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AI in Medicine versus AI in Prehospital

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Abstract

This study was made to compare the information about the studies on "Artificial intelligence in medicine" and "Artificial intelligence in Pre-hospital" on the Scopus database, and to investigate research on artificial intelligence in health and pre-hospital field. In the study, the studies on "Artificial Intelligence in Medicine/Prehospital," "Machine learning in Medicine/Prehospital" and "Deep learning in Medicine/Prehospital" on Scopus database were performed to compare the information. Two groups were examined according to "Year", "Author", "Institution", "Publication type", "Field", "Country", "Fund institution", "Language" and "Citation" parameters. Descriptive statistics and nonparametric Mann-Whitney-U test was used. In the studies conducted, the rate of change in the 2 screening groups was calculated around 83-84%. Although there is no statistical difference between the rate of change, it is seen that the concept of "Artificial intelligence in medicine" is used quite widely compared to "Artificial intelligence in Pre-hospital". It is seen that, as in all areas of Artificial Intelligence and its sub-concepts, the studies carried out in the fields of health and pre-hospitals continue and will continue to increase dramatically.

Keywords: Artificial intelligence (AI), prehospital, artificial intelligence in healthcare

Introduction

The concept of artificial intelligence was first described by John McCarty in 1956 [1]. When artificial intelligence investments are examined in recent years, it is seen that they are mostly made in the field of health [2]. The patients who need emergency health services due to accidents, disasters or illnesses should be evaluated by the health care team and the first treatment should be made and delivered safely to the hospital. In this concept known as pre-hospital, the integration of artificial intelligence continues rapidly.

In the near future, every field and everyone working in the health sector is expected to use artificial intelligence technology [3]. In 2021, large firms of the health sector estimate that the concept of artificial intelligence in health will approach $7 billion [4]. Artificial intelligence is actively used in the diagnosis of diseases, artificial intelligence supported surgeries, drug development, personalized treatment, gene regulation techniques and it is expected that its effect will continue to increase (Figure 1).

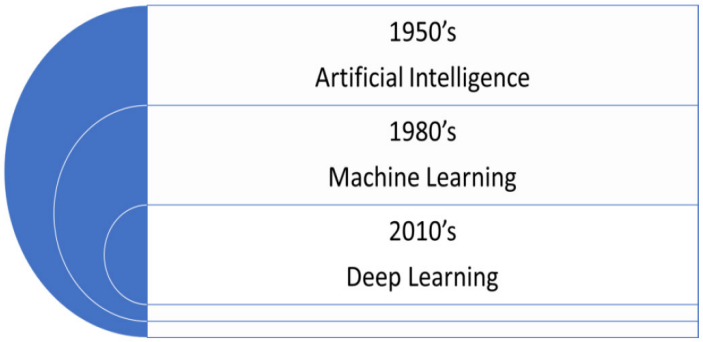

Figure 1. The relationship between the concepts of artificial intelligence and historical process

As the concepts of artificial intelligence and machine learning are intertwined in daily life, the differences between them are mixed. Artificial intelligence is the oldest of these concepts and includes all of them. It is a concept that has been developing since Aristotle's method of thinking, which is the method of comparison. The concept of artificial intelligence, which we understand now, has been embodied with the idea of artificial brain creation by scientists working in different disciplines such as engineering, mathematics, economics, politics, psychology and medicine since World War II.

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Machine learning is a concept under artificial intelligence. While artificial intelligence is a humanoid technology idea, machine learning tries to capture patterns in big data by using mathematical and statistical methods. It is basically the process of training the machine by learning from previous experience how to do a job. There are three main types of learning: Supervised, Unsupervised and Reinforcement learning. Supervised learning is the type of algorithm that learns from the training data set. There is no class in unsupervised learning, so it is aimed to create similar groups within the data set through clustering and association analysis.

Deep learning is a field of study that includes machine learning algorithms and artificial neural networks with one or more hidden layers.

The aim of this study is to compare the information about the studies on "Artificial intelligence in medicine" and "Artificial intelligence in Pre-hospital" on the Scopus database, and to investigate research on artificial intelligence in health and pre-hospital field.

Materials and Methods

Scopus is a large refereed supervised literature (scientific journals, books and conference reports). Elsevier-Scopus database was used for the research data [5]. The first group was selected as Artificial intelligence medicine, Machine learning medicine, Deep learning medicine with search words or connectors and 327071 documents were accessed. The second group was selected as Artificial intelligence prehospital, Machine learning prehospital, Deep learning prehospital with search words or, and 1255 documents were reached. The survey was conducted on the basis of 1980-2019. As a result of the screening, "Year", "Author", "Institution", "Publication type", "Field", "Country", "Funding institution", and "Language" 30- year process for two concepts based on the parameters.

Data analysis was performed with SPSS 24.0. Descriptive statistics and nonparametric Mann-Whitney U test was used. For statistical significance $p < 0.05$ was accepted.

Results

The search in the Scopus database shows the change in the number of researches of the two groups since 1980. Since the 1980s, the concept of artificial intelligence in medicine has started to increase. With the 2000s, a sharp acceleration was achieved. The concept of prehospital has been seen in artificial intelligence studies since the 1990s (Figure 2).

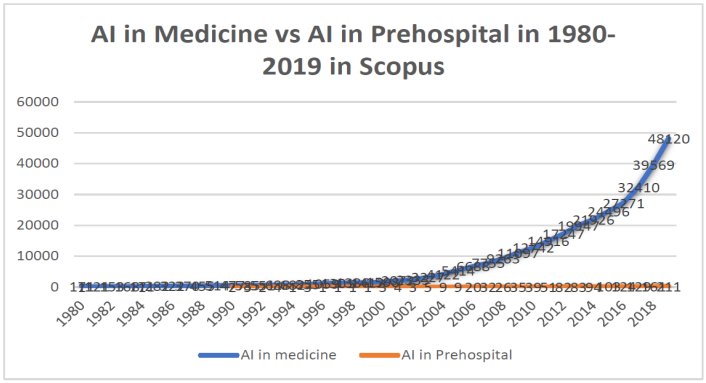

Figure 2. Documents by year of 1980-2019 in Scopus

The average change rates of the studies produced in the last 20 years between the two groups were 84% for "AI in Medicine" and 83% for in "AI in Prehospital". There was no statistically significant difference between the rates of change ($p > 0.05$).

Victor A. Convertino is the author of the most work in the "Artificial intelligence in prehospital" area who research physiologist in US Army Institute of Surgical Research. Dr. Dong Shen is the author of the most work in the "Artificial intelligence in Medicine" area who research the Immediate Past President of Chinese Biopharmaceutical association (CBA) and the Chair of CBA board of directors (Figure 3).

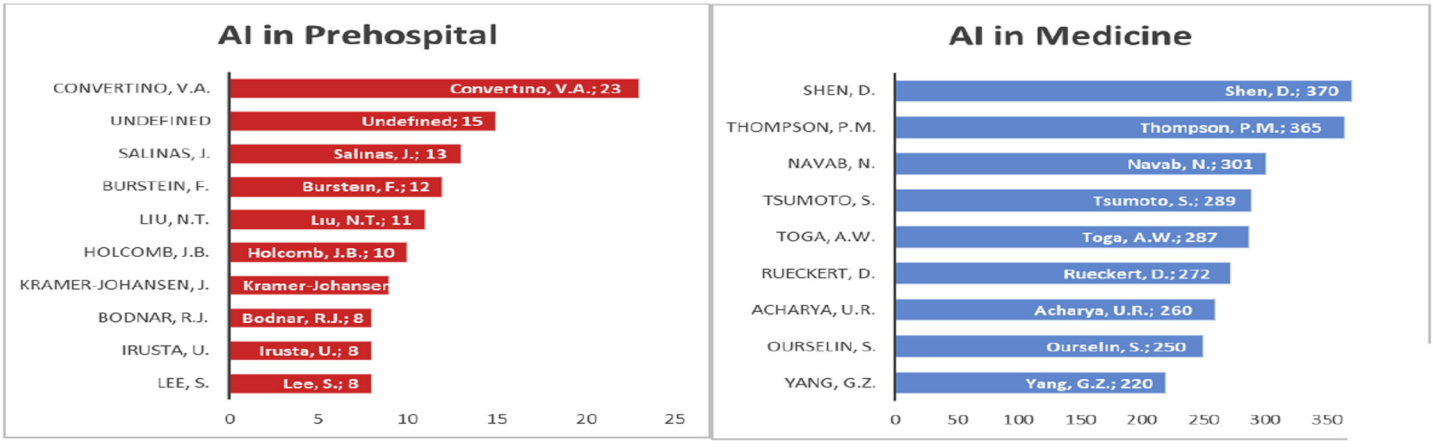

Figure 3. Documents by author of 1980-2019 in Scopus

The US Army Surgical Research Institute was founded in 1943 as a surgical research unit. Especially in the military field trauma, burn options such as the latest technology is supported. This is the most studied center in area about "Artificial intelligence in prehospital."

Harvard Medical School is a world-renowned center in the field of medicine since 1782. They work in partnership with 15 prestigious hospitals and research centers. This is the most studied center in area about "Artificial intelligence in medicine" (Figure 4).

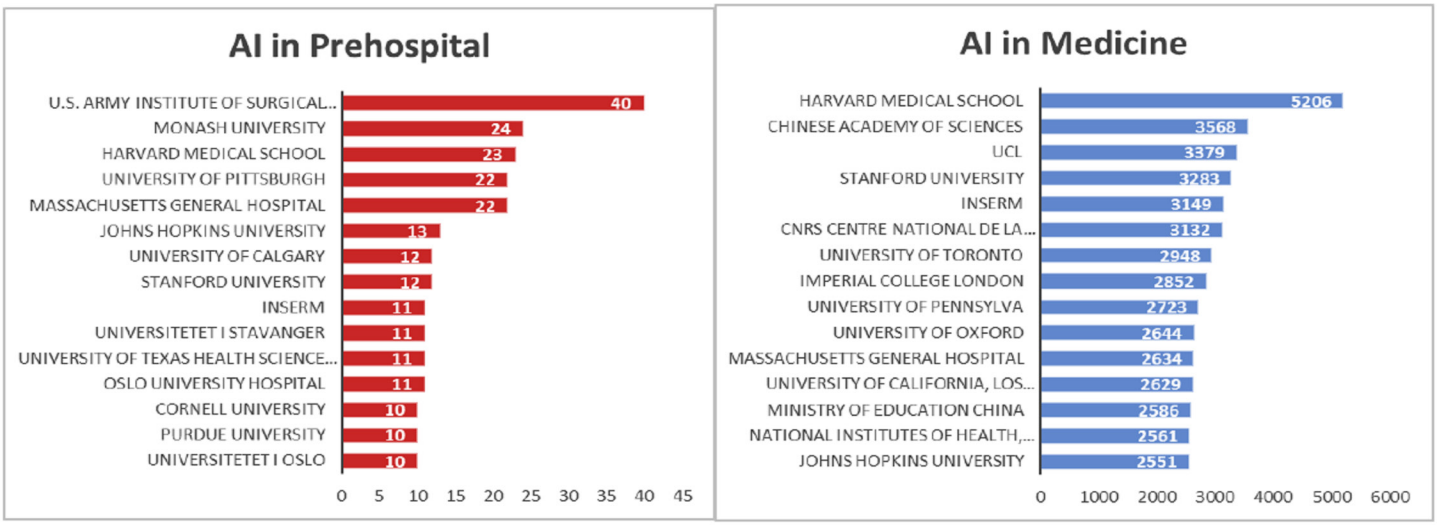

Figure 4. Documents by affiliation of 1980-2019 in Scopus

In the two groups of words that we searched, more than half of the studies consisted of articles, followed by conference papers, reviews and books, respectively (Figure 5).

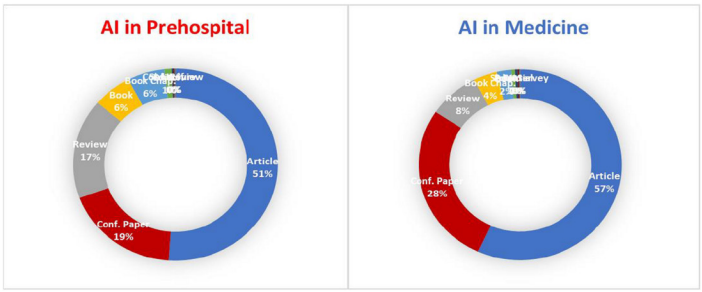

Figure 5. Documents by type of 1980-2019 in Scopus

Most studies for the "Artificial intelligence in prehospital and medicine" word groups have been produced in the fields of medicine, computer science, engineering, social sciences, mathematics, biochemistry, genetics and molecular biology and are common to both groups (Figure 6).

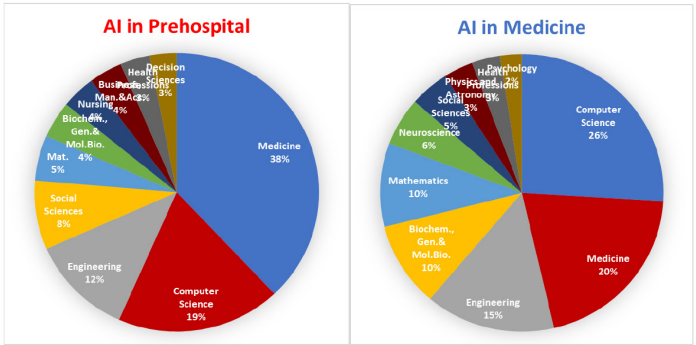

Figure 6. Documents by subject area of 1980-2019 in Scopus

In terms of countries, the United States of America was most commonly used for both concepts. Although China and India are at the top of the in AI in Medicine" list, they are behind in the "AI in Prehospital" concept. In "AI in Prehospital" studies were mostly conducted in USA, UK, Germany, Australia, Canada, Italy, China, France, Spain, Sweden and "In AI in Medicine" studies were mostly conducted in USA, China, UK, Germany, Canada, Italy, India, France, Australia and Spain respectively.

When the studies are classified according to languages, it is seen that English is above 90%. It is understood that English is the most common language in the world, and it is valid for academia (Table1). While countries such as China and India are in the rankings on the basis of the country, it is understood that the studies in these countries are conducted in English (Figure 7).

The highest funding for studies is provided by the National Institutes of Health (NIH) for AI in Medicine (n = 14877) and AI for Prehospital (n = 22) (Figure 8).

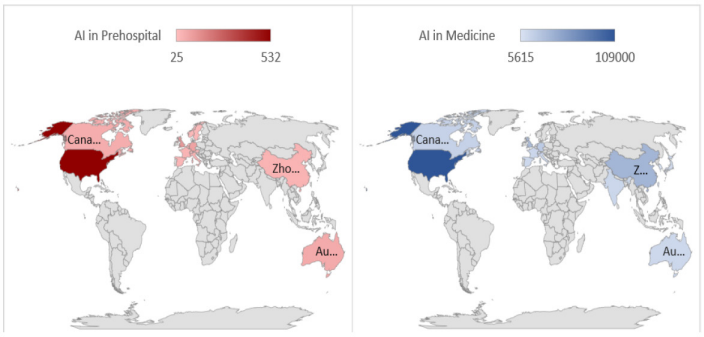

Figure 7. Documents by country of 1980-2019 in Scopus

Table 1. Documents by Language of 1980-2019 in Scopus

AI in Prehospital	#	%	AI in Medicine	#	%
English	1217	96,97	English	320314	97,91
German	16	1,27	Chinese	2651	0,81
Chinese	7	0,56	German	819	0,25
Spanish	6	0,48	Spanish	802	0,25
French	3	0,24	French	775	0,24
Portuguese	2	0,16	Turkish	412	0,13
Russian	2	0,16	Portuguese	272	0,08
Hungarian	1	0,08	Japanese	213	0,07
Turkish	1	0,08	Russian	186	0,06

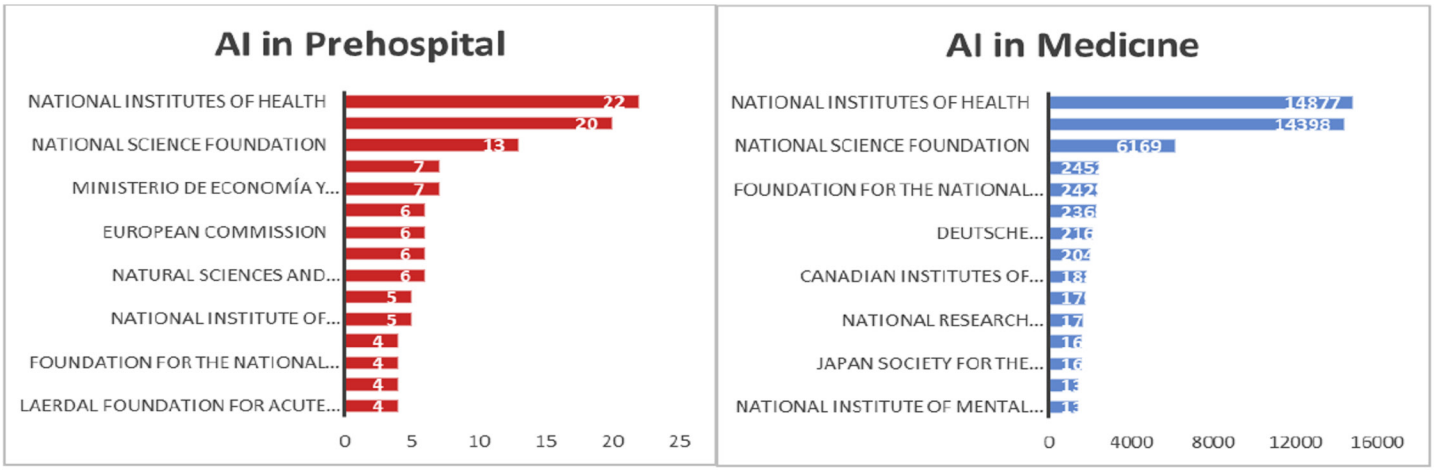

Figure 8. Documents by funding sponsor of 1980-2019 in Scopus

Although our study does not include the articles before the year 1980, the most cited (by Highest) article about AI in medicine published at 1973, cited 5525 times. The most cited (151 times) articles about AI in prehospital published at 2014 (Table 2).

Authors	Title	Year	Source title	Volume	Issue	Cited by	DOI
Persson, M., et al.	Microwave-based stroke diagnosis making global prehospital thrombolytic treatment possible	2014	IEEE Transactions on Biomedical Engineering	61	11	151	10.1109/TBME.2014.2330554
Adams, G.L., et al.	Effectiveness of Prehospital Wireless Transmission of Electrocardiograms to a Cardiologist Via Hand-Held Device for Patients With Acute Myocardial Infarction (from the Timely Intervention in Myocardial Emergency, NorthEast Experience [TIME-NE])	2006	American Journal of Cardiology	98	9	93	10.1016/j.amjcard.2006.05.042
Convertino, V.A., et al.	Individual-specific, beat-to-beat trending of significant human blood loss: The compensatory reserve	2015	Shock	44		33	10.1097/SHK.0000000000000323
Kurz, D.J., Bernstein, A., Hunt, K., Radovanovic, D., Erne, P., Siudak, Z., Bertel, O.	Simple point-of-care risk stratification in acute coronary syndromes: the AMIS model	2009	Heart	95	8	23	10.1136/hrt.2008.145904
Hooper, T.J., De Pasquale, M., Strandenes, G., Sunde, G., Ward, K.R.	Challenges and possibilities in forward resuscitation	2014	Shock	41	SUPPL. 1	18	10.1097/SHK.0000000000000096
Scheetz, L.J., Zhang, J., Kolassa, J.E.	Using crash scene variables to predict the need for trauma center care in older persons	2007	Research in Nursing and Health	30	4	17	10.1002/nur.20203
Howard, J.T., Janak, J.C., Hinojosa-Laborde, C., Convertino, V.A.	Specificity of Compensatory Reserve and Tissue Oxygenation as Early Predictors of Tolerance to Progressive Reductions in Central Blood Volume	2016	Shock	46	3S	15	10.1097/SHK.0000000000000632
Garvey, J.L., Zegre-Hemsey, J., Gregg, R., Studnek, J.R.	Electrocardiographic diagnosis of ST segment elevation myocardial infarction: An evaluation of three automated interpretation algorithms	2016	Journal of Electrocardiology	49	5	11	10.1016/j.jelectrocard.2016.04.010
Liu, N.T., Kramer, G.C., Khan, M.N., Kinsky, M.P., Salinas, J.	Blood pressure and heart rate from the arterial blood pressure waveform can reliably estimate cardiac output in a conscious sheep model of multiple hemorrhages and resuscitation using computer machine learning approaches	2015	Journal of Trauma and Acute Care Surgery	79	4	4	10.1097/TA.0000000000000671

Authors	Title	Year	Source title	Volume	Issue	Cited by	DOI
Zadeh, L.A.	Outline of a New Approach to the Analysis of Complex Systems and Decision Processes	1973	IEEE Transactions on Systems, Man and Cybernetics	SMC-3	1	5526	10.1109/TSMC.1973.5408575
Reiter, R.	A theory of diagnosis from first principles	1987	Artificial Intelligence	32	1	1902	10.1016/0004-3702(87)90062-2
Ott, P.A., et al.	An immunogenic personal neoantigen vaccine for patients with melanoma	2017	Nature	547	7662	596	10.1038/nature22991
Kononenko, I.	Machine learning for medical diagnosis: History, state of the art and perspective	2001	Artificial Intelligence in Medicine	23	1	530	10.1016/S0933-3657(01)00077-X
Xiong, H.Y. , et al.	The human splicing code reveals new insights into the genetic determinants of disease	2015	Science	347	6218	444	10.1126/science.1254806
Lanitis, A., Draganova, C., Christodoulou, C.	Comparing Different Classifiers for Automatic Age Estimation	2004	IEEE Transactions on Systems, Man, and Cybernetics, Part B: Cybernetics	34	1	413	10.1109/TSMCB.2003.817091
Iorio, F., et al.	A Landscape of Pharmacogenomic Interactions in Cancer	2016	Cell	166	3	378	10.1016/j.cell.2016.06.017
Cios, K.J., William Moore, G.	Uniqueness of medical data mining	2002	Artificial Intelligence in Medicine	26	1-2	363	10.1016/S0933-3657(02)00049-0
Hofmann, M., et al.	MRI-based attenuation correction for PET/MRI: A novel approach combining pattern recognition and atlas registration	2008	Journal of Nuclear Medicine	49	11	338	10.2967/jnumed.107.049353
Gottlieb, A., Stein, G.Y., Ruppin, E., Sharan, R.	PREDICT: A method for inferring novel drug indications with application to personalized medicine	2011	Molecular Systems Biology	7		327	10.1038/msb.2011.26

Discussion

The concept of artificial intelligence emerged in the 1950s. According to the Scopus database data, studies on the concept of artificial intelligence in medicine have increased significantly after 1980s. Between 2000 and today, an average increase of 84% occurred annually. The concept of pre-hospital and the concept of artificial intelligence has accelerated after 1990. In the studies carried out in this subject between 2000 and today, an increase of 83% is observed in medicine similar to the concept of artificial intelligence.

In a study conducted in 2016, a significant portion of the physician's office time was recorded as routine work. It has been suggested that the active use of artificial intelligence systems for routine tasks such as registration, etc., will save time and provide more effective patient care [6].

The development of pharmaceutical agents requires many years and high budget. A more effective and efficient way can be followed by improving the efficiency of the existing drugs and using artificial intelligence in the process of different diseases. The concept of individualized medicine is gaining importance and it can reach its real meaning and importance faster with the support of artificial intelligence [1].

It has been published that artificial intelligence assisted systems can more accurately distinguish suspicious skin lesions from dermatologists [7-10].

Even though the history and philosophy of artificial intelligence dates back centuries, the intensification of applications has started in recent years and continues to accelerate, and artificial intelligence will make itself known in the 21st century. As a conclusion, the appetite for AI in health industry will result in increasing number of studies both in medicine and prehospital. This will provide a better inside for clinicians.

Competing interests
The authors declare that they have no competing interest.

Financial Disclosure
This study received no financial support.

Ethical approval
No ethic approvell is needed to this research.

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