligence of social networks. |
| 2 | Fuzzy Inference System | By adding the entry criteria and should defined more rules so greater accuracy is required. |
| 3 | Commercial Packages | Applying data mining to customer relationship management (CRM), mining web-based text of customer surveys, and web-based marketing strategies for identifying potential customers, and also the technologies used for web mining. The selection of appropriate web mining software should be based on both its available web mining technologies and also the type of data to be encountered. |
| 4 | Support Vector  Machine(SVM)  Application | This model can be used to predict the degree of complexity of a keyword and predicted the number of aspects of the topics that can be captured by the search engines. |
| 5 | K-Nearest Neighbor An innovative approach based on | Algorithm Machine Learning Techniques, the K-  Application Nearest Neighbor Algorithm to estimate the Internet Popularity that a bank is likely to achieve based on its size and efforts in Internet presence. |

1.1 Table of the results of the AI methods

# **2. Adversarial Search**

## **2.1 What is Adversarial search in AI?**

Adversarial search is a game playing technique where the agents are surrounds by a competitive environment. Conflicting goal is given to the agents (multiagent). these agents compete with one another and try to defeat one another in order to win the game.

## **2.2 Why Adversarial search is important in AI?**

Each agents needs to consider the action of other agent and effect of that action on their performance.so, searches in which two or more players with conflicts goals are trying to explore the same search space for the solution, are called adversarial searches, often, called **game**.

## **2.3 What is Adversarial search used for?**

Adversarial search is search when there is an “**enemy**” or” **opponent**” changing the state of the problem every step in a direction you do not want. Examples Chess, business, trading, war. You change state, but then you do not control the next state.

## **2.4 What are characteristics of Adversarial search?**

* Two players
* Turn taking
* Zero-sum
* Perfect information -deterministic, fully observable
* Have small number of possible actions.
* Precise, formal rules
* Multi-agent environment:
* any given agent needs to consider the actions of other agents and how they affect its own welfare
* introduce possible contingencies into the agent’s problem-solving process
* cooperative vs. competitive
* Adversarial search problems: agents have conflicting goals -- games

## **2.5 AI and Games**

* + In AI, “games” have special format:
* deterministic, turn-taking, 2- player, zero-sum games of perfect information
* Zero-sum describes a situation in which a participant’s gain or loss is exactly balanced by the losses or gains of the other participant(s)
* Or, the total payoff to all players is the same for every instance of the game (constant sum)

## **2.6 Game Problem Formulation**

* + A game with 2 players (MAX and MIN, MAX moves first, turn-taking) can be defined as a search problem with:
  + initial state: board position
  + player: player to move
  + successor function: a list of legal (move, state) pairs
  + goal test: whether the game is over – terminal states
  + utility function: gives a numeric value for the terminal states (win, loss, draw)
* **Game tree = initial state + legal moves**

# 

# **Conclusion**

Application of artificial intelligence in search and optimization is plagued by mysterious criteria used in selecting the site by search engines as well as the confidentiality of the algorithm used by search and optimization companies to do their business. Even so, a number of efforts were made to apply artificial intelligence in search and optimization although in prototype form or in some commercial package. Potential use of artificial intelligence in improving search and optimization available, at least as a tool in the analysis of data in the website design. With devices based on artificial intelligence, analysts of search and optimization optimization methods can decide what needs to be done both on structure, keywords, content, or links to increase their internet presence.

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