Human computer interaction using machine learning

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Abstract:
Interest in the complex subject of human-computer interaction (HCI) has increased recently. Human-computer interaction has been more important in the area of safety risk management since the start of the Fourth Industrial Revolution. The development of human-computer interaction for spotting possible dangers in buildings has not received much attention. We created a study framework for the application of human-computer interaction (CHR-HCI) in the detection of construction-related risks after performing an extensive literature review. The nexus of ergonomics, virtual reality, and computer vision will be the subject of future research. In this study, we established a theoretical framework for the conclusions and linkages from earlier research and provided specific suggestions for the future development of HCI in threat identification. Additionally, we looked at two case studies that dealt with context-aware navigation and wearable vibration-based devices in the context of CHR-HCI.
Keyword: Human, computer, interaction, machine, learning.
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1. Introduction

With the widespread use of computers, the significance of effective human-computer interaction has increased. The study of human-computer interaction (HCI) focuses on how effectively computers are made to communicate with people and how well people are able to use them. The question of how to connect computers has always arisen with their use. The ways in which people communicate with computers have greatly improved throughout time. Even though we have made great strides over the past few decades, we still have a long way to go. Research in this area has flourished, and new technology and system ideas appear every day.

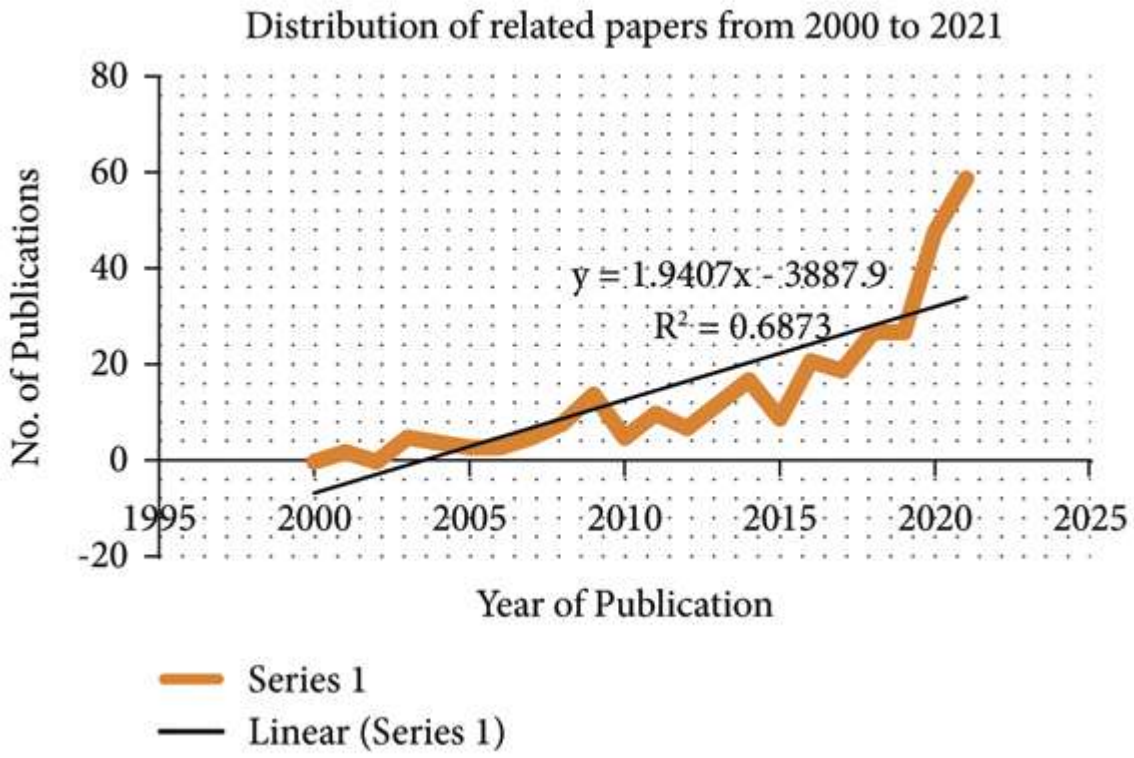

Fig.1: Human computer interaction using machine learning Flow.

The field of human-computer interaction (HCI) has evolved over time, as has the calibre of communication between humans and computers. The design of conventional command- and action-oriented user interfaces has received less attention from many fields of research than the concepts of multimodality and flexible user interfaces.

2. Methods for HCI Design

Through the use of a specialised user interface, data and information are input into and extracted from a computer during the process known as "human and computer interaction" [13]. Users give the system their instructions, which it then examines, computes, and processes before returning the results to the users through the same interface [14]. In the present day, information is transferred between humans and machines through a number of channels, including data communications, numerical and symbolic interaction, voice interaction, and intelligent interactions [11].

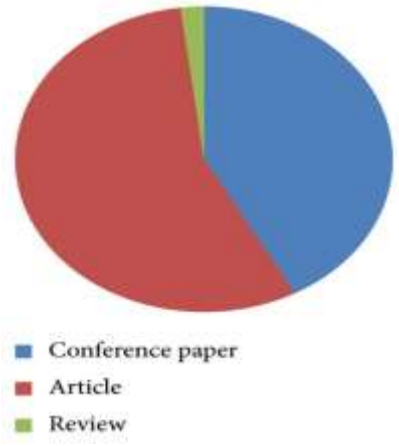

Fig.2: Human computer interaction using machine learning Graph.

Within the three primary components of the interface design process—interactive design, structural design, and visual design—Tosi [6] and Jeon et al. [9] have suggested subclassifications. Examples of additional categories for interactive design, which is concerned with how people engage with systems, are "the types of interactions" and "how the interactions take place" [7]. According to Esposito et al. [1-6-7], it is essential to consider aspects like "people's orientation, consistency, users' operation ability, shortcuts, assistance, and feedback" while developing an interactive interface. Again, structural design may be broken down into three subcategories that focus on analysing individual requirements, the rationale for carrying out the work, and the way in which the task was designed [1-8-9].

3. Research Methodology

3First and foremost, the means for acquiring information were found. After careful consideration and comparison, the databases selected for the literature search were Scopus, ACM Digital Library, Web of Science, and Google Scholar. Second, the literary subgenres that will be examined were picked. The main literature base for this inquiry is a set of journal papers on risk assessment and HCI technologies. Conference papers should be a key component of the literature resources for investigating hazard recognition and HCI since academic conferences are a significant venue for academics to share research findings and solve scientific challenges in this field [3].

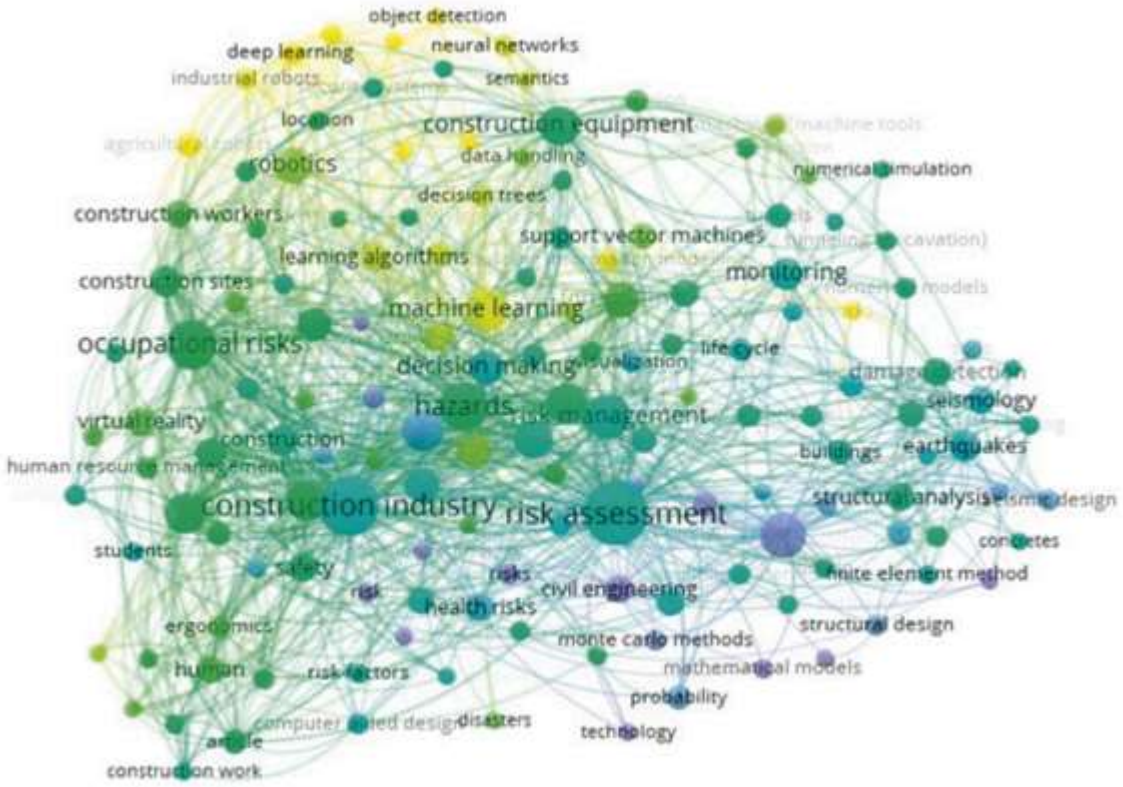

Fig.3: Human computer interaction using machine learning Network.

The limitations used to direct the literature search were ultimately applied. Researchers must be very particular about what they are looking for and the time period they are looking at in order to obtain documents. We looked up the words "construction," "hazard," "recognition," "human-computer," and "interaction" in the dictionary and compared them to words with similar and dissimilar sounds. To ensure that the literature search was complete and thorough, the following steps were done [3]: synonyms and antonyms were connected using Boolean operators, and the resulting pairings were utilised to query multiple data repositories. We added the missing synonyms and near-synonyms using the most pertinent search terms, abstracts, and publications.

4. Basic Information Analysis

Once the sample was established, the underlying data from the 274 papers were examined. The main goal of this part is to provide readers with the fundamentals, such as the number of yearly publications and the composition of literary genres in this subject, similar to how descriptive statistics are used in some experimental studies. The distribution of various publications

(journals, conferences, and reviews) through time offers information on the growth of knowledge and may offer hints as to the direction CHR-HCI may take in the future.

5. Keyword Co-Occurrence Network

By analysing keyword co-occurrences, the scientific knowledge of [3] illustrates how CHR-HCI research has evolved. Second, the word co-occurrence network's cluster analysis produced two reliable results: a mean silhouette (P) value of 0.7533 and a modularity (Q) value of 0.796. A word co-occurrence network is shown in Figure 3 and may be utilised directly in cluster analysis. In accordance with their frequency of occurrence, the study words in Figure 3 may be divided into two groups: one for lower-level ideas and one for higher-level concepts. At the top is the overarching research question, followed by a tier of keywords related to human-computer interaction and a tier of keywords related to terms concerning construction safety and hazard recognition.

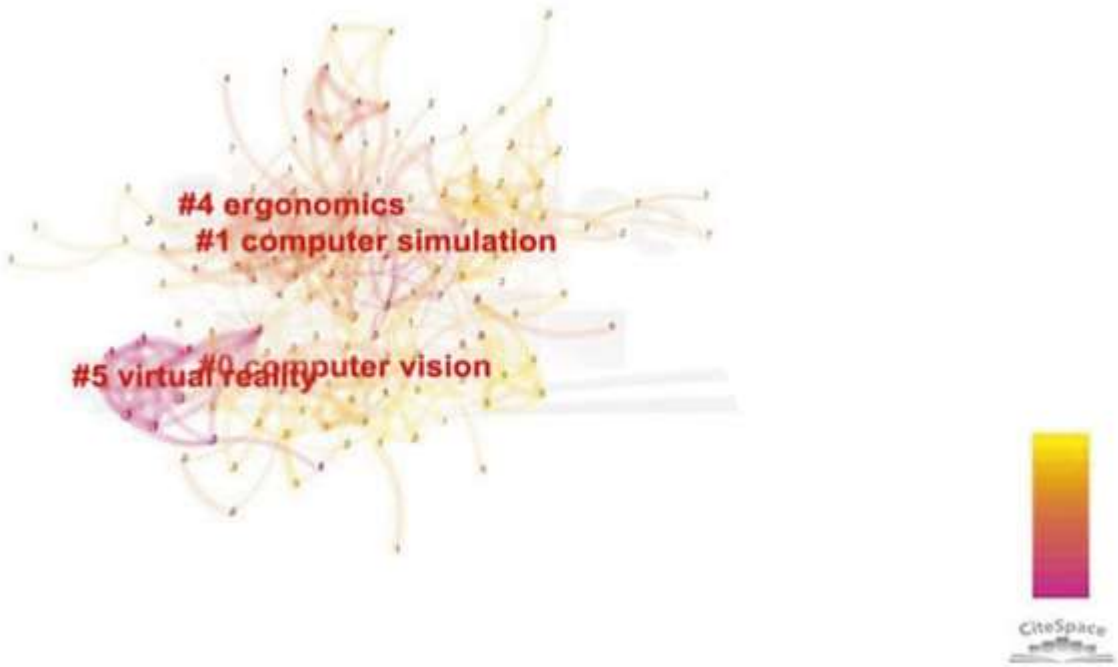

Fig.4: Human computer interaction using machine learning Location

Cluster Analysis

The most significant advancements in the field of CHR-HCI were described through the application of cluster analysis [3]. Cluster analysis is a method of analysis that may be used to examine text data and find intriguing research topics since it makes use of the best

computational tools in statistics. In this study, cluster analysis was carried out using VOSviewer and CiteSpace, with CiteSpace being utilised to polish the data collected by VOSviewer. The three most popular methods for naming modules in CiteSpace are log-likelihood ratio, mutual information, and largest word frequency [2-9-3]. We chose to utilise the greatest word frequency method to identify which modules existed since the names of the modules are so illustrative.

6. Computer Vision

177 of the 251 items that were discovered were specifically related to the keyword [3]. This emphasises how crucial a part computer vision plays in danger identification studies. Recent advancements in computer vision technology are based on the continuous improvement of deep learning methods including convolutional neural networks, stacked auto encoder network models, and deep belief networks. Important areas of study include content-based image extraction, posture evaluation, multimodal data identification, autosomal motion, image tracking, scene reconstruction, image recovery, and system integration. Regarding the identification of dangers, there are two key research areas in computer vision [3]. As an illustration, Luo et al.'s [3-1] analysis of cognitive links and model development.

7. Conclusion

The CHR-HCI area is proposed to be divided into three tiers using a framework in this research. This acknowledges the fact that human-computer interaction is a developing multidisciplinary subject involving many disciplines and that hazard detection also necessitates extensive theoretical knowledge and practical skills. The articles examined two relevant case studies and analysed a number of related works in the subject of CHR-HCI. For the purposes of risk assessment, accident prevention, foresight, prediction, and intelligent monitoring, the construction industry finds, perceives, and recognizes hazards as well as the factors that influence them. This technique is known as hazard identification from a research viewpoint.

Changes in human-computer interface technology have made it feasible to move away from post-accident analysis and towards preaccident prediction and prevention, which has been the main progress in engineering safety driving philosophy during the past 21 years. This is one of the reasons we are advocating for the broad application of HCI techniques. Theoretically, hazard recognition consists of two fundamental elements: theory relating to the risks or hazards

involved and theory relating to the actual process of recognising or recognising the dangers. Risk psychology, for example, provides theoretical support for the use of HCI technology.

Human aspects engineering, sociology, psychology of behaviour, and ergonomics. Because engineering oversees scientific investigations and is so crucial to the advancement of science and technology, academics have given close attention to engineering ethics. As a result, engineering ethics ought to be used as a basic guide for spotting possible risks [4-7].

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