Düzce University
Journal of Science & Technology

Review Article

Artificial Intelligence (AI) Studies in The TR Index: A Systematic Review

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DOI: 10.29130/dubited.964460

ABSTRACT

Artificial Intelligence (AI) analytics, tools, and coding are increasingly used to improve quality in every part of the industry. However, such tools find their place in bugs, vulnerabilities, security points, duplications, and many more. Researchers around the world have conducted many academic studies with AI until today. The increasing development and use in the field in the last decade led to the need to research the publication amount, application areas, and achievements of countries in technology. This article used systematic research and literature review to determine the structured approach to the concepts of AI, machine learning, deep learning, and neural networks that can be searched in the TR Index. Although the results do not have an essential place in the TR Index, they can be evaluated as an accelerated increase of around 70% in the last three years. In the field distribution, engineering ranked first with 673 units. In addition, a decrease in the indexation rate of the subject is also observed. The results of this study may lead to the examination of the indexing of many publications made in our country in the TR Index.

Keywords: *Machine Learning, Deep Learning, Artificial Neural Networks, TR Index, Systematic Review*

TR Dizin'de Yapay Zekâ (YZ) Araştırmaları: Bir Sistematik İnceleme Çalışması

ÖZ

Yapay zekâ analizleri, araçları ve kodlaması her sektörde kalite artırmak için giderek daha fazla kullanılmaktadır. Bu tür araçlar, hataları, güvenlik açıklarını, güvenlik noktalarını, yinelemeleri ve diğer birçok konuda kendisine yer bulmaktadır. Bugüne kadarki çalışmalarında, dünyanın dört bir yanındaki araştırmacılar, yapay zekâ ile birçok akademik çalışmalar yapmıştır. Son on yılda alanda artan gelişim ve kullanım, teknoloji bağlamında ülkelerin yayın miktarı, uygulama alanları ve başarılarının araştırılması ihtiyacına yol açmaktadır. Bu makale, TR Dizin de taranabilen yapay zeka, makine öğrenmesi, derin öğrenme ve yapay sinir ağları kavramları ile ilgili yapı yaklaşımını belirlemek için sistematik araştırma ve literatür incelemesi kullandı. Sonuçlar, TR Dizin genelinde çok önemli bir yer tutmasa da, son 3 yılda %70 civarında ivmeli bir artış olarak değerlendirilebilir. Alan dağılımında 673 adetle mühendislik ilk sırada yer aldı. Bunun yanında konunun endekslenme oranında ki düşüklük de gözlenmektedir. Bu çalışmanın sonuçları, alanda ülkemizde yapılan birçok yayının TR Dizinde endekslenmesi konusunun irdelenmesine yol açabilecektir.

Anahtar Kelimeler: *Makine Öğrenmesi, Derin Öğrenme, Yapay Sinir Ağları, TR Dizin, Sistematik Derleme*

Received: 07/07/2021, Revised: 31/08/2021, Accepted: 07/09/2021

I. INTRODUCTION

Even in very rare sectors where technology is not reflected, expectations and satisfaction measurements are made continuously. Analysts have almost taken for granted the use of artificial intelligence (AI) in all measures, public and private. The relationship between the success of the system used in the studies and the adaptation to the use attracts a lot of attention. In this case, measurement was inevitable Observations, according to the methods, the determination of the criterion of use is obvious. The data marks the correctness of the procedures and the disaggregated evaluation of the system (Szajna, 1993). Continuously advancing technology and innovative approaches make it almost obligatory to use artificial intelligence in every aspect of life. Software and digital life are in our circle and agenda. Studies show how important digital is in lifelong education. The spread and applicability of technologies applied in every field is gaining extreme importance for all countries. For example, the use of artificial intelligence in the logistics sector, which connects production and marketing, has increased greatly with Industry 4.0 [1].

There is no doubt that Artificial Intelligence is changing the world and the appearance of technology, and it is now considered the technology of the future as we begin to experience it in our daily lives. It continues to be rapidly adopted by organizations and businesses so that AI structures can be sustained. Artificial intelligence laid the foundation for each of the intelligent systems we know today in the field of technology and informatics. Therefore, AI is becoming ubiquitous; permeates our business and private lives in many areas. It is now available in many and a wide variety of use cases [2,3].

It is essential that all executives, politicians, and academics consider the opportunities and challenges presented by AI. They must revise their vision and mission to be ready for an AI-powered future. Therefore, the subject is indispensable for sustainability. AI applications have begun to overcome the economic and social challenges faced by developing countries. Al has manufacturing-to-manufacturing effects. There is no response to their procedures. The negative impact of the system forces them to optimize AI solutions, as developing countries cannot find help from developed countries. One of the strengths of AI is developing and specializing the traditional manufacturing understanding [4,5].

In this complex situation, without prudent management, individuals, companies, and governments can falter and fail in their struggle for sustainability and economic growth. For this reason, developing countries such as Turkey should have an action plan on these issues in order to complete their development. So naturally, academic studies gain importance while creating plans. Due to this approach that directs the current, the aim of the study is to analyze, compile, report, and understand the academic studies on artificial intelligence conducted in Turkey and scanned in Turkey-based indexes.

II. METHODOLOGY

Systematic literature reviews aim to mature a particular field of research with a detailed and reliable vision of quantitative or qualitative and successive results. In addition, study results can be clearly differentiated [6] In order to compile this systematic literature review, Barbara Kitchenham's systematic literature review procedure was used. A systematic literature review can be divided into three parts: Study Analysis, Process, and Reporting. In addition, a literature review, acceptance and rejection procedure is applied. Afterwards, we proceed with the examination questions [7].

A. PROJECTION

Naturally, topic determination is the launching point of this section. All needs are resolved. Existing literature studies on the relevant field are reviewed. After these, the literature study on the field and the

subject begins. The purpose of this study is to report accessible academic studies regardless of language published within the scope of ULAKBIM-based TR-Index, which describes itself as "To establish and operate networks for research and education purposes between universities and research institutions, to connect these networks with domestic and international networks, to provide information technology support that will help information production, and to assist the production of scientific information in our country through this network and/or traditional ways. To provide academic information and documentaries and to develop Information products that reflect the country's knowledge. To keep the academic network connecting universities and research institutions in national and international context interactive, high-speed, open to new technologies and at world standards, to expand information and document access services nationally in line with developing technologies, to develop information systems at international standards including national scientific information products, systems and to achieve the quality of an archive by hosting global e-information resources. Furthermore, it is responsible for the development and implementation of software, content, information access models, infrastructure, and systems for the effective use of information technology tools in order to improve the technology in educational institutions, increase the quality of education and increase the prevalence and accessibility of education in national and international education fields." [8] and to form a review. In this context, no systematic literature review was found, which leads us to address three research questions in this study:

Q1: Which basic and sub-areas do AI academic studies cover in the relevant index in Turkey?
Q2: What is the level of the balanced approach that extends to years in these studies?
Q3: What is the level of a citation for the academic awareness and benefit of the studies?

Aslan [9] summarized TR Index in his study as follows: "The auditing and indexing of scientific journals in Turkey started with the establishment of TUBITAK in 1963, gained significant momentum with the development of National Databases (UVT) in 1993 and has been continuing since 2003 and fully online access to the indexed articles is provided. The expressions referred to as TUBITAK-ULAKBİM National Medical Database / Turkish Medical Directory have been combined into a single expression under the name TR Index since 2013 and continue in this form today. The number of journals in the TR index increased each year and reached 842 in 2018. The greatest contribution of the TR index to the Turkish scientific world has been to bring about a scientific standardization in the field of publishing".

TR Index defined itself as follows on its official website [10] "One of the main missions of ULAKBİM is to develop products that reflect Turkey's scientific knowledge. Among the most important studies carried out in this context is the TR Index (conducted under the name of National Databases-UVT until the end of 2013), which was developed by international standards to enable researchers to access national and scientific content electronically. TR Index being created by ULAKBİM; It consists of journals in the main subjects of Science and Social Sciences, Dentistry, Pharmacy, Engineering, Basic Sciences, Health Sciences, Veterinary, Social and Human Sciences. National scientific journals that make up the scope of the TR Index are selected by committees made up of ULAKBİM TR Index experts, experts, and academics in their respective fields, based on Journal Evaluation Criteria. TR Index can be browsed on the web page since August 2000. In addition to the bibliographic information (article title, author, abstract, etc.) of the articles of the journals in the index, the full texts of the articles can also be accessed, depending on the participation permit agreement signed between the ULAKBİM directorate and the journal editors".

TR Index indexes scientific research in influential journals, books, theses and articles in science, social, arts and humanities based in Turkey. At the same time, TÜBİTAK projects are also included in this structure. The query language used for our study is as follows:

("yapay Zeka"
OR
"artificial intelligence"
OR

"makine öğrenmesi"
OR
“machine learning”
OR
“derin öğrenme”
OR
“deep learning”
OR
“yapay sinir ağları”
OR
“artificial neural networks”)
AND
PUBYEAR>2010
AND
Language= “Turkish”, “English”

The admission options identified for the study are:

OK1: Study, application or review under the general heading of artificial intelligence.
OK2: The focus or application of the publication should be about keywords.
OK3: Publications must have been published in the previous ten years.
The reject options for the study are:
RE1: If the same study topic and the author have published in different media, only one should be considered.
RE2: If the type of study is a literature review, it should be excluded.

Detail review procedure for accepted studies:

• Year of publication and type of work;
• Used/corrected/improved model;
• Perceptibility for non-experts.

B. COMPILATION AND REPORTING

1,356 records were found. No duplicate records were found. As a result of the first review, 107 TÜBİTAK projects were seen and excluded. Also, in this review, 88 systematic reviews and book presentations, etc. studies were excluded from subsequent studies. It was decided to include 1 161 records in the study. The flow chart of the systematic literature review process is presented in Table 1.

Table 1. *The flow of the Exclusion and Inclusion Process*

Source	Results found	TÜBİTAK Projects	Exclusions	Final Study
TR Index	1 356	107	88	1 161

C. DATA SUMMARIZATION (DATA EXTRACTION AND COMPRESSION)

1,356 records were found. No duplicate records were found. As a result of the first review, 107 TÜBİTAK projects were seen and excluded. Also, in this review, 88 systematic reviews and book presentations, etc. studies were excluded from subsequent studies. It was decided to include 1 161 records in the study. The flow chart of the systematic literature review process is presented in Table 1. At the end of the compilation, the following information can be given about the TÜBİTAK projects (since they are related to the field) that are in the TR Index but are outside our study. Distribution of projects over the years found as; 2020 | 15, 2019 | 16, 2018 | 19, 2017 | 19, 2016 | 14, 2015 | 10, 2014 |

3, 2013 | 2, 2012 | 2, 2011 | 5, 2010 | 2. More detailed information on this subject can be obtained from TÜBİTAK sources.

Studies that pass the query language and criteria are reported in this section. The illustrations below provide a representation of the studies selected based on the data analysis. As shown in Figure 1, most publications were published in 2020 at an increasing rate (the year 2021 continues, not included in the chart). The high jump in 2017 – 2018 and 2018 – 2019 has also been determined very clearly. In the distribution of subject categories, engineering is overwhelmingly the first with 58%, followed by social sciences with 19%, basic sciences with 13%, and unfortunately medicine with 7% (Figure 2). Due to the difficulty of indexing the subject areas under the categories, the highlights are shown in Figure 3 by using the discrimination structure used by the TR Index. Although this distinction is necessarily intricate, it is observed that the fields of medicine, defense industry, and space are pretty small. Also, the search result sets ranked with the highest interest are given in Figure 4. The resulting clusters support the subject area distribution.

Figure 1. *Visual representation of the annual distribution of studies*

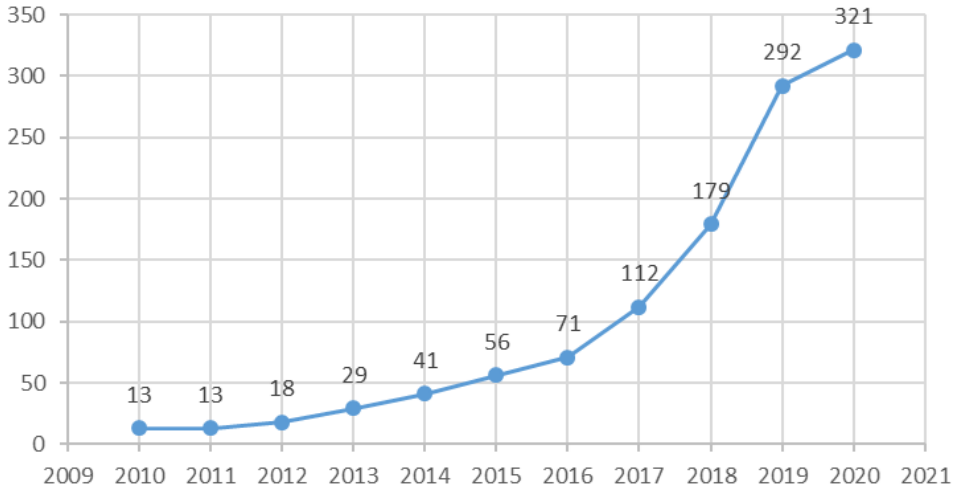

Figure 2. *Subject category distribution amounts*

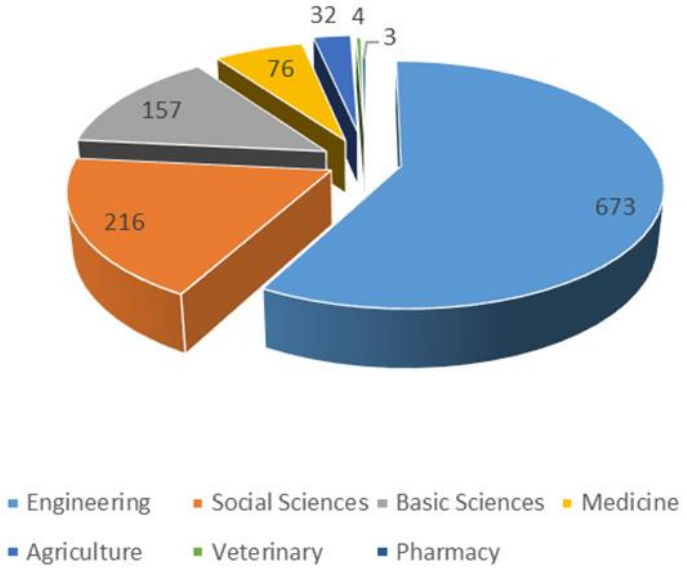

***Figure 3**. Selected subject area distribution amounts*

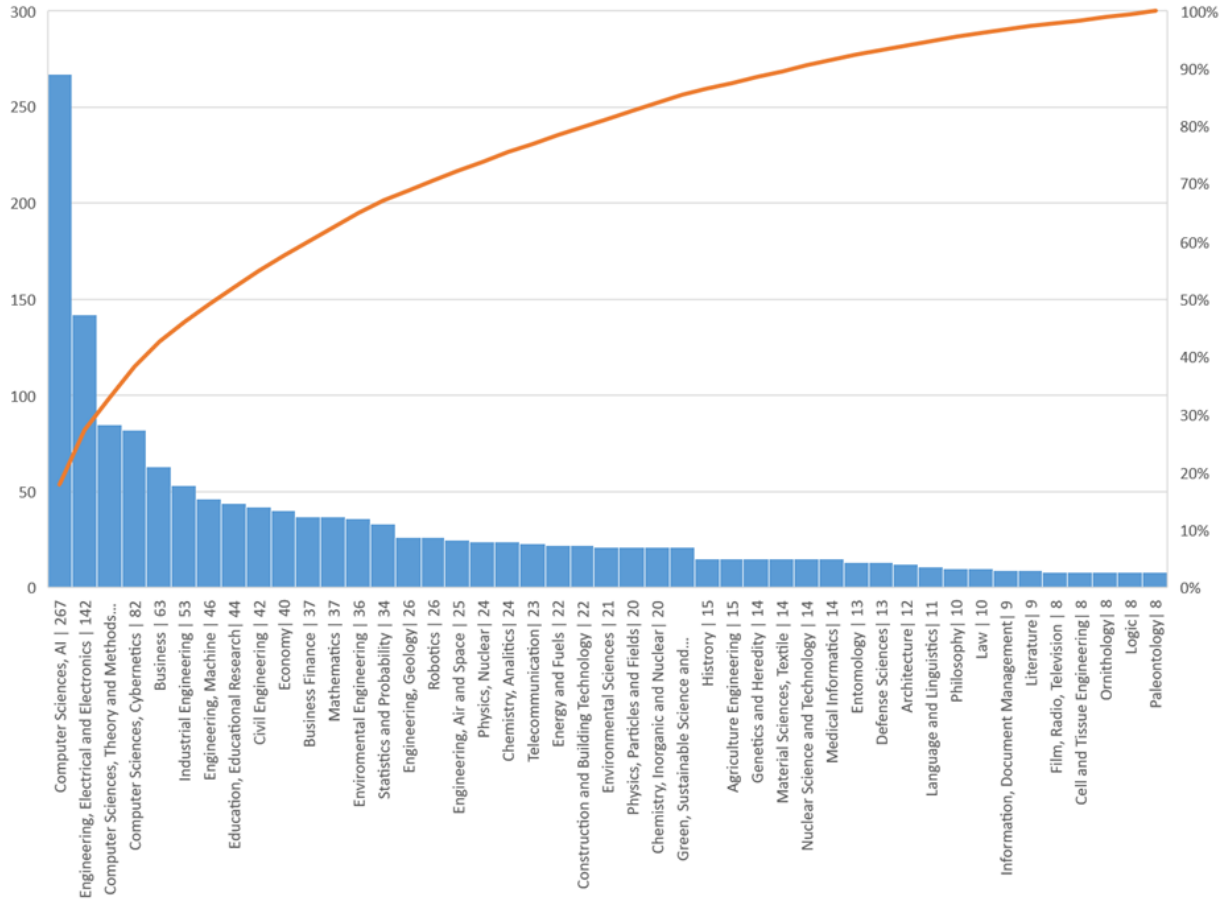

***Figure 4**. Search result sets ranked with the highest interest*

When the citation status of the studies is examined for the academic awareness and benefit of the studies, the 30 most cited studies are given in Table 2. From this point of view, success is seen in the subject area of "Education." Then, the contribution of "Computer Sciences" and "Business" is also observed.

***Table 2**. The results of the most area scan in the study*

Title of Publication	Year	Subject Area	Number of Citations
Examination of prospective teachers' learning approaches, learning styles, and critical thinking dispositions [11]	2010	Education	46
Adaptation of Revised Two Factor Study Process Questionnaire (R-SPQ-2F) to Turkish [12]	2010	Education	16
The role of learning strategies and individual characteristics in predicting academic achievement in teacher candidates [13]	2011	Education	13
Epistemological beliefs: A variable that predicts teacher candidates' learning approaches [14]	2012	Education	13
Predictive modeling with neural networks [15]	2013	Business	12
Prediction of financial failures of banks with traditional and new methods [16]	2010	Business	12
The effect of blogging on reflective thinking skills [17]	2011	Education	10
The Relationship Between Teacher Candidates' Learning Approaches and Teacher Self-Efficacy Beliefs [18]	2015	Education	10
A Detailed Research on Crowd Analysis with Deep Learning [19]	2018	Software E.	9
Firm Failure Prediction: A Case Study Based on Machine Learning [20]	2016	Information Syst.	9
Predictability of banks' financial failures within the framework of artificial neural networks model [21]	2013	Business Fin.	9
The fuzzy logic approach in raw milk quality assessment [22]	2014	Agriculture	9
Investigation of the effects of kernel functions on the classification of satellite images with support vector machines [23]	2010	Computer S.	9
Comparison of adaptability of multiple linear regression and artificial neural network models to lactation milk yields [24]	2012	Statistics	8
Turkey Net Energy Demand Forecast with Artificial Neural Networks [25]	2014	Economy	8
Examination of Teacher Candidates' Deep and Surface Learning Approaches in Terms of Various Variables [26]	2012	Education	8
Contribution Of Machine Learning Methods to The Construction Industry: Prediction of Compressive Strength [27]	2015	Civil Eng.	7
The effect of statistical normalization techniques on the performance of the neural network [28]	2012	Software E.	7
Successful students' learning approaches and factors affecting their learning approaches [29]	2015	Education	7
Comparison of 2005 and 2013 Fifth Grade Mathematics Curriculums in the Context of Learning Areas and Outcomes [30]	2015	Education	7
The Legal Status of Artificial Intelligence about Civil Law and The Liability Thereof [31]	2018	Law	6
A Review of Machine Learning Applications in Veterinary Field [32]	2017	Veterinary	6
Estimation of used car prices in Turkey and determination of price determinants [33]	2013	Education	6
Predicting Academic Achievement with Machine Learning Methods [34]	2017	Education	6
Kernel Function Selection for Solving Classification Problems with Support Vector Machines [35]	2014	Software E.	6
Prediction of Gold Prices with Artificial Neural Networks and an Application [36]	2016	Economy	5
Automobile sales forecasting with artificial neural networks method [37]	2012	Business	5
Estimation of Graduation Grades of Students by Data Mining Methods [38]	2013	Education	5
Planning in Capitalism: Historical and Social Analysis [39]	2014	Political Sci.	5
The Effect of Differentiated Teaching Methods on Students' Academic Achievement Scores, Learning Approaches and Permanence of Learning [40]	2017	Civil Eng.	5

III. DISCUSSION

If the results obtained from a systematic review of the literature are analyzed, the following can be said: When Figure 1 is examined, we can conclude that not much research was done in 2017, but after that, the number of articles increased significantly over the years. It can be said that this issue has attracted the attention of academics, even if it is a little late compared to the previous periods. It can be attributed to the academic development of artificial intelligence at the international level in parallel with the information sector and the increase in the need for writing articles on this subject. It is also observed in Figure 2 and Figure 3 that most of the selected research is in engineering, and we can conclude that there is a high interest in this field in the country. Looking at the results in Figure 4, it can be said that the result sets are more up-to-date and spread over a wide area.

In response to the first research question, 673 of the selected studies are in the "Engineering," 2016 in the "Social Sciences" and 157 in the "Basic Sciences" core subject category, meaning that it can be used to measure the success of the academic community. In response to the second question, the consecutive increase in publications was 60-70% on average, compared to the years made in the field after 2012, while it was only 9% between 2019-2020. This situation can be explained by the fact that academics have difficulties finding new data sets due to new fields other than the fields studied. Finally, in answer to the last question, while the total number of citations of the 30 most cited studies in the study is 294, the total number of 1161 studies is only 614. This shows that there is a severe problem in the recognition and academic usability of the studies.

As a result of the systematic examination of the studies conducted in our country on artificial intelligence and its sub-fields, it has been revealed that there are few complementary and experimental studies on the subject and there is a need for more experimental studies. The continuity of studies in the field and the development of policies are very important. In addition, research designs with controlled and long-term observation and project-level studies will close the gap in this area.

IV. CONCLUSION

There is a marked increase in artificial intelligence services in both the most developed and developing countries. The sectoral approach to technology and informatics has been ahead of the academy for the last 20 years. Although various researchers have made great efforts in this regard, it can be determined that this is not enough due to the study. In order to solve this situation, it is evident that academicians, government officials, and sector representatives need to come together and evaluate the situation. For this purpose, it is necessary to focus on current practice areas with existing models or by developing a new model. It should be emphasized that academics in Turkey urgently need to work on every field of medicine and health, space and astronomy, and especially the defense industry.

The regional, technological and systematic factors affecting the results of this study and the success of the academic-state-sector trio should be rapidly evaluated. This group should act as a guide for them to develop or improve coordination to communicate well and provide better services in parallel with the work around the world. In the context of this study, scanning the international literature can be recommended for new studies. In addition, it can be suggested that academic studies related to the field should be supported in all aspects.

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