SMART CITY
智慧城市

ASTRI's cutting-edge research and state-of-the-art technologies are driving the implementation of Hong Kong's Smart City Blueprint 2.0 — a Government-led initiative positioning the city as a global leader in smart city innovation. Through significant advancements in Smart Connectivity, Smart Mobility, and Smart Living, ASTRI is playing a pivotal role in realising the vision of this pioneering blueprint.

應科院憑藉尖端研究及先進科技,在香港特區政府帶領下,致力推動落實《香港智慧城市藍圖2.0》,助推香港成為全球智慧城市創新的領導者。透過「智慧網絡」、「智慧出行」及「智慧生活」三大層面的重大突破,應科院在這創新藍圖的願景中扮演重要角色。
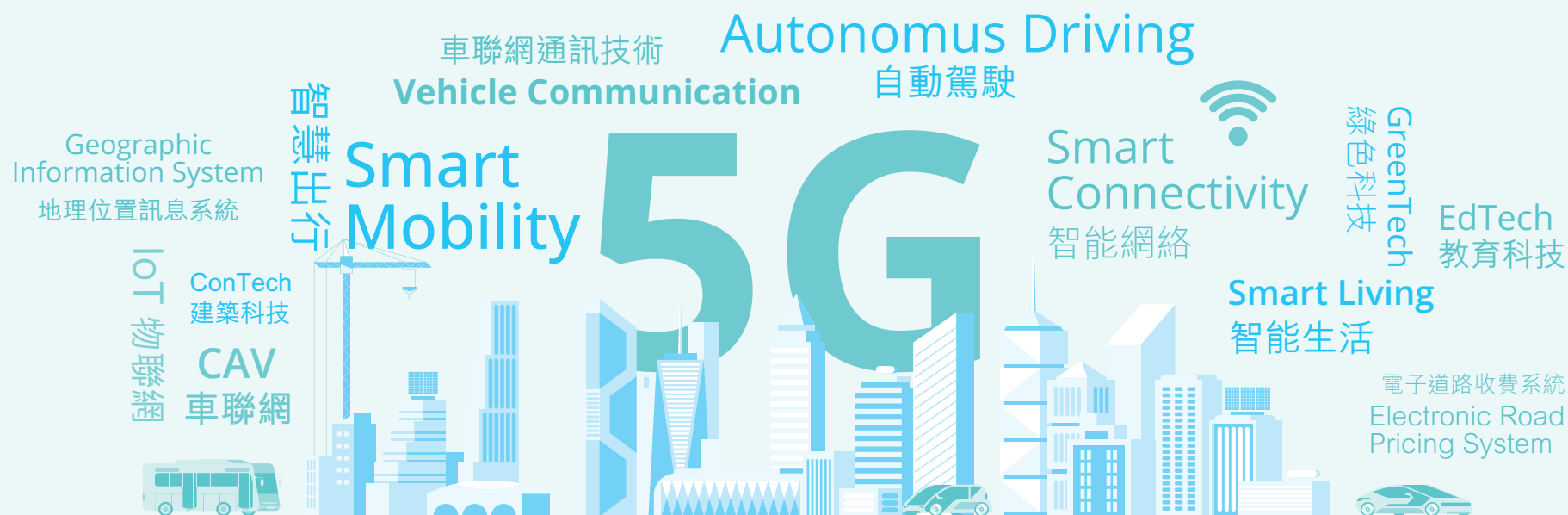
Advanced technologies are transforming city management, and ASTRI is spearheading groundbreaking initiatives, including C-V2X communication trials, Connected Autonomous Vehicle (CAV) research and development, and real-time intrusion alert systems to enhance public transport safety.

As Hong Kong advances towards becoming a leader in 5G adoption, the interconnectedness of people, devices, data, and knowledge will grow exponentially. ASTRI's research into cutting-edge communication technologies for pre-5G and 5G wireless systems is set to revolutionise connectivity, unlocking unprecedented potential for the city's smart future.

城市管理的轉型有賴先進技術，為此應科院正積極帶領進行多項突破性項目，包括車聯網通訊測試、聯網自動駕駛研發、實時入侵警報系統等，以提升公共交通安全。

隨着香港邁向採用5G技術的領導地位，用戶、設備、數據與知識的互聯互通程度亦隨之倍增。應科院在尖端無線通訊技術方面的研究聚焦前5G及5G，將大大革新連接方式，釋放前所未有的潛力，推進香港邁向智慧未來。
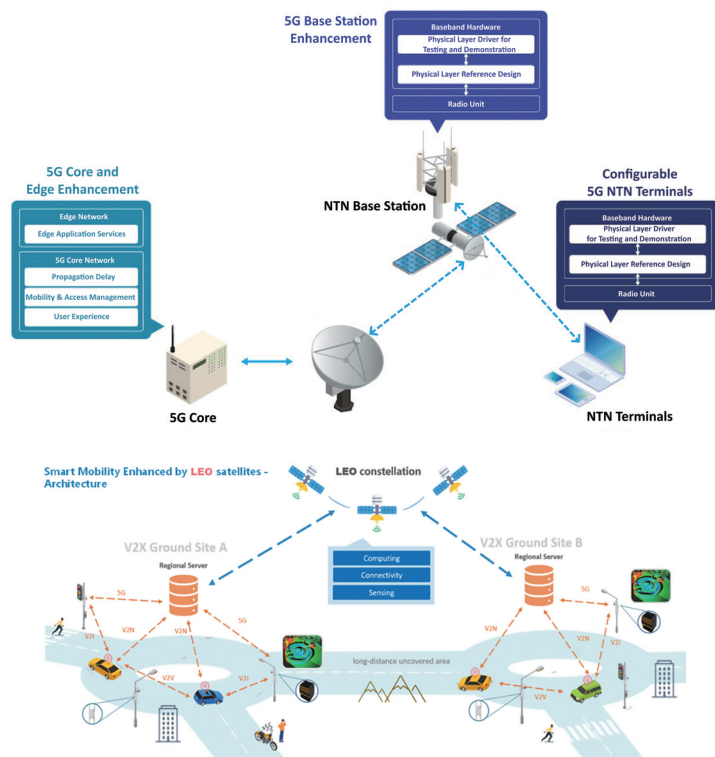
Research Areas & Focus
研究領域與重點

車聯網通訊技術
Vehicle Communication

Autonomus Driving
自動駕駛

智慧出行
Smart
Mobility

Geographic
Information System
地理位置訊息系統

IoT 物聯網

ConTech
建築科技

CAV
車聯網

5G

Smart
Connectivity
智能網絡

GreenTech
綠色科技

EdTech
教育科技

Smart Living
智能生活

電子道路收費系統
Electronic Road
Pricing System

Technologies Breakthrough 技術突破

ASTRI's research and development in smart connectivity, smart mobility and smart living supports Hong Kong's Smart City Blueprint vision.

應科院在智能網絡、智慧出行及智能生活方面的研發工作,支持踐行香港智慧城市藍圖的願景。

Smart Connectivity 智慧網絡

5G Base Station Enhancement
- Baseband Hardware
- Physical Layer Driver for Testing and Demonstration
- Physical Layer Reference Design
- Radio Unit

NTN Base Station

5G Core and Edge Enhancement
- Edge Network
- Edge Application Services
- 5G Core Network
- Propagation Delay
- Mobility & Access Management
- User Experience

5G Core

Configurable 5G NTN Terminals
- Baseband Hardware
- Physical Layer Driver for Testing and Demonstration
- Physical Layer Reference Design
- Radio Unit

NTN Terminals

Smart Mobility Enhanced by LEO satellites – Architecture

LEO constellation

V2X Ground Site A — Regional Server
- Computing
- Connectivity
- Sensing

V2X Ground Site B — Regional Server

long-distance uncovered area

Advancing 5G Core Network and Base Station Technologies for Satellite Communications

ASTRI completed a groundbreaking research project evaluating 5G core network and base station enhancements for non-terrestrial networks (NTN). The initiative successfully tackled key technical challenges unique to satellite communications, such as long-distance signal delays, mobile cell management, and quality of service optimisation. This research has attracted considerable attention from satellite operators across Hong Kong and Chinese Mainland, who are now exploring infrastructure upgrades to integrate advanced satellite communication capabilities into their networks.

推進衛星通訊5G核心網絡和基站技術

應科院完成了一項突破性研究項目,評估非地面網絡(NTN)的5G核心網絡和基站增強技術。該項目成功應對了衛星通訊特有的關鍵技術挑戰,包括長距離訊號延遲、移動小區管理,以及服務質量優化。這項研究吸引了香港及中國內地衛星營運商的高度關注,他們現正探索基礎設施升級方案,以將先進的衛星通訊能力整合到其網絡中。

Low Earth Orbit (LEO) Satellite-Enabled V2X and CAV Technologies

ASTRI explored the use of LEO satellites to address connectivity challenges in densely built urban environments, particularly for Vehicle-to-Everything (V2X) and Connected Autonomous Vehicle (CAV) technologies. Key developments included linking satellite movements to smart mobility applications, designing a satellite simulator, and creating a feasibility plan for smart mobility satellites. Successful trials at Hong Kong Science Park demonstrated the potential of LEO satellites to provide flexible, cost-effective, and scalable connectivity solutions, garnering significant media attention.

低軌衛星賦能的車聯網與網聯自動駕駛汽車技術

應科院探索利用低軌衛星解決高密度城市環境中的通訊挑戰,重點聚焦車聯網和網聯自動駕駛汽車領域的應用。關鍵技術進展包括將衛星運行與智慧出行應用進行聯動、設計衛星運行仿真系統,以及探索智慧出行衛星的可行性方案。應科院在香港科學園的成功試驗證明了低軌衛星具備提供靈活、經濟、高效且可擴展通信解決方案的潛力,並獲得媒體的廣泛關注。

Smart Living 智慧生活

Efficient Hybrid System for DC Grid Applications (EHS)

ASTRI developed a US-patented cooling system featuring magnetic components enhanced with graphite laminate layers to improve thermal performance. By bridging air gaps and reducing thermal resistance, the system increases heat dissipation efficiency and lowers the cooling system's power requirements. This innovation not only reduces energy costs but also extends the service life of components by preventing overheating during operation. The EHS is suitable for a wide range of applications, including power converters for renewable energy, data centres, uninterruptible power supplies (UPS), switch-mode power supplies (SMPS), automotive systems, and electric vehicle (EV) charging infrastructure.

用於直流電網應用的高效混合系統

應科院研發了已取得美國專利的冷卻系統,採用磁性元件並加入石墨層壓板以提高散熱性能。通過彌合氣隙和降低熱阻,該系統提高了散熱效率並降低了冷卻系統的功率需求。這項創新不僅降低了能源成本,還通過防止部件在運行過程中過熱來延長其使用壽命。這套系統用途廣泛,包括可再生能源、數據中心、不斷電系統、開關電源、汽車系統和電動汽車充電基礎設施。

Smart Mobility 智慧出行

Advanced Air Mobility and Low-Altitude Economy

ASTRI serves as a technical partner to support the HKSAR Government's Low-altitude Economy Regulatory Sandbox. By providing technical reviews, identifying gaps, and engaging stakeholders, ASTRI supports data collection and the formulation of a roadmap for Low-Altitude Economy (LAE) development, along with legal, regulatory, and operational standards.

先進空中交通與低空經濟

應科院作為技術合作夥伴,積極支持香港特區政府「低空經濟監管沙盒」計劃。透過提供技術評估、找出發展缺口及推動持份者參與,本院協助收集關鍵數據,並共同制定低空經濟發展路線圖,以及相關的法律、監管與操作標準。


Dynamic Vision Sensor (DVS)-Based 3D Intrusion Detection System

In collaboration with MTR Corporation, ASTRI developed a DVS-based system combining edge processing and AI sensing technologies to detect unauthorised intrusions into trains. This platform enhances passenger safety and operational efficiency by enabling real-time detection with high accuracy. The project has laid the groundwork for further 3D sensing advancements, such as stereo event-based systems for autonomous vehicles and intelligent traffic management.

基於動態視覺感測器的3D入侵偵測系統

應科院與香港鐵路有限公司合作開發了一套基於DVS的系統,結合邊緣運算與AI感知技術,用以偵測列車前方入侵物體。此平台透過高精準度的即時偵測,提升乘客安全與營運效率。該項目亦為後續3D感知技術的進階發展奠定基礎,例如用於自動駕駛車輛的立體事件感測系統,以及智慧交通管理。
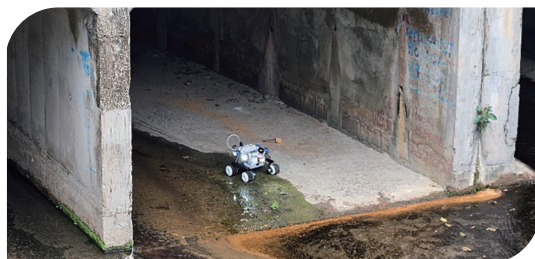

Autonomous Inspection Robotic System (AIRS) for Underground Drainage

ASTRI's AIRS uses advanced robotics to inspect underground stormwater drainage systems autonomously, enhancing safety, efficiency, and data accuracy. It navigates complex 3D environments, collects structural data, and reconstructs 3D maps for better maintenance planning. Developed with Model-based Systems Engineering, AIRS ensures reliability, reduces costs, and supports sustainable infrastructure management.

地下雨水排水系統自主檢測機械人系統(AIRS)

應科院研發的AIRS採用先進機械人技術,自主檢測地下雨水排水系統,提升安全性、效率及數據準確性。系統能於複雜的3D環境中導航、收集結構數據並重建3D地圖,優化維護規劃。透過開發基於模型的系統工程,AIRS確保可靠性、降低成本,並支持可持續基建管理。
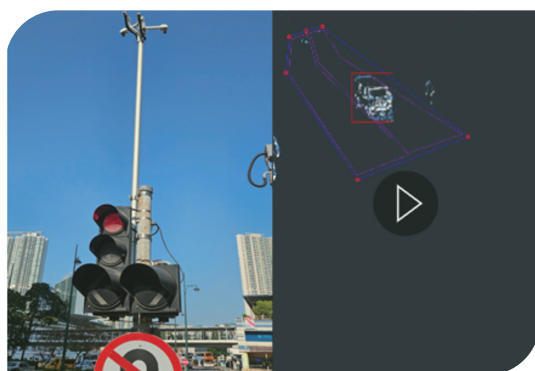
Smart Traffic Control System

ASTRI deployed a Sensing Fusion System for real-time traffic monitoring. This system automates the detection and classification of vehicles and pedestrians, optimises traffic signal timings, and improves operational efficiency and road safety. Designed with privacy protection and energy efficiency in mind, the system contributes to Hong Kong's vision for a sustainable and smart urban transport network.

智能交通控制系統

應科院於實時交通監控中應用了感測融合系統,以自動檢測和分辨車輛及行人,優化交通訊號燈時間,並提升運作效率和道路安全。系統設計考慮了隱私保護和能源效率,有助香港實現可持續且智能的城市交通網絡願景。

> These innovative solutions showcase ASTRI's dedication in advancing smart city development through technologies.
>
> 這些創新解決方案彰顯了應科院藉科技促進智慧城市發展的決心。

Partnership and Commercialisation
合作夥伴及市場化項目

Smart Connectivity 智能網絡	**5G Private Network for Construction Sites** ASTRI, with support from the Housing Authority, deployed an innovative 5G private network integrated with advanced IoT solutions at construction sites. This technology enables remote crane control, real-time safety monitoring, and mobile plant danger zone alerts, significantly improving worker safety, crane operation accuracy, and construction efficiency.	**適用於建築工地的5G專用網絡** 在香港房屋委員會的支持下，應科院整合先進的物聯網解決方案，成功於建築工地部署創新的5G專用網絡。此技術實現起重機遠程控制、即時安全監測及移動設備危險區域警示功能，顯著提升工人安全、起重機操作精準度與施工效率。
	Multi-Band 5G Private Network for Public Safety ASTRI successfully trialled a 5G standalone (SA) private network across multiple bands (700 MHz and 4.9 GHz) at Hong Kong Police Force headquarters. This trial serves as a replicable model for other locations, demonstrating optimised configurations for public safety applications.	**適用於公共安全的多頻段5G專用網絡** 應科院於香港警察總部成功完成多頻段（700 MHz及4.9 GHz）5G獨立組網專用網絡的測試驗證。此試驗成果建立了可複製的部署模式，為公共安全應用場景展示出經過優化的網絡配置方案。
Smart Mobility 智慧出行	**LEO Satellite Collaboration for Smart Mobility** ASTRI successfully delivered a Low Earth Orbit (LEO) satellite project in collaboration with the satellite industry, enabling advanced connectivity to support smart mobility applications.	**低軌衛星助力智慧出行** 應科院與衛星產業合作夥伴成功完成了一個低軌衛星項目，旨在提供先進的網絡連接，支援智慧出行應用。
	C-V2X and CAV Development Collaborations with the Transport Department, Hong Kong International Airport (HKIA), and Chinese Mainland partners have advanced C-V2X and Connected Autonomous Vehicle (CAV) technologies. Projects include a C-V2X trial site at HKIA, smart port and highway systems, and a Green Transit System for newly developed areas.	**蜂窩車聯網通訊系統** 應科院正為香港國際機場指定道路的路側準備一套車聯網試點系統。該系統配備車聯網通訊、路側感知功能及實時數據交換能力，旨在提升路口、環島等複雜交通場景下，具備車聯網功能的車輛的通行能力。這一舉措是推動機場實現常態化載客自動駕駛運營的關鍵一步。
Smart Living 智能生活	**Energy Storage Systems** ASTRI implemented six 125kW energy storage systems in Zhongshan Industrial Park, resulting in an estimated annual savings of RMB1.06M through reduced electricity costs.	**儲能系統** 應科院在中山工業園區安裝了六套125kW儲能系統，協助園區降低電費，預計每年可節省人民幣106萬元。
	AI and Smart Construction Solutions In collaboration with the Housing Authority and Housing Society, ASTRI is advancing projects such as AI-based crane structural health monitoring and Modular Integrated Construction (MiC) precision positioning systems.	**人工智能與智慧建造解決方案** 應科院與香港房屋署及房屋協會合作，推動以人工智能為基礎的塔式起重機結構健康監測系統和智能光學精準定位系統。
	Smart Caring Solutions ASTRI collaborated with the Neighbourhood Advice-Action Council to pilot a sensing fusion event-based system, with plans to expand to the Hospital Authority and Pok Oi Hospital. In partnership with Sony, ASTRI is promoting Dynamic Vision Sensor solutions for elderly care.	**智能護理解決方案** 應科院與鄰舍輔導會合作，試驗開發基於事件感知融合的系統，並計劃將其擴展至醫院管理局和博愛醫院。同時亦與索尼合作，推廣用於老人護理的動態視覺感測器解決方案。
Smart Government 智慧政府	**Automated On-Board Private Car Clearance** ASTRI developed an innovative immigration clearance system for the Immigration Department, leveraging facial recognition, real-time image enhancement, and anti-spoofing algorithms. This system enables seamless clearance for pre-registered passengers without requiring them to stop, enhancing both efficiency and security.	**自動化私人車輛入境清關系統** 應科院為入境事務處開發了一個利用面部識別、實時圖像增強和防欺騙算法的創新入境清關系統。預先登記的乘客能毋需停車即可順利通過清關，提升清關效率和安全性。

Smart
Government
智慧政府

AI-Assisted E-Discovery and Data Analytics Platform
ASTRI developed an AI-driven data analytics platform for risk management, including a Customs Crime Analytics System (CCAS) for the Hong Kong Customs and Excise Department. Building on these achievements, the platform was customised for the Independent Commission Against Corruption (ICAC) to handle dynamic case data, such as instant messages, emails, and notes. UI/UX designs and initial event extraction results have been delivered, enhancing the efficiency and effectiveness of ICAC investigations.

人工智能輔助電子證據及數據分析平台
應科院開發以人工智能驅動的數據分析風險管理平台,其中包括供香港海關用作其「海關犯罪分析系統」。本院更以此為基礎,為廉政公署度身設計另一平台,以處理即時訊息、電郵及備忘等動態案件數據。其用戶介面/用戶體驗已完成設計,亦已取得初步事件抽取成果,可進一步提升廉署調查的效率及成效。

Project commenced in 2024/25*
2024/25年度開展的研發項目*

Efficient Hybrid System for DC Grid Applications	應用於直流電網的高效混合系統	AI Infrastructure for 5G and Beyond Core Network	5G及未來核心網的AI基礎設施
V2G VPP for Hybrid Grids System from Residential to Commercial Applications (VVH)	用於住宅至商業等級的混合電網虛擬發電廠V2G電動車充電系統	Trial: Enhanced 5G Coverage for Remotely Controlled Tower Crane	試驗計劃:增強5G覆蓋以用於塔式起重機的遠程控制
Transformer-based Semantic Malware Analysis Framework	基於變換器的惡意軟體語意分析框架	Detection of Human Interaction for Visually Impaired People	以人際互動辨識作視障輔助的主要手段
Private Conversational AI Platform with Copyright Protection	具有版權保護機制的私有化可對話AI平台	Non-Destructive Critical Dimension Inspection System for Flat Optics	平面光學元件無損關鍵尺寸檢測系統
AI Programmatic Advertising for Real-time Intelligence	基於人工智能的實時程序化廣告平台	High-speed 3D Sensing System for Transportation Infrastructure Inspection	用於交通基礎設施檢測的高速三維感測系統
Trial: AI Assisted E-Discovery and Data Analytic Platform	試驗計劃:人工智能輔助電子發現與數據分析平台	E-nose for Food Waste Management	用於廚餘垃圾管理的電子鼻
Software Supply Chain Vulnerability Identification Platform with Binary Disassembly and Hybrid Analysis	軟件供應鏈漏洞識別平台,具有二進制反匯編和混合分析功能	Smart Tactile Sensor for Food Quality Control	應用於食品質量控制的智能觸覺傳感器系統
Collaborative Multi-Agent Systems Pose-Graph Optimisation For Digital Twins	對於數字孿生的協作多智能體系統位置圖優化	Photonics Enabled AI Crane Structural Health Monitoring System	光電子支援的人工智能起重機結構健康監測系統
Low Earth Orbit (LEO) Satellite Enabled V2X and CAV Technologies	低地球軌道(LEO)衛星支持的V2X和CAV技術	Semi-Auto AI with Procedural Generation	基於程序化生成的半自動人工智能
Base Station for Spectrum Sharing	共享頻譜基站	Deep learning based real time Computer-Generated Holograms (CGH) for SLM projection	基於深度學習的即時計算全息投影
Architecture Design and Profiling for 5G Base Station Using Next Generation Chipset Platforms	新一代晶片組平台的5G基站架構設計與剖析	Smart Optics for Modular Integrated Construction (MiC) Precision Positioning	組裝合成建築法的智能光學定位系統