Type: 海报展示

犯罪侦查决策支持模型

摘要

人工智能和大数据技术已成功应用于众多领域的科学问题分析中,其中也包括犯罪分析领域。犯罪案件侦查一直是犯罪分析工作的重点和难点。犯罪案件在侦查阶段,主要包括证据收集和证据推理等工作。证据的全面高效收集对案件推理和快速侦破具有重要意义。与此同时,不同证据在案件中的重要程度不同,如果具有高重要度的证据在侦查早期阶段被收集,可有助于提高案件侦破效率。然而,现有的人工智能方法应用于犯罪侦查决策支持的研究较少。鉴于此,该文提出了一种基于加权信息熵的证据重要度的计算方法,并在此基础上构建了基于 Bayes 网络的犯罪侦查决策支持模型,然后利用 420 例犯罪案例对模型的准确率进行了验证,并用一例实际案例的分析过程对模型应用进行了阐述。分析结果表明:提出的模型能够输出有效的侦查建议,为侦查阶段的证据收集和推理工作提供决策支持。

关键词

社会安全;犯罪侦查;证据重要度;Bayes 网络;决策支持

Abstract

[Objective] Artificial intelligence and big data technologies have been used to solve many scientific problems, including crime analysis. The investigation of criminal cases has always been a critical and difficult point in the domain of crime analysis. The investigation stage of criminal cases primarily consists of evidence collection and evidence reasoning, and comprehensive and efficient collection and reasoning of evidence are critical to the rapid detection of cases. Simultaneously, the significance of the various pieces of evidence in the case varies. Evidence of high importance gathered during the investigation stage is critical for the accurate and efficient resolution of crime cases. However, existing research lacks the application of artificial intelligence methods to crime investigation decision support. Aiming at the problem of crime investigation, this research proposes a decision support model based on the Bayes Network to help domain experts determine the direction of the investigation and reasoning the criminal facts. [Methods] First, the Bayes Network is used to reason the hypothesis of criminal facts. Second, the weighted information entropy method was used to calculate the importance of criminal evidence. Four different types of weighted information entropy methods are employed to test the efficiency of the calculation method. The two methodologies are then combined to create the decision support model for crime investigation. Finally, the proposed model is applied to 420 crime cases to verify its accuracy, and the proposed model is also applied to a real case analysis to illustrate the application process of the model. [Results] The analysis of 420 crime cases revealed that calculations based on weighted information entropy are the best of all four methods. The top 3, 5, and 10 evidence provided with the weighted information entropy method all have the highest coverage of importance, given any arbitrary evidence missing ratio. Meanwhile, when 50% of the evidence is missing, the output result's coverage of the top 3, 5, and 10 important pieces of evidence are greater than 50%, 65%, and 80%, respectively; when 90% of the evidence is missing, coverage of the top 3, 5, and 10 is greater than 40%, 60%, 75% respectively. These suggest that the model's detection recommendations are effective and can be used to assist in crime detection. Furthermore, the analysis of a real-world case also shows that the proposed model can generate effective investigation suggestions and provide decision support for evidence collection and reasoning during the investigation stage. [Conclusions]Finally, the proposed decision support model for crime investigation can analyze available case information and generate effective investigation suggestions and reasoning conclusions. However, it should be noted that the model developed in this study does not completely replace the role of professionals in the field of criminal investigations but rather provides analysis results to scientifically support the investigation' s subsequent investigators' decisions in the initial stages of the investigation. Furthermore, this study focuses on the research of evidence collection and reasoning during the investigation stage of criminal cases but pays limited attention to the "evidence standard" involved in the process of evidence collection. Therefore, we can

continue to investigate this aspect in the future to aid intelligence and standardization of evidence collected during the investigation stage.

Keywords

Social Security; Crime Investigation; Evidence Importance; Bayes Network; Decision Support

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