Results of Competition: SBRI: Innovation in Rail Security Surveillance Analytics, Phase 1

Competition Code: 1909_SBRI_NR_SECURITY

Total available funding is £968,000 plus VAT (£1.1m)

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Ipsotek Limited	AIVA development to enhance Network Rail experience for passengers and staff	£117,773	£117,773

Note: you can see all Innovate UK-funded projects here: https://www.gov.uk/government/publications/innovate-uk-funded-projects
Use the Competition Code given above to search for this competition's results

Project description - provided by applicants

Ipsotek specialises in advanced video analytics solutions enhanced through artificial intelligence techniques ("AIVA"). It's technology has been applied to address safety, security and operations requirements in a wide range of commercial verticals, and particularly in airports where it has significant deployments. Ipsotek intends to apply its technology to provide bespoke solutions for the UK rail industry by developing a suite of capabilities that address immediate challenges and support long term growth plans.

Safety and security challenges will be addressed with the application of Video Analytics (VA) and Artificial Intelligence (AI) technology to accurately detect and identify each threatening behaviour or safety risk demonstrated by individuals or crowds at the station. Here specific AI networks will be deployed that are trained to detect people and other objects in crowded scenes, estimate crowd density and generate density heatmaps. These networks will be further trained on Network Rail specific camera footage to improve their performance and make their experience specific to the rail CCTV environment. Furthermore, specific VA algorithms will be customised to raise events when behaviours of interest have been observed. Ipsotek will fully utilise its patented Scenario Based Rule Engine to create precise and detailed scenarios of interest that will address immediate requirements while providing the flexibility to adapt as the behaviours evolve and requirements progress. Additionally, on a continuous basis the system is able to generate data based on scene conditions that will enable crowding and other trends to be identified, as well as generate real time alarms for predefined safety and security threats detected.

The developed solutions will be deployed and demonstrated in a live station environment on live feeds from the station CCTV network with live events and reports provided to station staff and managers.
Throughout the project, Ipsotek will demonstrate the feasibility of adopting the solutions developed on a large scale with minimum reconfiguration or redesign by relying on its mature underlying video analytics platform that provides advance scene recognition, segmentation and calibration capabilities.

Ipsotek aims to provide a system that will assist rail managers to reach informed decisions related to station and passenger management, enhance security and safety by heightening situational awareness and improve the overall rail journey of commuters.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Sensing Feeling Limited	Station Advanced Visual Sensing Of Risks (Station ADVISOR)	£144,753	£144,753

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Project description - provided by applicants
Station Advanced Visual Detection of Risks (Station ADVISOR) The Station ADVISOR product will provide a scalable and cost-efficient, live station risk monitoring solution for use across the rail network, enabling station asset owners and operators to respond more proactively to risks, incidents and events in real time through visual analytics integrated with station surveillance systems. Sensing Feeling delivers advanced human behaviour IoT sensing products powered by Computer Vision and Machine Learning. The company's products incorporate patent-pending sensing capability that performs automatic visual observation and analysis of human physical behaviours that can be used to reliably predict and detect high-risk situations relating to individuals or groups of people in real world conditions within safety-critical environments, entirely passively, in real-time, and at scale.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Viapontica Ltd	FourAI: Four Point AI System for CCTV Security	£145,154	£145,154

Project description - provided by applicants
The current project builds upon our prior research to deliver a market-ready AI product which enhances safety and reduces delay minutes caused by dangerous, suspicious or anti-social behaviour in a railway environment. The scope proposes to radically change the way Network Rail delivers its mission to connect people safely on time, while developing a capability that fills a void in the marketplace for interpretable and inclusive AI which safeguards that algorithmic decision-making does not unfairly single out protected demographics. The innovation seeks to save time, enable faster response, and push the state-of-the-art in the industry by enabling transparent, explainable and accountable AI models that reduce negative externalities due to bias and unfairness.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
SeeQuestor Limited	SBRI: innovation in rail security surveillance analytics, phase 1	£120,525	£120,525

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Project description - provided by applicants
SeeQuestor - a leading UK SME in the field of video artificial intelligence with a track record of delivering innovative & award winning products - will deliver its vision for "Intelligent CCTV (iCCTV)". The advanced analytics platform will take recorded video streams and process them through SeeQuestor's metadata engine, making that data instantly searchable, whilst presenting events of interest to Network Rail viewers (as if in real time). Key features will include: threat detection (e.g. guns, knives, abandoned bags); behavioural analysis (loitering, running, abnornal activity); crowd analysis; instantly locating persons of interest & more. The demonstrator is designed to facilitate rapid incident response as well as to predict events that might impact public safety ahead of time. Leveraging as much of the Network Rail camera infrastructure as possible and designed to be easily scalable, including for very large camera networks. iCCTV will enhance the skills of Network Rail CCTV operators, by providing rapid, intelligent and simultaneous monitoring of live feeds from hundreds of cameras, something outside the capabilities of any human. Thereby vastly improving monitoring coverage by focusing operator's attention to where it is most effective, improving response times through proactively checking & identifying persons of interest and behaviour and the receiving of associated safeguarding information, key to the safety of personnel, as well as improve passenger service and experience. SeeQuestor is able to demonstrate some of these functionalities today, however, is applying for funding to further develop, refine & productise its algorithms and to build a robust software demonstrator platform.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
CSIT, Queen's University Belfast	Video-based semantic analysis for on crowded rail stations	£133,200	£133,200

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Project description - provided by applicants
Video-based semantic analysis on crowded rail stations In this project, we propose the use of advance machine learning and artificial intelligence for the semantic analysis of crowds in train stations, monitored through a large set of non-overlapping cameras. Specifically, we will make use of deep learning neural networks and tracking algorithms for assessing and monitoring crowd density and dynamics within train stations. Then, we propose an evidential reasoning network to extract high-level semantic knowledge on the previous data analytics so event reasoning can be performed effectively and false positives can be filtered. This system will deliver early-warning alerts to operators relating to: crowd behaviour, abandoned objects, loitering and crowd avoidance. The project builds on significant existing capabilities at Queen's University Belfast and BAE Systems Applied Intelligence Laboratories.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Massive Analytic Limited	SBRI Innovation in Rail Security and Surveillance Analytics Phase 1	£140,100	£140,100

Project description - provided by applicants

Video Precognition for a Safer Network Rail

Massive Analytic's Nethra:VideoAnalytic's platform optimises the use of CCTV feeds in Network Rail stations. It's AI uses deep learning to detect dangerous objects, behaviours and illegal activities alerting station staff to any issues or dangers and with it's unique augmented reality technology Nethra empowers station staff with a wholistic view of the entire station, while also allowing passengers to maintain their privacy.

Nethra is the one stop solution to drastically cutting response times and enabling staff to operate efficiently for safer Network Rail stations.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
The Manufacturing Technology Centre Limited	DETER - crowD bEhaviour and objecT dEtection for Railway station security	£145,182	£145,182

Note: you can see all Innovate UK-funded projects here: https://www.gov.uk/government/publications/innovate-uk-funded-projects
Use the Competition Code given above to search for this competition's results

Project description - provided by applicants
Project DETER: Crowd behaviour and object detection for railway station security

Project DETER aims to enhance safety at railway station environments and to reduce delay resulting from incidents caused by unusual, unsuitable and undesirable behaviours through the use of intelligent video analytics. In order to ensure successful development and commercialisation of DETER's solution, this project brings together a strong partnership between the Manufacturing Technology Centre (MTC) and One Big Circle (OBC).

The MTC is a High Value Manufacturing Catapult which focuses on delivering applied research projects with the objective of maturing technologies at low readiness level into industry-ready solutions, additionally showcasing these solutions by means of technology demonstrators. OBC provides bespoke technical solutions to complex video and integration projects with 30 years combined experience in CCTV system commissioning.

This project will focus on developing a specific set of components and modules to enhance One Big Circle's proven video capture and analysis product AIVR (Automated Intelligent Video Review), which can perform object recognition and people detection in railway environments. The innovation in DETER, will be in building a Behaviour Engine capable of classifying events of interest in real time specifically for the railway station environment. Upon detection of such events, an automatic alert will be generated for the operator which will provide information such as location of the camera and the event detected. This new solution will be commercialised by One Big Circle as AIVR Lookout.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Zircon Software Limited	Smart Engineered Big Sister	£145,186	£145,186

Project description - provided by applicants

Title:

Smart Engineered Big Sister (SEBS)

Text:

Zircon has been involved in Machine Learning (ML) research for over 5 years. In particular much of the research has utilised Video Analytics.

After a successful 6 month trial a previous research project, called Platform Train Interface (PTI) Cam, was installed at London Undergound Victoria station. PTI Cam detected passenger interaction and intrusion from platform to the track. PTI Cam forms the basis upon which the SEBS solution can be built. PTI Cam delivered a successful demonstration. Zircon are taking the same approach in this competition and applying it to the scenarios outlined, notably: Loitering; unusual behaviours and incidents; crowd trend analysis; threat detection and abandoned objects that are not part of station upgrade work.

Using PTI Cam as a foundation, Zircon intends to integrate existing individual off the shelf ML detection technologies with a bespoke analysis platform to deliver an automated monitoring and alerting system that meets station control centre needs.

Zircon will be utilising existing CCTV Infrastructure and as a result there will be no significant roll out cost to deploy our solution.