Engagement and Impact 2018

Curtin University

CUT08 (ST) - Impact

Overview

Title

(Title of the impact study)

iCetana: Smart surveillance software a paradigm shift for public safety

Unit of Assessment

08 - Information and Computing Sciences

Additional FoR codes

(Identify up to two additional two-digit FoRs that relate to the overall content of the impact study.)

10 - Technology
01 - Mathematical Sciences

Socio-Economic Objective (SEO) Codes

(Choose from the list of two-digit SEO codes that are relevant to the impact study.)

89 - Information and Communication Services

Australian and New Zealand Standard Industrial Classification (ANZSIC) Codes

(Choose from the list of two-digit ANZSIC codes that are relevant to the impact study.)

77 - Public Order, Safety and Regulatory Services

Keywords

(List up to 10 keywords related to the impact described in Part A.)

security surveillance

video surveillance system

live-monitoring

Sensitivities

Commercially sensitive

Culturally sensitive

Sensitivities description

(Please describe any sensitivities in relation to the impact study that need to be considered, including any particular instructions for ARC staff or assessors, or for the impact study to be made publicly available after EI 2018.)

Aboriginal and Torres Strait Islander research flag

(Is this impact study associated with Aboriginal and Torres Strait Islander content?
NOTE - institutions may identify impact studies where the impact, associated research and/or approach to impact relates to Aboriginal and Torres Strait Islander peoples, nations, communities, language, place, culture and knowledges and/or is undertaken with Aboriginal and Torres Strait Islander peoples, nations, and/or communities.)

No

Science and Research Priorities

(Does this impact study fall within one or more of the Science and Research Priorities?)

Yes

Science and Research Priority	Practical Research Challenge
Cybersecurity	Secure, trustworthy and fault-tolerant technologies for software applications, mobile services, cloud computing and critical infrastructure.

Impact

Summary of the impact

(Briefly describe the specific impact in simple, clear English. This will enable the general community to understand the impact of the research.)

A dynamic live-monitoring surveillance system developed by Curtin University researchers is transforming security control centres in organisations located around the world. Operated by Perth-based company iCetana, the system uses machine-learning algorithms to learn ‘normal’ movement patterns in each surveillance location, without additional programming. The system identifies abnormal events in real-time and shows only those screens to surveillance operators, who can then determine if there is a high-risk situation. From 2011 to 2016, the software was deployed to organisations in 10 countries. Users report that the software has reduced response times to incidents, reduced expenditure on manned guards, and even prevented a fatality.

Beneficiaries

(List up to 10 beneficiaries related to the impact study)

City of Belmont

Deakin University

Majid Al Futtaim

Swinburne University

University of California, San Diego

other undisclosed beneficiaries

Countries in which the impact occurred

(Search the list of countries and add as many as relate to the location of the impact)

Australia
United Arab Emirates
United States of America

Details of the impact

(Provide a narrative that clearly outlines the research impact. The narrative should explain the relationship between the associated research and the impact. It should also identify the contribution the research has made beyond academia, including:
- who or what has benefitted from the results of the research (this should identify relevant research end-users, or beneficiaries from industry, the community, government, wider public etc.)

- the nature or type of impact and how the research made a social, economic, cultural, and/or environmental impact
- the extent of the impact (with specific references to appropriate evidence, such as cost-benefit-analysis, quantity of those affected, reported benefits etc.)
- the dates and time period in which the impact occurred.

NOTE - the narrative must describe only impact that has occurred within the reference period, and must not make aspirational claims.)

Between 2011 and 2016, a self-learning video surveillance system developed by Curtin University researchers transformed security surveillance for universities, government organisations and corporations across 10 countries and 10,000 camera streams, resulting in significant costs savings and improvements to profitability across a wide range of users.

End-users of the new surveillance technology include Western Australian councils, Curtin University, Deakin University, Swinburne University, UAE retail giant Majid Al Futtaim, and the University of California, San Diego.

The research was partly funded by the Australian Research Council. Following a commercialisation process, the technology is now owned by Perth-based company iCetana, which Curtin established to facilitate commercialisation. The iCetana system utilises computer vision, machine-learning, and an anomaly detection algorithm to learn the normal visual patterns in an area under surveillance. The system reports unusual behaviour across the surveillance network in real time by showing surveillance operators only those areas that display abnormal activity. This enables operators to limit data overload and operator fatigue, and focus their limited resources and attention on the small percentage of events requiring action.

At Curtin University, which became one of iCetana's first customers in October 2012, the technology has been a vital asset to help the Safer Community Team ensure the safety of students, staff and visitors at its locations across Perth CBD, Bentley, and regional Kalgoorlie. Curtin University has approximately 1,400 cameras across its locations, rendering it infeasible for a security team to monitor each camera simultaneously. The iCetana system has reduced the security team's dependency on the community to notify them of incidents, and are able to respond more proactively.

An example of the system's ability to improve an organisation's proactive response to adverse incidents is demonstrated by Curtin University Operations Manager Christopher Hall. The University experienced repeated bicycle theft in a particular location that was difficult to place under surveillance. The bicycle rack was moved into the view line of the iCetana system. Using its machine-learning capabilities, the system taught itself that a person walking towards the bicycles with a bolt cutter was an abnormal occurrence. The system alerted the surveillance operators to this scene, who were then able to apprehend the thieves and have them arrested.

iCetana's other customers have reported significant and measurable reductions to costs and increases to profitability as a direct result of implementing the technology. Confidentiality arrangements prohibit iCetana from disclosing the identity of these users, but assures Curtin these events took place within the reference period. A user based in Central America and the US recorded a reduction in response times to incidents in the order of 60 to 80 percent. Another user prevented an incident that could have led to a fatality, and a user in the Middle-East reduced their manned guarding budget by 10 per cent within the first six months of adoption. Users also report indirect cost savings, such as a reduction in the number of insurance claims made against iCetana's customers, as the technology has reduced the number of health and safety incidents. This effectiveness has been reflected in iCetana recording a 100 per cent renewal rate from its customers.

The technology's success has been translated into financial benefits for iCetana, which recorded a revenue of $4.5 million with a profit of $1.5 million in the 2016 fiscal year. iCetana also won the iiNet Encouragement award for innovation in superfast broadband applications in the 2011 WA Innovator of the Year Awards.

Associated research

(Briefly describe the research that led to the impact presented for the UoA. The research must meet the definition of research in Section 1.9 of the EI 2018 Submission Guidelines. The description should include details of:
- what was researched
- when the research occurred
- who conducted the research and what is the association with the institution)

The research underpinning the iCetana technology was conducted by Curtin's then Institute of Multi-sensor Processing and Content Analysis, led by Professor Svetha Venkatesh. Professor Venkatesh is the current

Director of the Centre for Pattern Recognition and Data Analytics at Deakin University.

The background research, which began as a PhD project exploring how to detect anomalies in compressed data, was funded as part of several ARC linkage projects. These included a three-year, $747,000 project in 2005 to develop intelligent surveillance systems for the transport industry and a three-year, $340,000 project in 2008 to develop intelligent security for urban spaces. It was also aligned with one of the Australian Government's national research priorities at the time: Safeguarding Australia.

The research findings were then applied to surveillance technology to produce the first software with the ability to detect 'unknown unknowns' by detecting a range of abnormal behaviour without the need for pre-defined coding relating to specific anomalies. The software constructs a mathematical model based on the 'normal' pixel flow in a camera view to determine what is abnormal.

FoR of associated research

(Up to three two-digit FoRs that best describe the associated research)

08 - Information and Computing Sciences

References (up to 10 references, 350 characters per reference)

(This section should include a list of up to 10 of the most relevant research outputs associated with the impact)

S Rana, W Liu, M Lazarescu, S Venkatesh, 2009, A unified tensor framework for face recognition Vol. 42, pp. 2850-2862, Pattern recognition, Oxford, England, C1-1

S Moncrieff, S Venkatesh, G West, 2009, Dynamic privacy in public surveillance Vol. 42, pp. 22-28, Computer, Piscataway, N.J., C1-1

T Duong, D Phung, H Bui, S Venkatesh, 2009, Efficient duration and hierarchical modeling for human activity recognition Vol. 173, pp. 830-856, Artificial intelligence, Amsterdam, Netherlands, C1-1

D Phung, B Adams, S Venkatesh, M Kumar, 2009, Unsupervised context detection using wireless signals Vol. 5, pp. 714-733, Pervasive and mobile computing, Amsterdam, Netherlands, C1-1

Additional impact indicator information

Additional impact indicator information

(Provide information about any indicators not captured above that are relevant to the impact study, for example return on investment, jobs created, improvements in quality of life years (QALYs). Additional indicators should be quantitative in nature and include:
- name of indicator (100 characters)
- data for indicator (200 characters)
- brief description of indicator and how it is calculated (300 characters).)