Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 56 Issue: 01: 2023
DOI10.17605/OSF.IO/6M3YB

A STUDY TO IDENTIFY THE COMPONENTS OF ARTIFICIAL INTELLIGENCE IN NVA

LIN ZHENQUAN

Scholar Lincoln University College.

Dr. AMIYA BHAUMIK

Professor, President Lincoln University College Research.

Abstract

Using a value-added and non-value-added analysis, the authors of this paper apply the lean concept to the industrial sector's inspection procedure. An essential aspect of this procedure is transporting the component from one cell to another, then back again after inspection. Based on these observations, we were able to break the procedure down into manageable chunks. Descriptive research and quantitative methods were used in this investigation. The primary data was collected via a questionnaire with set questions. This prompted the employment of Regression and Analysis of Variance tests to shed light on the connection between the explanatory variables and the dependent ones. The study found that a cloud-based surveillance system's camera sensor, crowd-supported content, surveillance applications, probability of incorporating essential computer vision, and network video analytics (NVA) all had significant relationships with one another.

Keyword: Network video analysis, video analytics, computer vision, cloud-based surveillance, and cameras

Introduction

Requests are delivered to the NVAs, who are responsible for handling them, through the application gateway. In addition, workload virtual machines that are part of the main pool of the load balancer will deliver outbound requests to NVAs. Instead of employing a load balancer to manage outward traffic, network virtual appliances (NVAs) are responsible for managing incoming traffic through the use of application gateways. As a consequence of this, the application gateway is able to determine the origin of both incoming and outgoing requests. This enables it to provide the user with a response that is tailored to their specific needs. AVNs are required to interact with one another and pass on the answer in order for the appropriate AVN to be able to send the response (Stuhlmuller, 2022).

One of the first forms of technology and one of the most common types of security measures in use today is video surveillance. The implementation of IP cameras has helped hasten the transition away from analogue CCTV networks and toward IP networks.

The ratio of the screen to the camera is somewhere in the range of 1/4 to 1/30, whereas the ratio of the agent to the screen is roughly 1/16. Therefore, despite the fact that all cameras are, in a sense, being viewed, only a select number displays are being seen in real time (Bezzine et al., 2020). In order to overcome these problems, a major migration

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 56 Issue: 01: 2023
DOI10.17605/OSF.IO/6M3YB

to intelligent surveillance systems is currently taking place. A video-based intelligent system would not be able to differentiate between a scenario representing an actual combat between two individuals and a fake one, such as a scene from a game of hand, since it would not be able to recognize the difference between the two.

Literature Review

The analysis of movies for a number of objectives may be accomplished with the help of computer vision and deep learning, which are integrated in video analytics. Other names for this technique include intelligent video analytics and video content analysis. The implementation of cutting-edge video analytics software is becoming increasingly common. The most major users of AI are organizations that have been using video surveillance systems for an extended period of time and organizations that are attempting to tackle long-standing problems with the most recent AI technology (Ahonen, et al., 2006).

Deep learning and machine learning are two subcategories of artificial intelligence that have made it feasible to employ video analytics to transform automated procedures that previously required the involvement of a person. The market for video analytics is subject to considerable shifts on an annual basis. This year, videos are being analysed in real time, and enhanced software for video identification is being created specifically for video analytics (Ahonen, et al., 2008).

In order to determine whether or not there is motion, two or more images of the same scene are compared and contrasted to look for differences. A frame reference and pixel matching are both necessary components of video motion detection. The process of identifying motion is a standard step in video analysis. This capability may be included, for instance, in a video management programmer or an IP/CCTV camera (Ojansivu, et al., 2008).

Cisco and Avigilon are two of the most recognizable brands in the field of video analytics. Other businesses include Genetic, Aventura Systems, IBM, and Bosch Security, as well as Axis Communications and Aventura. It is feasible to classify video analytics as either a service or a piece of software. Video analytics are currently being applied in a broad variety of business settings, including retail, healthcare, and the manufacturing sector. Recently, advancements in computer vision systems have allowed for the construction of specialized video analytics tools. Because of the availability of low-code development platforms, businesses now have the ability to rapidly and simply construct custom video analytics solutions while still enjoying the benefits of ready-made software solutions (Vasconcelos et al., 2010).

Statement of the Problem

The application of artificial intelligence in video analytics is a popular issue (AI). Some of these technologies allow for the rapid acceleration and automated processing of data analysis and other repetitive tasks. However, AI cannot replace the expertise and

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 56 Issue: 01: 2023
DOI10.17605/OSF.IO/6M3YB

discretion of a human operator. Combining AI solutions with human inventiveness is more powerful than depending simply on AI solutions. Machine learning and deep learning are subsets of the AI umbrella. Using these iterative procedures, an AI system may be developed and evaluated to ensure it meets predetermined criteria before being released to the public. Ultimately, the algorithm is ready to be utilized in an analytics solution that can be purchased and deployed on a monitoring site.

Due to developments in algorithm development and camera processing capabilities, AI-based video analytics may now be conducted directly on the camera rather than on a server (server-based) (server-based). Having uncompressed video material available in real time helps boost real-time functionality. Always follow the manufacturer's guidelines when employing artificial intelligence (AI) in video analytics. Video analytics output is sensitive to such factors as the cameras used, where they are placed, the quality of the footage captured, the nature of the scenario, and the amount of available light. By changing and understanding the effect of these components, video analytics performance may be enhanced in various circumstances. To add insult to injury, manually searching through a large number of video streams is a time-consuming process (Bae et al., 2008).

In the case of person monitoring and identification, position and lighting fluctuations, face emotions, and ageing conditions are the most prevalent hurdles to overcome. A person's look can be substantially influenced by a combination of their expression and lighting problems. Even humans are unable to notice these minor distinctions due to the strength of the noise (Mantri et al., 1995).

With the advancement of smartphone camera technology, this is becoming increasingly helpful. Companies like OpenCV, the pioneers of contemporary computer vision software, now make their services open to the general public (Norman, 2017).

There is no IT system without network monitoring, which keeps eyes on network components, endpoint devices, performance, and traffic patterns. There are a range of tools that may be used to monitor network activities. Performance counters are vital for monitoring traffic, bandwidth usage, and other data. Tools for network monitoring make it simpler for IT managers to resolve problems with real-time network performance by delivering instant warnings and data in the form of tables, graphs, dashboards, and reports in real-time.

Objective of the Study

The purpose of this research is to examine an intelligent video analytics system that can automatically recognize and categories items from a large number of video streams and is distributed over several cloud computing resources. The other research objectives flow logically from this primary aim.

- To study the components of artificial intelligence.

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 56 Issue: 01: 2023
DOI10.17605/OSF.IO/6M3YB

Research Question

- When defining AI, what factors must be considered?

Research Methodology

Secondary information is information that has been gained in the past from primary sources and is now made available to researchers as secondary data. Primary information is the data that was collected. To phrase it another way, this is conventional wisdom that has been around for a considerable amount of time. It is possible that researchers will gather data for a particular study, and then later make the data available to other researchers so that they can use it for their own research endeavors. It is possible to repurpose data in one of two ways: either as primary data for the first research project, or as secondary data for the second research project.

This research relied on descriptive research as its foundation. In the same vein, this descriptive research utilized a cross-sectional study to compare the demographic characteristics with the respondent's knowledge and awareness of NVA. Age, gender, occupation, length of employment, level of technical knowledge, level of surveillance skill, and income were the demographic factors that were included in the analysis. This research essentially summarized the results of the public survey as well as its features, making it descriptive.

Research Design

The conceptual framework of the study as well as the correlations that were hypothesized to exist between the variables are presented in this part. However, in the model's basic model, which investigated the direct impacts of five factors on commitment, there was a possibility that some of the variables were being mediated by other variables. Because of recent developments in cameras, mobile phones, and camcorders, particularly the quality at which they can capture an image or video, large amounts of data are being created every day. This is particularly true in terms of the resolution at which images and videos may be recorded. Because human object recognition and classification may be time-consuming and prone to errors, automated analysis is required in order to extract meaningful information and meta-data from this video data.

In recent years, deep learning has emerged as a significant approach for obtaining high levels of accuracy and precision in computer vision applications. In addition, they may be educated utilizing a vast assortment of input datasets that correspond to a number of unique classes and can be trained on those datasets. However, when applied to the analysis of data obtained from video streams, deep learning algorithms run into a number of significant challenges.

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 56 Issue: 01: 2023
DOI10.17605/OSF.IO/6M3YB

Analysis

In this study, the latent structure, or dimensions, of a collection of research variables was uncovered through the application of factor analysis. It condenses the attribute space, going from a high number of variables to a more manageable number of components, and as a result, it is referred to as a "non-dependent" technique (that is, it did not assume a dependent variable to be specified).

Surveillance cameras, often known as CCTV cameras, have been shown in several studies to make use of IP networks to link the camera at the remote location to a central monitoring station (Valentn, 2017). The platform's online interface and mobile capabilities let users access it from their smart phones, and it enables businesses to keep tabs on their staff and conduct surveillance at all hours (Zhou, 2020). As a result, the efficiency of a surveillance system may be greatly improved by strengthening the connection between camera sensors and cloud-based platforms.

This sort of intelligence might provide both in-the-moment and retrospective understanding of a significant occurrence. When several data sets, such as GIS data, location data, and other metadata, are combined, a comprehensive suite of video analytics tools may be generated. Algorithmic procedures will become more efficient as a result of this. Similarly, the quality of the data and the precision of the algorithm are affected by elements such as the display of camera location and perspective, which should include three-dimensional projection, geographical context, and narrative time sequence. Research in this area might benefit from abandoning the current application-specific solutions in favour of a more general video analytic framework (Olatunji, 2019).

Conclusion

A more significant problem emerges as a result of the possibility that such systems might constitute a shift of power from those being observed to those doing the monitoring. In various countries and in a broad variety of settings, the degree to which manual CCTV capabilities are regulated is quite variable and can be quite different from one location to the next. In certain jurisdictions, the installation of cameras in public places is restricted to governmental authorities. However, in other jurisdictions, the installation of cameras on private property with a view of public areas is authorized. The legality of covert surveillance deployment and the limits placed upon it are subject to change in semi-private and private locations. It is not out of the question that as this technology reaches a point where it is more accessible to the average worker, automatic analysis of the footage that is collected by these devices will become more prevalent in the workplace.

Within the built component, several threads were utilized in order to perform analytics operations on input video streams in a simultaneous manner. The workers that make up the video analytics component of the recommended system were synchronized in an acceptable manner to ensure the secure execution of a large number of concurrent threads. As a direct consequence of this, the proposed system was evaluated using the cloud's many different types of workloads. One of the duties was providing a streaming

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 56 Issue: 01: 2023
DOI10.17605/OSF.IO/6M3YB

video in real time of a recorded footage of traffic on a roadway. – For this reason, DeepSORT was utilized, which makes use of the MaskRCNN algorithm to track recognizable vehicles as they move across recorded film. This was done in order to fulfil this objective.

In this article, the most recent advancements in CCTV systems, as well as the potential for these systems to continue developing in the future, are dissected and analysed. Analyzing and combining data from several types of sensors can be a useful strategy for dealing with the ever-evolving nature of security risks and threats.

Security and monitoring systems are becoming increasingly prevalent in today's society as a means of reducing risks to the general populace. This is especially true for applications that need knowledge of the surrounding environment. It is also necessary to have complete and thorough management and control over all parts of a society's life.

The inquiry started with a comprehensive look at the various monitoring technologies that are now in use, as well as an analysis of how these technologies have developed over the course of time. This investigation came to a close with a discussion of some of the forthcoming advancements that would be made in video surveillance systems.

In order to develop further video surveillance systems, there needs to be a continuous flow of data that is acquired, reviewed, and utilized in order to make educated judgments and respond in an intelligent manner. On this work, an architecture for video surveillance that is hosted in the cloud is proposed. Using this strategy, it is possible to offer video surveillance as a service; doing so would grant us access to a system that is malleable and extensible enough to meet the requirements of a wide variety of contexts. As part of our continuous efforts to create new features and functionality, the researcher has shown interest in including more filters into the processing module in the not too distant future. The researcher also intends to incorporate more types of sensors into the system, such as sensors that can detect motion and temperature, as well as similar sensors, because they believe they would assist the system in gaining a deeper understanding of a given scenario.

For instance, computer vision needs to overcome a variety of challenging issues that are associated with shifting lighting, but this is nothing in comparison to the work that is being done in edge devices and the Internet of Things (IoT). It is only a matter of time until IP-based solutions and intelligent surveillance systems become the norm in the industry. And who knows, maybe in the not too distant future the researcher may have monitoring systems that are capable of anticipating everything. Everyone is familiar with the term "Internet of Things," often known as "IoT."

References

1. "K. Takahashi, S. Nobuhara, T. Matsuyama, A new mirror-based extrinsic camera calibration using an orthogonality constraint, in: Computer Vision and Pattern Recognition (CVPR), 2012 IEEE Conference on, IEEE, 2012, pp. 1051–1058.

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 56 Issue: 01: 2023
DOI10.17605/OSF.IO/6M3YB

2. K. Yan, Y. Chen, and D. Zhang, "Gabor surface feature for face recognition," in Pattern Recognition (ACPR), 2011 First Asian Conference on, pp. 288–292, IEEE, 2011.
3. Karpagavalli, P. R. (2013). Estimating the density of the people and counting the number of people in a crowd environment for human safety. 2nd International Conference on Communication and Signal Processing, ICCSP, pp. 663-667.
4. Khan, S., Shah, M.: Tracking multiple occluding people by localizing on multiple scene planes. IEEE Trans. Pattern Anal. Mach. Intell. 31(3), 505–519 (2009).
5. Khan, Z. G. (Sep. 2010). Joint feature correspondences and appearance similarity for robust visual object tracking. IEEE Trans. (pp. pp. 591–606). Inf. Forensics Security.
6. Khan, Z., Balch, T., Dellaert, F.: MCMC-based particle filtering for tracking a variable number of interacting targets. IEEE Trans. Pattern Anal. Mach. Intell. 27(11), 1805–1918 (2005).
7. Kim, J., Grauman, K.: Observe locally, infer globally: a space-time MRF for detecting abnormal activities with incremental updates. In: Proceedings of IEEE International Conference on Computer Vision and Pattern Recognition, pp. 2921–2928 (2009).
8. Kratz, L., Nishino, K.: Anomaly detection in extremely crowded scenes using spatio-temporal motion pattern models. In: Proceedings of the Conference on Computer Vision and Pattern Recognition, Maimi Beach, Florida, pp. 1446–1453 (2009).
9. Kwak, S., Nam, W., Han, B., Han, J.H.: Learning occlusion with likelihoods for visual tracking. In: 2011 IEEE International Conference on Computer Vision (ICCV), pp. 1551–1558 (2011).
10. L. Shen and L. Bai, "A review on gabor wavelets for face recognition," Pattern analysis and applications, vol. 9, no. 2-3, pp. 273–292, 2006.
11. L.-M. Ang, K.P. Seng, L.W. Chew, L.S. Yeong, W.C. Chia, Wireless multimedia sensor networks on reconfigurable hardware (2013).
12. Laureshyn, Application of automated video analysis to road user behaviour, 2010.
13. Lee, L., Romano, R., Stein, G.: Monitoring activities from multiple video streams: establishing a common coordinate frame. IEEE Trans. Pattern Anal. Mach. Intell. 28(8), 758–767 (2000).
14. Li, H.; Graham, D.J. Heterogeneous treatment effects of speed cameras on road safety. Accid. Anal. Prev. 2016, 97, 153–161.
15. Li, J., Lu, X., Ding, L., Lu, H.: Moving target tracking via particle filter based on color and contour features. In: 2010 2nd International Conference on Information Engineering and Computer Science (ICIECS), pp. 1–4. IEEE, New York (2010).
16. LIU, Xinchen, LIU, Wu, MA, Huadong, et al. Large-scale vehicle re-identification in urban surveillance videos. In: 2016 IEEE International Conference on Multimedia and Expo (ICME). IEEE, 2016. p. 1-6.
17. Luber, M., Stork, J.a., Tipaldi, G.D., Arras, K.O.: People tracking with human motion predictions from social forces. In: 2010 IEEE International Conference on Robotics and Automation, pp. 464–469. IEEE, New York (2010).
18. Lucas, B.D., Kanade, T.: An iterative image registration technique with an application to stereo vision. In: Proceedings of Image Understanding Workshop, pp. 121–130 (1981).
19. Lun Zhang Li, S.Z. Xiaotong Yuan Shiming Xiang, Beijing, "Real-time Object Classification in Video Surveillance Based on Appearance Learning", Computer Vision and Pattern Recognition, 2007, IEEE Conference Issue Date: 17-22 June 2007, Print ISBN: 1-4244-1180-7, pp.1-8.
20. M. A. Hossain and B. Song, ``Ef_cient resource management for cloudenabled video surveillance over next generation network,'' Mobile Netw. Appl., vol. 21, no. 5, pp. 806_821, 2016.

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online):0493-2137
E-Publication: Online Open Access
Vol: 56 Issue: 01: 2023
DOI10.17605/OSF.IO/6M3YB

21. Carrasco, L. Pizarro, and D. Mery, "Bimodal biometric person identification system under perturbations," in Advances in Image and Video Technology (D. Mery and L. Rueda, eds.), (Berlin, Heidelberg), pp. 114–127, Springer Berlin Heidelberg, 2007.
22. M. Chihaoui, W. Bellil, A. Elke_, and C. B. Amar, \Face recognition using hmm-lbp,"in International Conference on Hybrid Intelligent Systems, pp. 249{258, Springer, 2016.
23. M. Cristani, R. Raghavendra, A. Del Bue, V. Murino, Human behavior analysis in video surveillance: A social signal processing perspective, Neurocomputing 100 (2013) 86–97.
24. M. de Diego, I. S. Román, J. C. Montero, C. Conde, and E. Cabello, ``Scalable and _exible wireless distributed architecture for intelligent video surveillance systems,'' Multimedia Tools Appl., vol. 78, no. 13, pp. 17437_17459, 2019.
25. M. S. Bartlett, J. R. Movellan, and T. J. Sejnowski, \Face recognition by independentcomponent analysis," IEEE Transactions on neural networks, vol. 13, no. 6, pp. 1450{1464, 2002.
26. M. S. Hossain, ``QoS-aware service composition for distributed video surveillance,'' Multimedia Tools Appl., vol. 73, no. 1, pp. 169_188, 2014.
27. M. U. Yaseen, A. Anjum, and N. Antonopoulos, "Spatial frequency-based video stream analysis for object classification and recognition in clouds," in 2016 IEEE/ACM 3rd International Conference on Big Data Computing Applications and Technologies (BDCAT), pp. 18–26, Dec 2016.
28. M.K.K. Reddy, M. Hossain, M. Rochan, Y. Wang, Few-shot scene adaptive crowd counting using meta-learning, in: The IEEE Winter Conference on Applications of Computer Vision, 2020, pp. 2814–2823.
29. Ma, L., Liu, J., Wang, J., Cheng, J., Lu, H.: A improved silhouette tracking approach integrating particle filter with graph cuts. In: 2010 IEEE International Conference on Acoustics Speech and Signal Processing (ICASSP), pp. 1142–1145. IEEE, New York (2010).
30. Mehran, R., Oyama, A., Shah, M.: Abnormal crowd behavior detection using social force model. In: Proceedings of the Conference on Computer Vision and Pattern Recognition, Maimi Beach, Florida, pp. 935–942. IEEE, New York (2009).
31. N. Chen, Y. Chen, Y. You, H. Ling, P. Liang, R. Zimmermann, Dynamic urban surveillance video stream processing using fog computing, in: Multimedia Big Data (BigMM), 2016 IEEE Second International Conference on, IEEE, 2016, pp. 105–112.
32. Nan Lu et. al, "An Improved Motion Detection Method for Real-Time Surveillance", Proc. of IAENG International Journal of Computer Science, Issue 1, 2008, pp.1-16.
33. Naoum, S.G. (2007) Dissertation Research and Writing for Construction Students. 2nd Edition, Butterworth-Heinemann, Cambridge.
34. National Bureau of Statistics of China, 2018. Available online: http://data.stats.gov.cn/ (accessed on 30 October 2018).
35. Neal, D. (2012, 9). VIDEO SURVEILLANCE IN THE CLOUD? Retrieved from International Journal on Cryptography and Information Security (IJCIS),
36. O. C. L. Au and M. C. Kung, "Block parallel and fast motion estimation in video coding," Oct. 29-2009. US Patent App. 12/111,322.