ICS/SWE graduate seminars

Automotive AI: From Situational Awareness to Automation and Optimization

AI has become a cornerstone of innovation across the automotive ecosystem — from vehicle design and manufacturing to operation, update, and end-of-life management. This talk explores how AI technologies are redefining the way vehicles perceive, decide, act, and learn. It highlights three fundamental patterns of AI application: situational awareness, automation, and optimization. The discussion covers how AI enhances situational awareness through intelligent sensing and perception, enables automation across both physical and digital processes, and tackles complex optimization problems in mobility, logistics, and infrastructure. The talk concludes by reflecting on the technical, ethical, and operational challenges that must be addressed to fully unlock AI's potential as a transformative enabler of next-generation mobility systems.

November 3, 2025

2:30-3:45 PM

22-127

Dr. Alaa Khamis

Dr. Alaa Khamis is an Associate Professor in the Department of Industrial and Systems Engineering and Director of the AI for Smart Mobility Lab at the Interdisciplinary Research Center for Smart Mobility and Logistics at KFUPM. Before joining KFUPM, he was the AI and Smart Mobility Technical Leader at General Motors. He also serves as an Adjunct Professor at the University of Toronto and Ontario Tech University. Dr. Khamis has authored three books and over 190 scientific papers in refereed journals and conferences, and holds 72 U.S. patents, trade secrets, and defensive publications. He is the author of Smart Mobility: Exploring Foundational Technologies and Wider Impacts and Optimization Algorithms: AI Techniques for Design, Planning, and Control Problems. His research focuses on the intersection of AI and mobility systems, services, and business models, addressing challenges such as seamless integrated mobility, contextual observability in software-defined vehicles (SDVs), and optimization in mobility, logistics, and infrastructure. He is the recipient of the 2018 IEEE Member and Geographic Activities (MGA) Achievement Award, the Best Paper Award at the 2023 IEEE International Conference on Smart Mobility, the 2022–2024 GM Critical Talent Award, and first place in the 2025 Sustainable Solutions for Pilgrims Challenge.

King Fahd University of Petroleum and Minerals
ISE Department & IRC for Smart Mobility and Logistics

Automotive AI

Alaa Khamis, Ph.D.

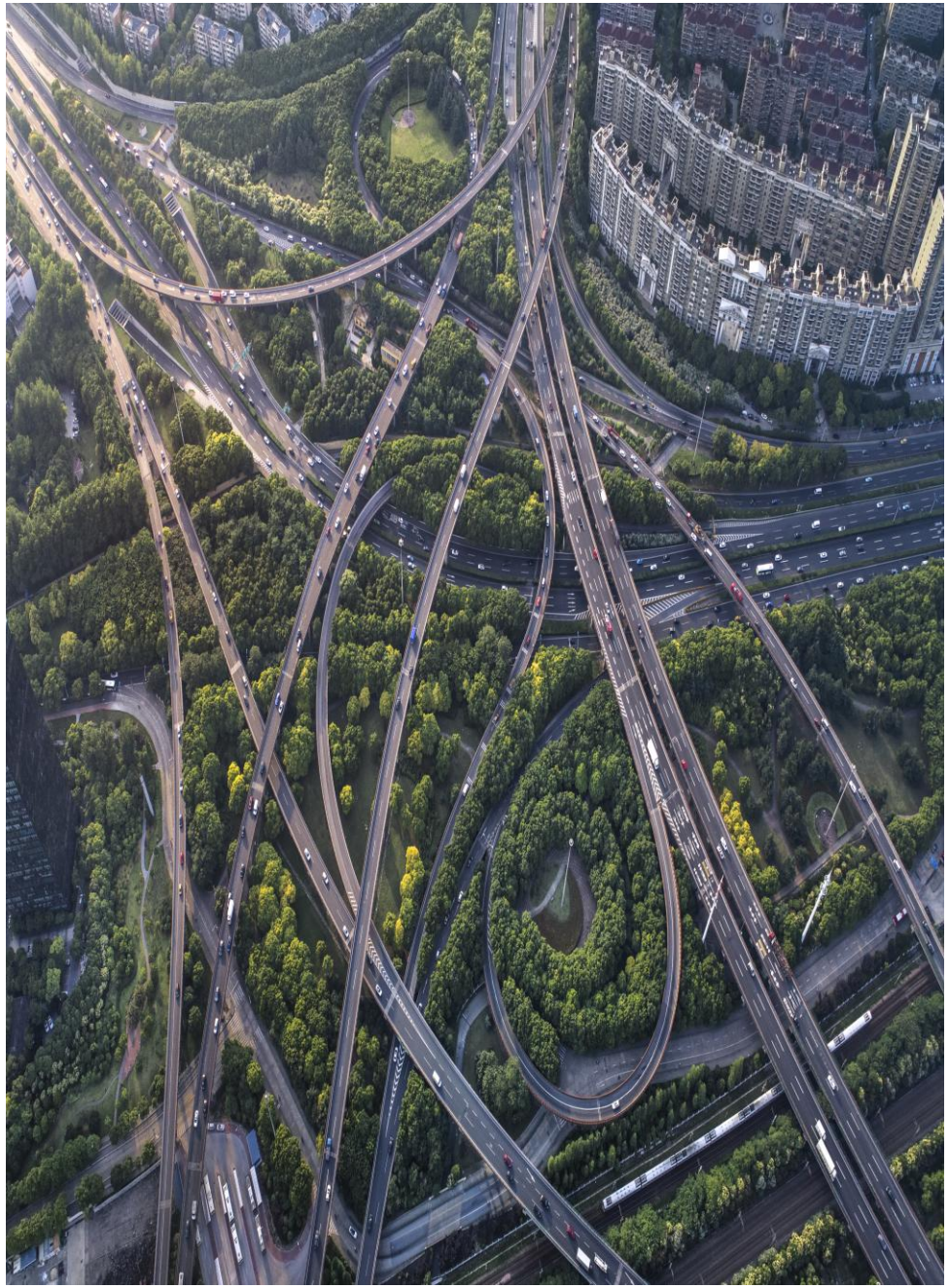
Associate Professor in ISE Department

Director of AI for Smart Mobility Lab at IRC SML

November 3, 2025

Outline

- About AI for Smart Mobility Lab
- Automotive AI
- Situational Awareness
- Automation
- Optimization
- Potential Barriers



AI for Smart Mobility Lab at KFUPM

Mission

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- Our mission is to advance **smart mobility** as a transformative enabler of **sustainable development**.
- Our research focuses on the **intersection of AI and mobility systems, services and business models**.

Smart Mobility

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Existing and emerging smart mobility business models

Existing and emerging smart mobility services

Existing and emerging smart mobility systems

Alaa Khamis and Suzette Malek, "Smart Mobility for Sustainable Development Goals: Enablers and Barriers," The IEEE International Conference on Smart Mobility, 2023.

Ongoing Projects

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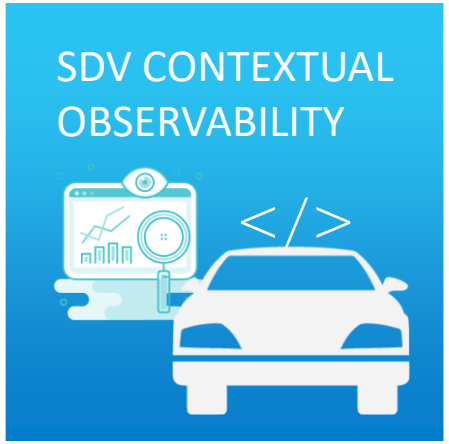

- **Title:** Contextual Observability of Software-Defined Vehicles
- **Objective:** Develop a testbed for software-defined vehicle (SDV) contextual observability.
- **Collaboration:** IRC SML and auto OEMs, NGOs and Suppliers

- **Title:** Agentic AI-based Framework for SIM
- **Objective:** Develop as a unified platform that integrates multimodal transportation options.
- **Collaboration:** RCRC, MIT, VTTI

- **Title:** SmartDispatch: AI-driven Optimization for Eco-Efficient Last-Mile Delivery
- **Objective:** Develop an AI-driven routing model for eco-efficient last-mile delivery.
- **Collaboration:** IRC SML KFUPM

- **Title:** Enabling Cybersecurity Adaptation in Software Architecture
  Objective: Develop as a unified platform that integrates multimodal transportation options.
- **Collaboration:** UAB, Chile

Collaboration & Facilities

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الهيئة الملكية لمدينة الرياض
ROYAL COMMISSION FOR RIYADH CITY

Massachusetts Institute of Technology

JTL Transit Lab
URBAN MOBILITY LAB AT MIT

VIRGINIA TECH TRANSPORTATION INSTITUTE

UNIVERSITY OF TORONTO

OntarioTech UNIVERSITY

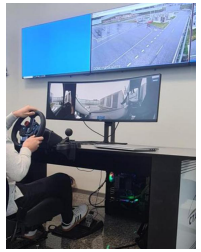
Universidad Andrés Bello

gm

FOXCONN

MAXNERVA

CTAG



For More information

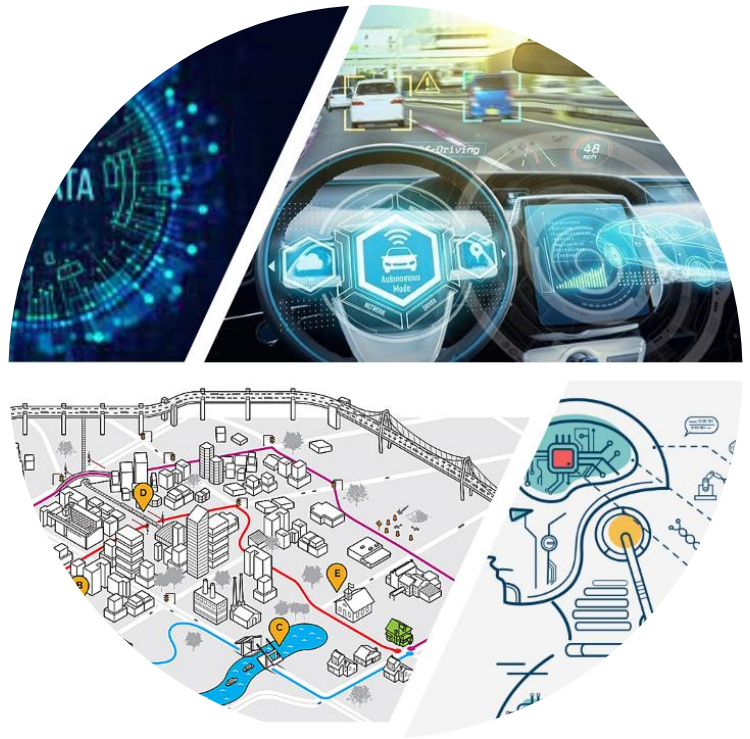
https://www.ai4sm.org/

https://github.com/ai4smlab

https://www.youtube.com/@AI4SM_lab

https://medium.com/ai4sm

Automotive AI



Automotive AI

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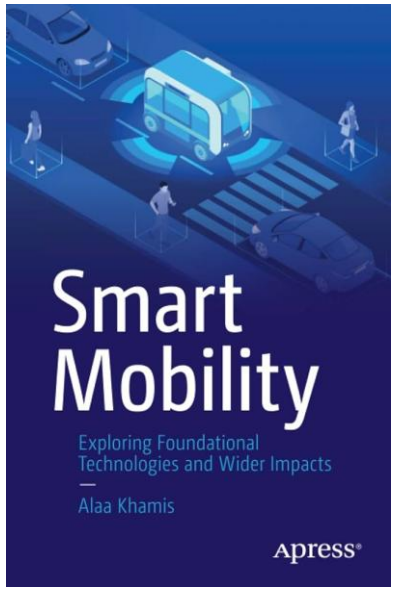

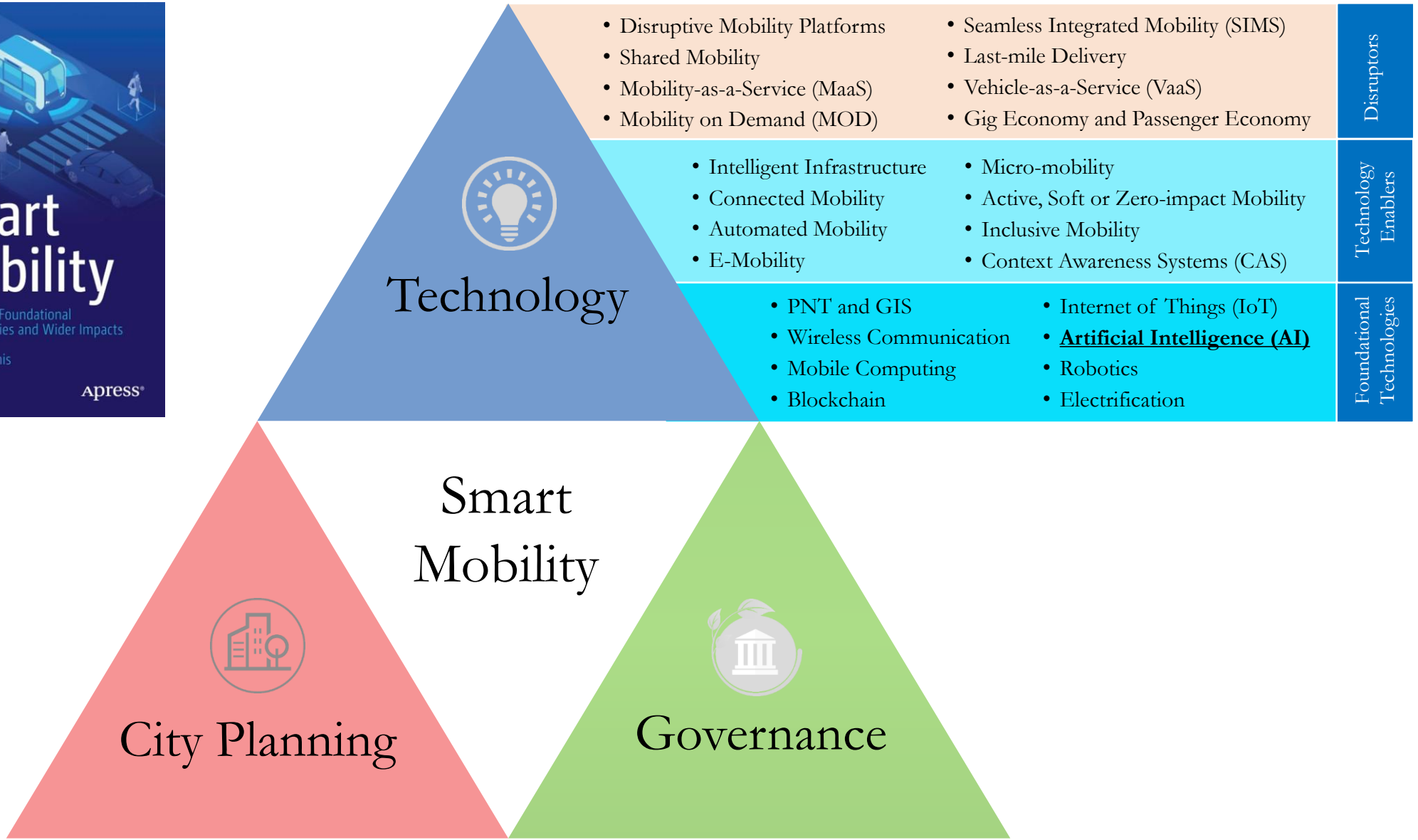

Automotive AI

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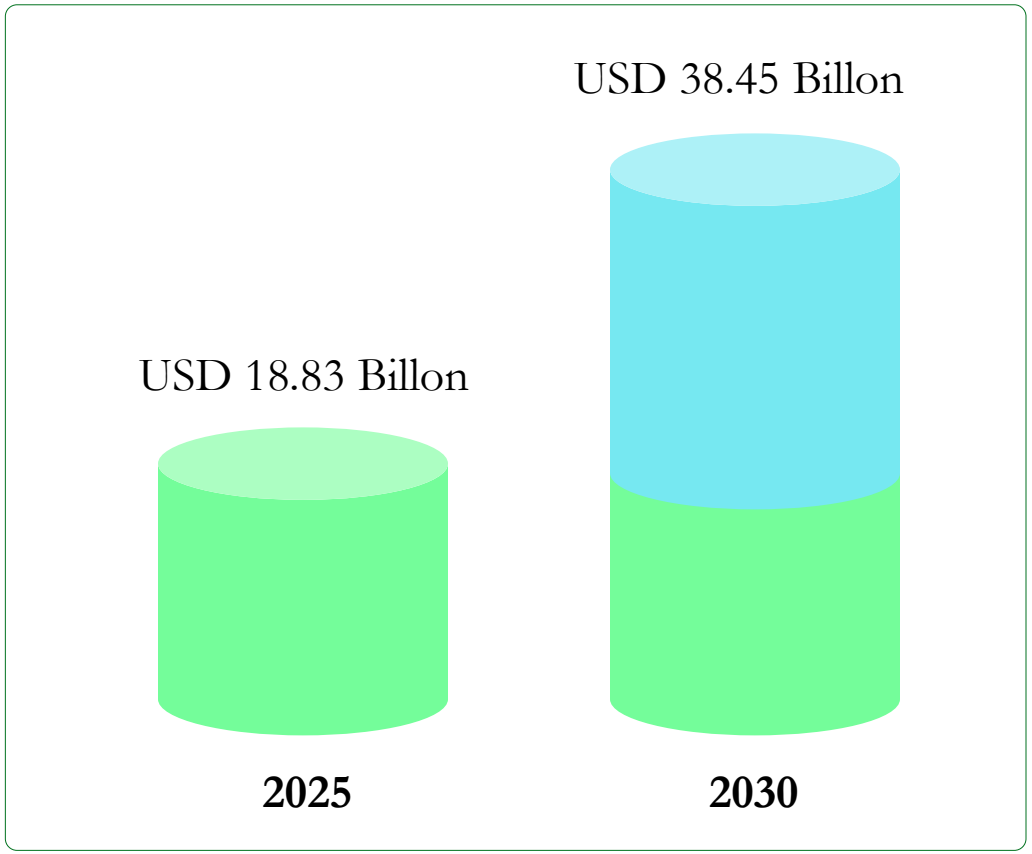
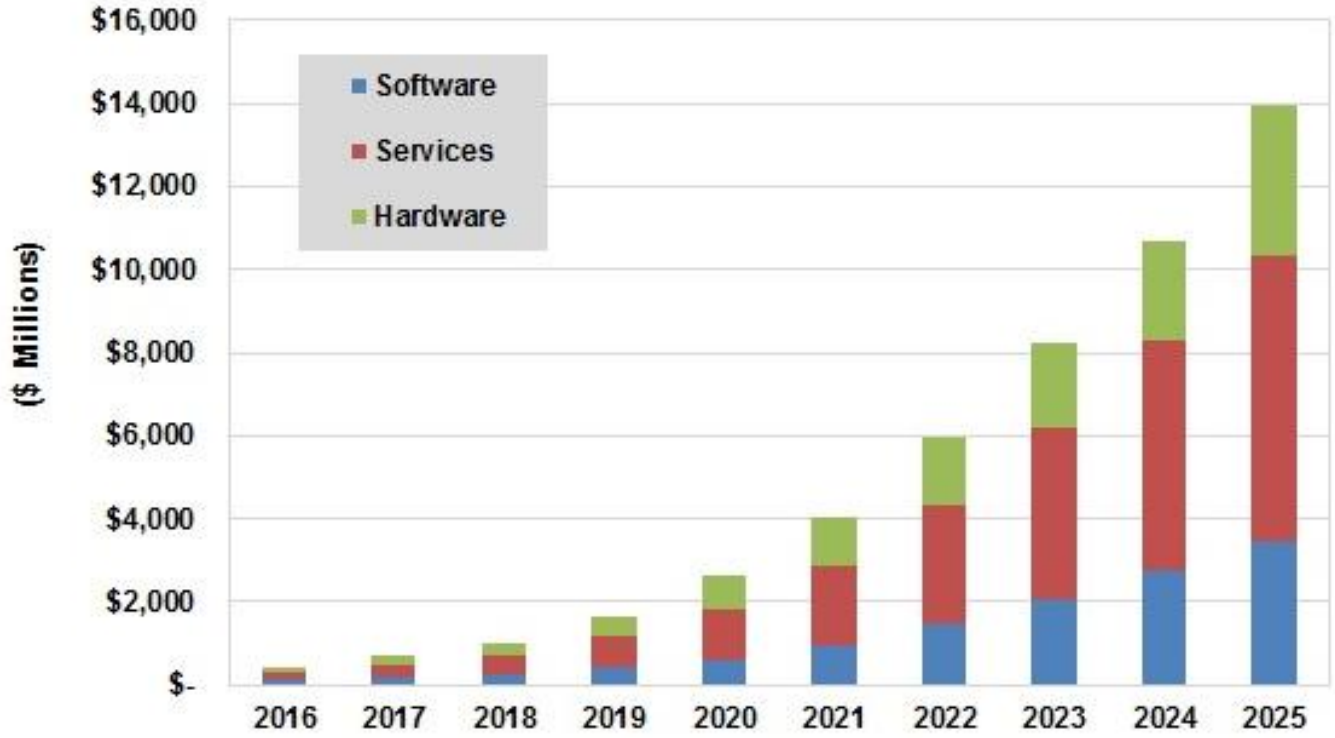
» Market Size

Market Forecast to grow at a CAGR of 15.3%



Source: Research and Markets



Automotive AI Total Revenue by Segment, World Markets: 2016-2025 [Tractica]

Automotive AI

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Manufacturing

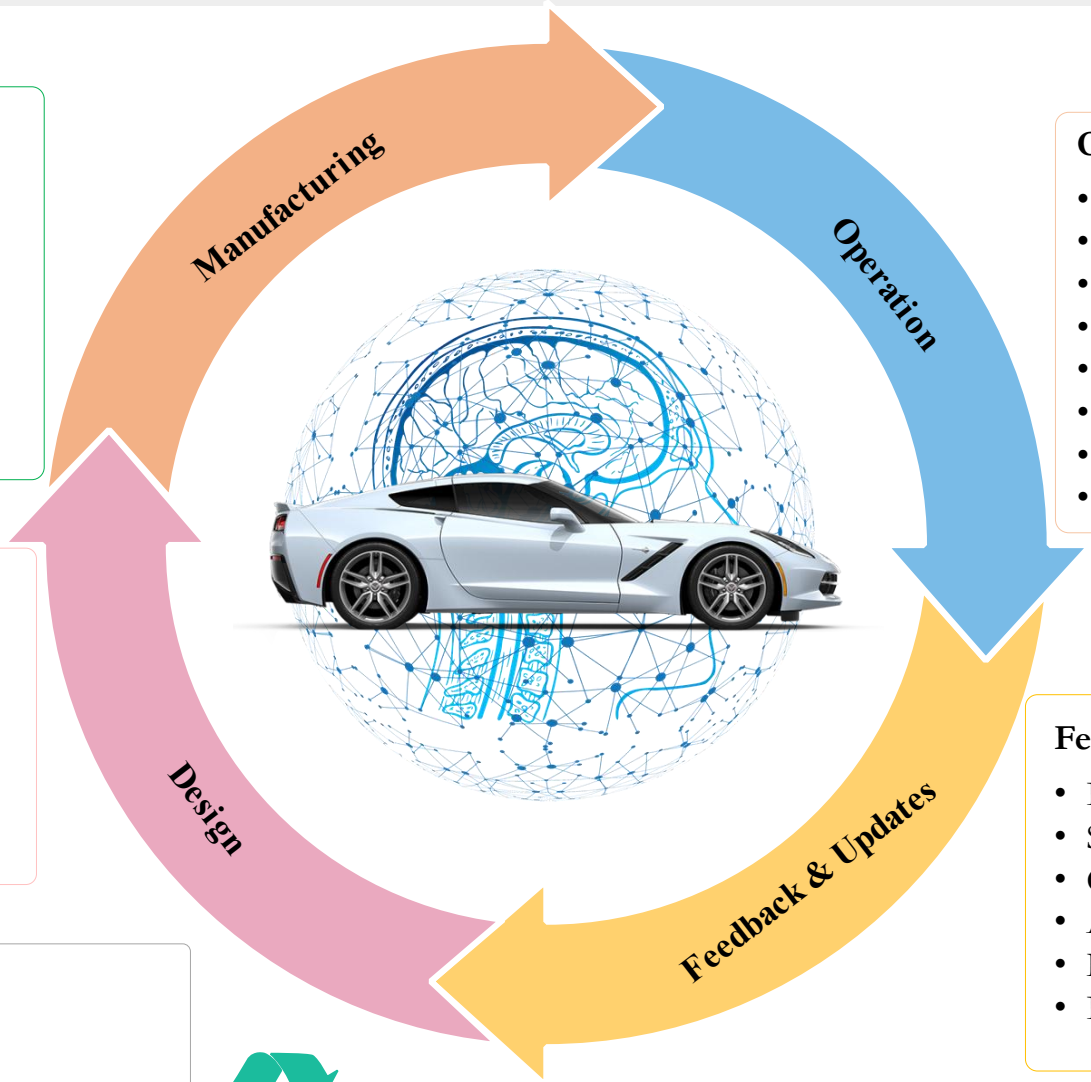
- Industry 4.0, Mass Customization
- Additive Manufacturing
- Robotic Process Automation (RPC)
- Quality Control, Calibration, Test Automation, Assembly Line Balancing, etc.

Design

- Generative Design
- Engine Efficiency
- Crash Analysis
- New material discovery and characterization
- Battery Design, etc.

Disposal and Recycling

- Predicting Battery Life
- Reduce Battery Ownership Cost
- Battery Recycling and AI-based Sorting
- Waste Management and Recycling, etc.



Operation

- Perception
- Diagnostics & Prognostics
- SDV Observability
- Localization
- Mapping
- Behavioral Control
- Planning
- ADAS and ADS
- Predictive Infotainment
- Digital Companion
- Dispatch and Routing
- Online Optimization
- Supply Chain Management
- Fleet Management
- Crowd Intelligence
- Data/Experience Monetization

Feedback and Updates

- Intelligent Agent Assistants
- Sentiment Analysis
- Customer Churn Prediction
- Automated Claims Processing
- Dynamic Pricing
- Incentive Optimization
- Personalized Loyalty
- Personalized Marketing
- Retail Support Bots
- Demand Planning
- Supply Chain Management
- Legal Analytics, etc.

Automotive AI

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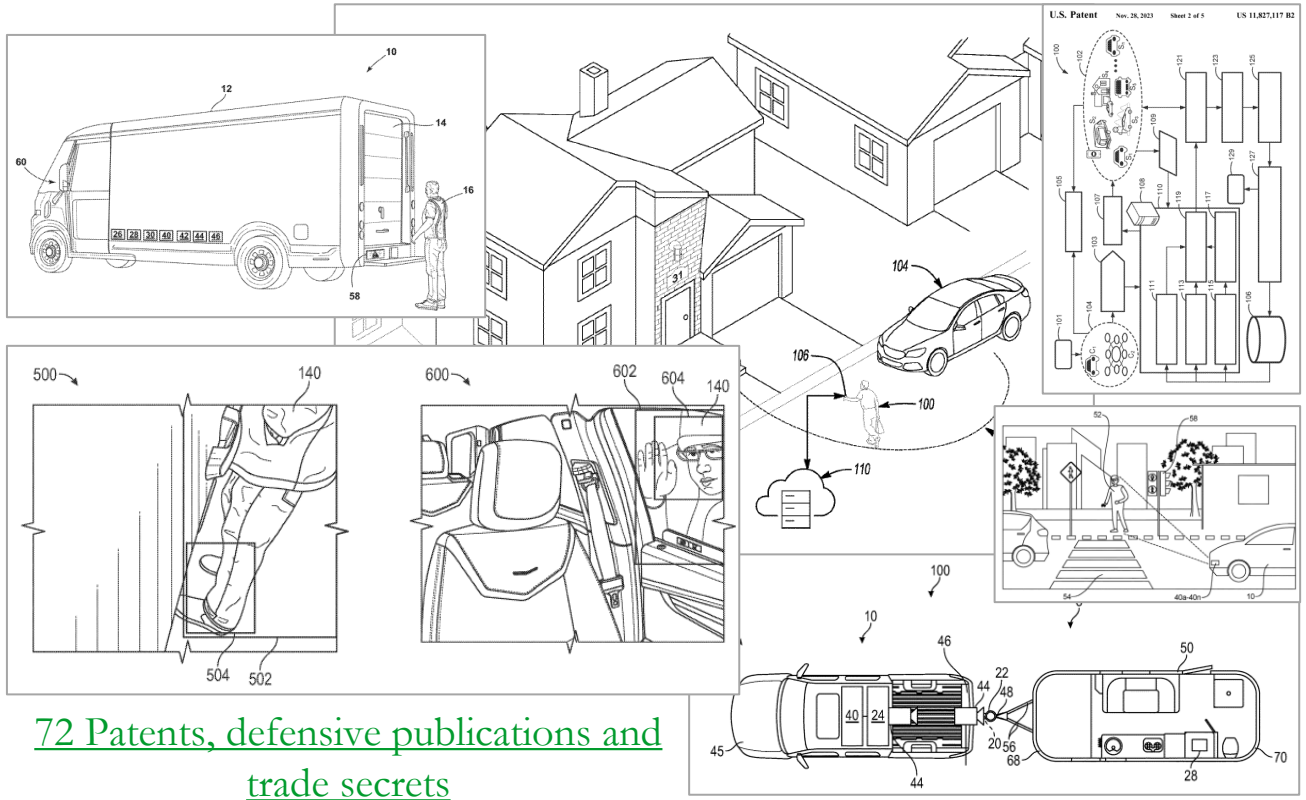

[72 Patents, defensive publications and trade secrets]

- Edge AI
- Connected Mobility and HMI
- Active Safety
- Assisted and Automated Driving
- Software-defined Vehicles

Automotive AI

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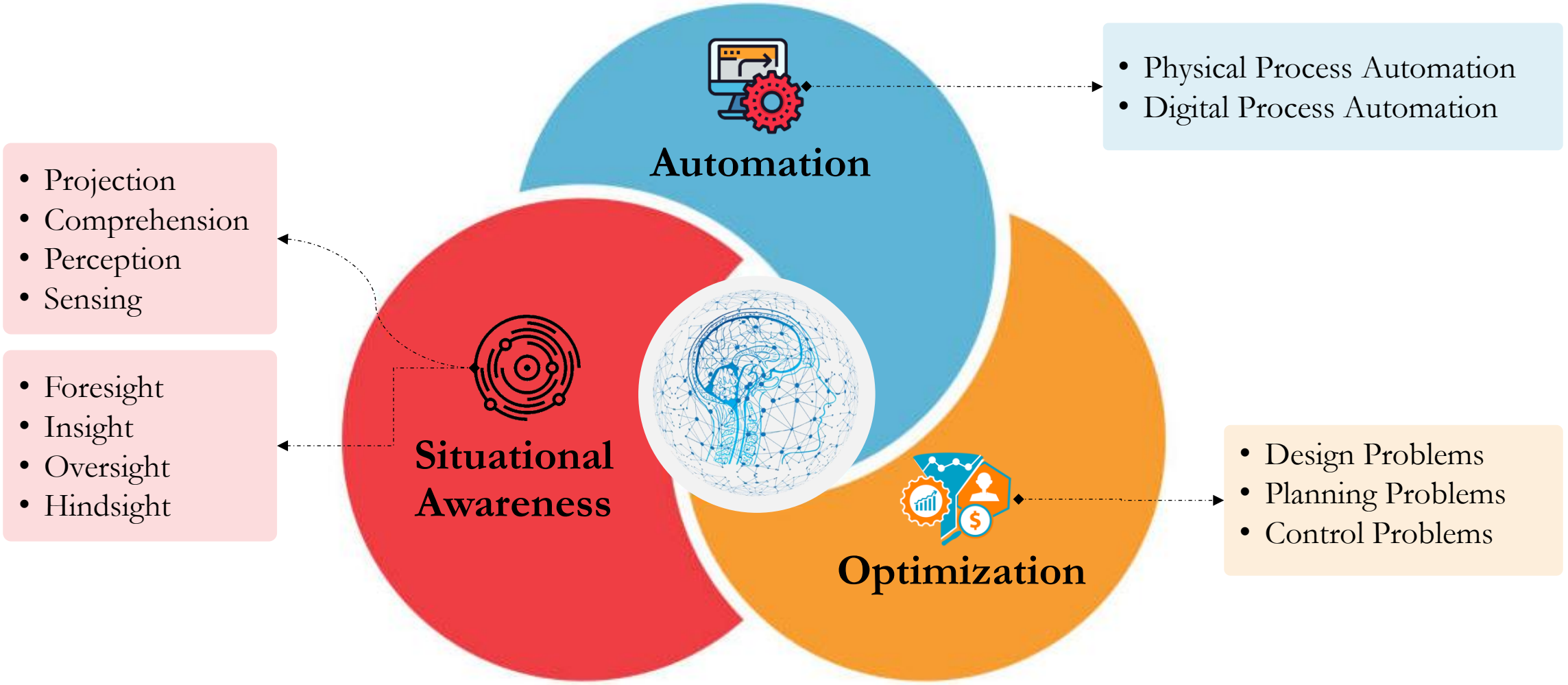
» The Three Patterns of AI



Situational Awareness

Situational Awareness: SA Levels

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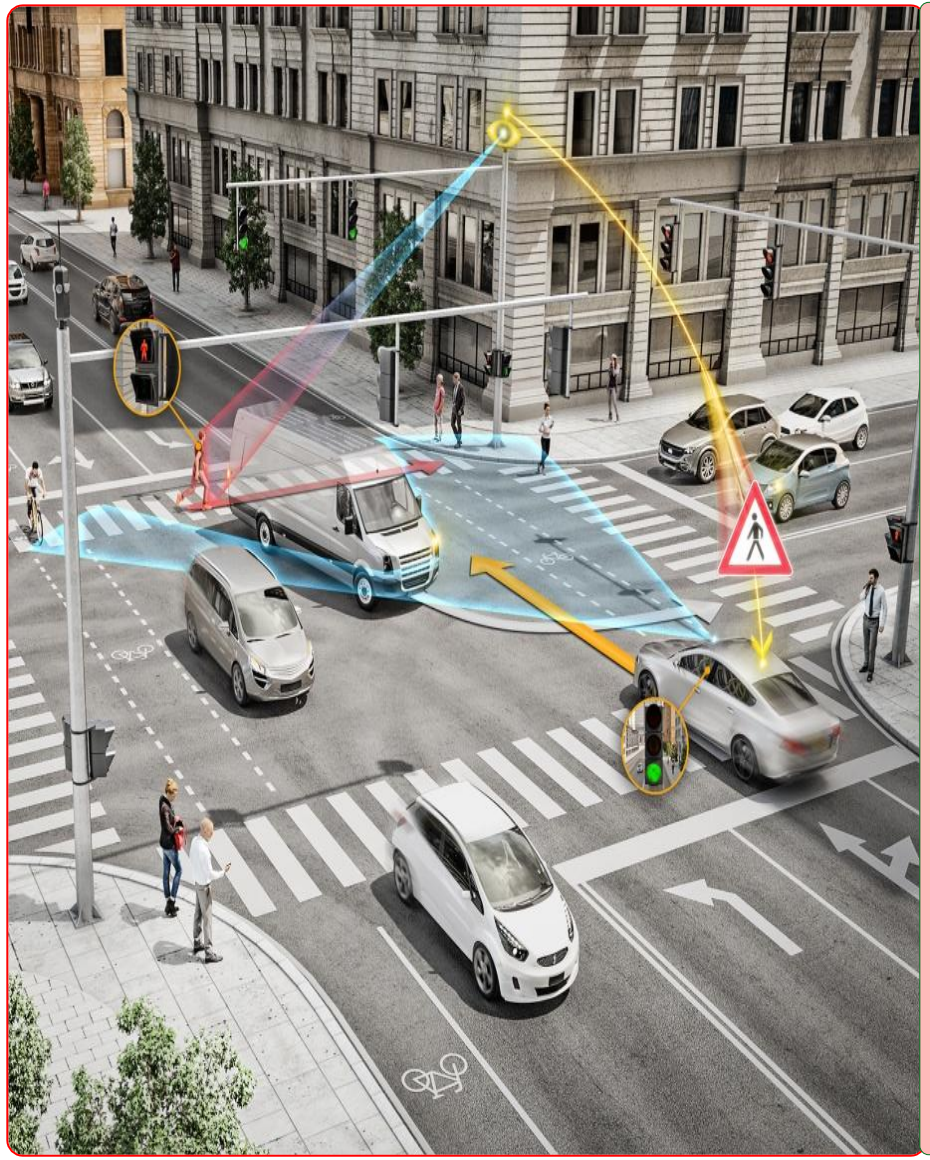

Situation Awareness

L3: Projection

Status of entities in the near future and possible consequences

- VRU intent (crossing intent, adversarial intent recognition, bullying behavior)
- Near-misses detection
- Predict risk of collision with VRU
- Predict traffic flow

L2: Comprehension

Relate Situation Entities

- VRU crossing recognition
- Other vehicles maneuvers recognition
- Signal phase and timing and pedestrian flashing sign status

L1: Perception

Identify Situation Entities

- VRU (vehicles, pedestrians, cyclists, jaywalker, wheelchair, kids)
- Traffic signs and pedestrian signs
- Lane markings, lane layout, crosswalks

L0: Sensing

Collect Relevant Data

- Vehicle onboard sensors (Cameras, LiDAR, etc.)
- Infrastructure (Camera, LiDAR, smart traffic lights, HD map)

Decision Making/Support

- Activate warning signs or lights for pedestrians and cyclists if a jaywalker is detected.
- Pre-crash warning
- Across traffic turn collision risk warning
- Rear-end crash prevention
- Recommends actions to the driver, such as braking or adjusting course to avoid a collision.
- Apply AEB

Situational Awareness: The 4 Lines of Sight

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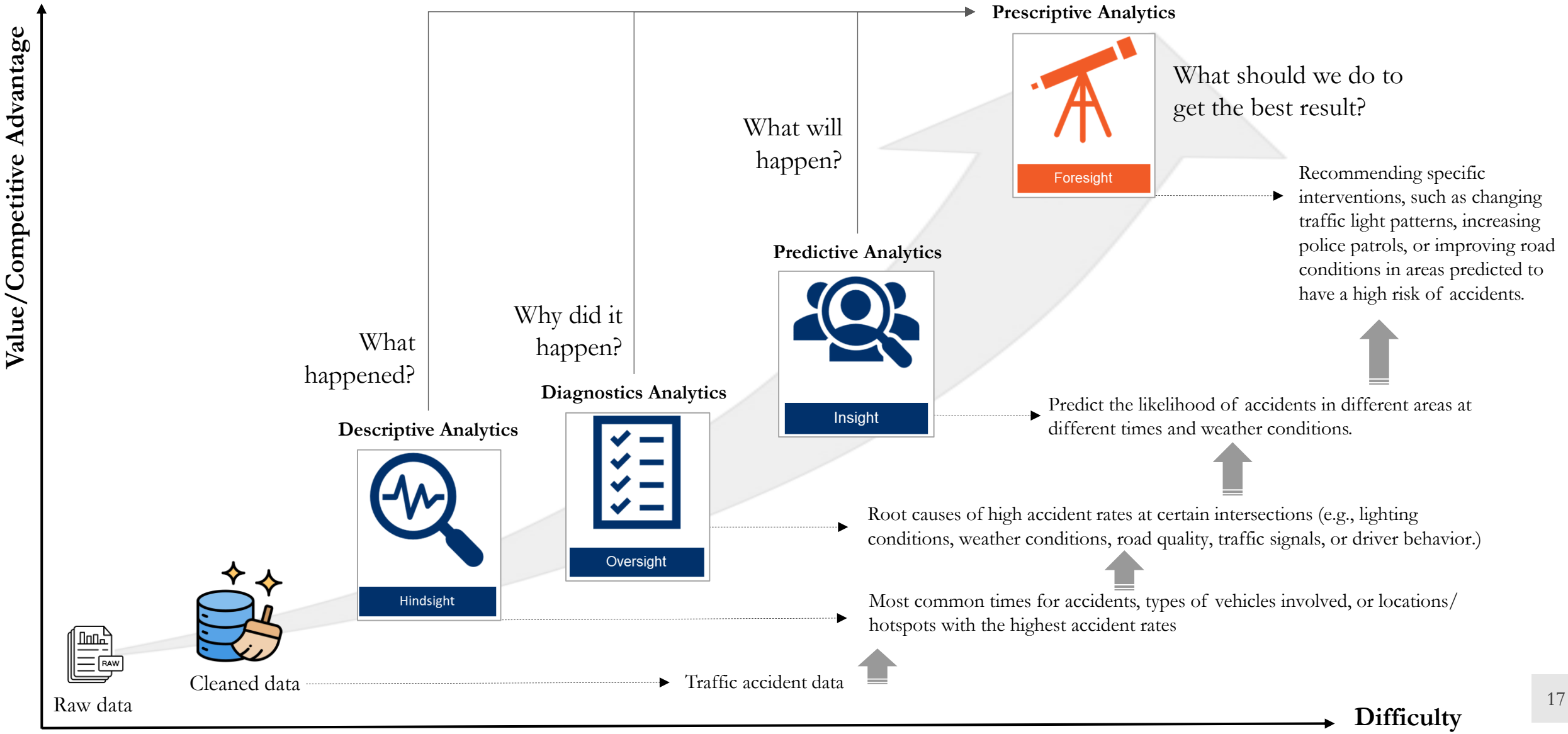

Situational Awareness: VRU Intent Prediction

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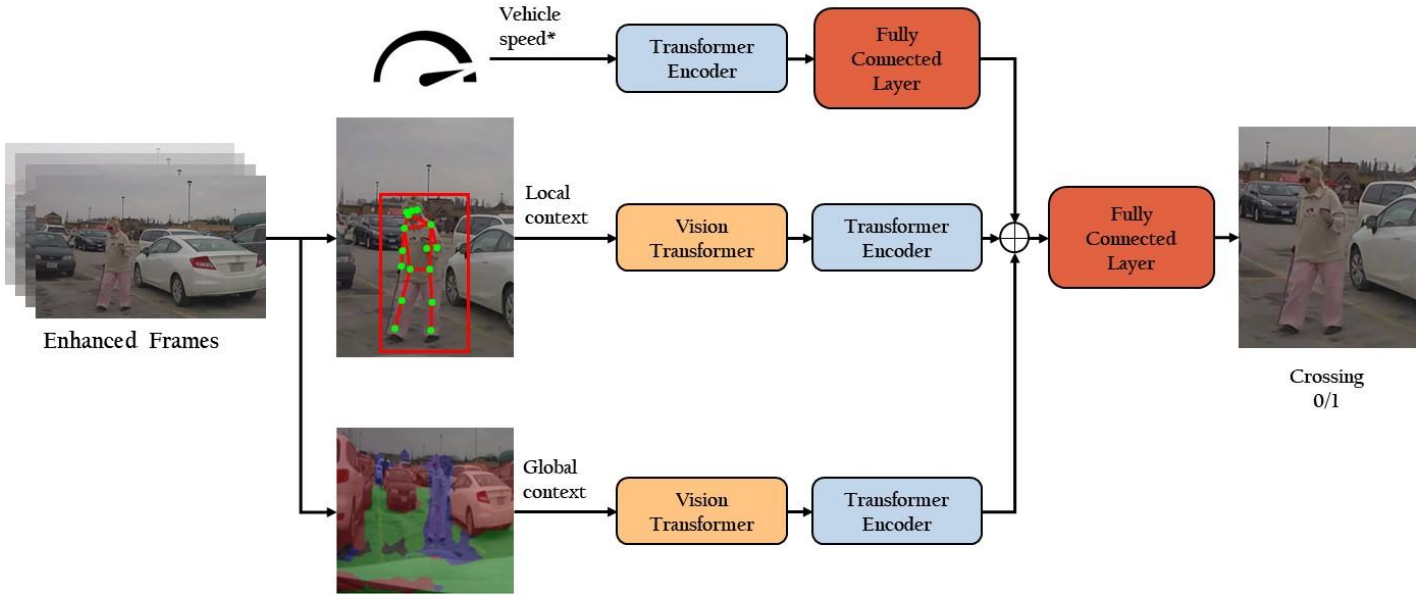

Pedestrian Crossing Intent Prediction using Vision Transformers

Foggy weather

Rainy weather

Nighttime

Clear weather

Inclement Weather Perception

- Ahmed Elgazwy, Khalid Elgazzar, Alaa Khamis. Predicting Pedestrian Crossing Intentions in Adverse Weather with Self-Attention Models. IEEE Transactions on Intelligent Transportation Systems (T-ITS), 2025.
- Ahmed A Elgazwy, Hossameldin Ouda, Ammar Elmoghazy, Ghadeer Abdelkader, Austin Page, Alaa Khamis and Khalid Elgazzar, "Image Enhancement for Better VRU Detection in Challenging Weather Conditions," ICCSPA'24.

Situational Awareness: SDV Observability

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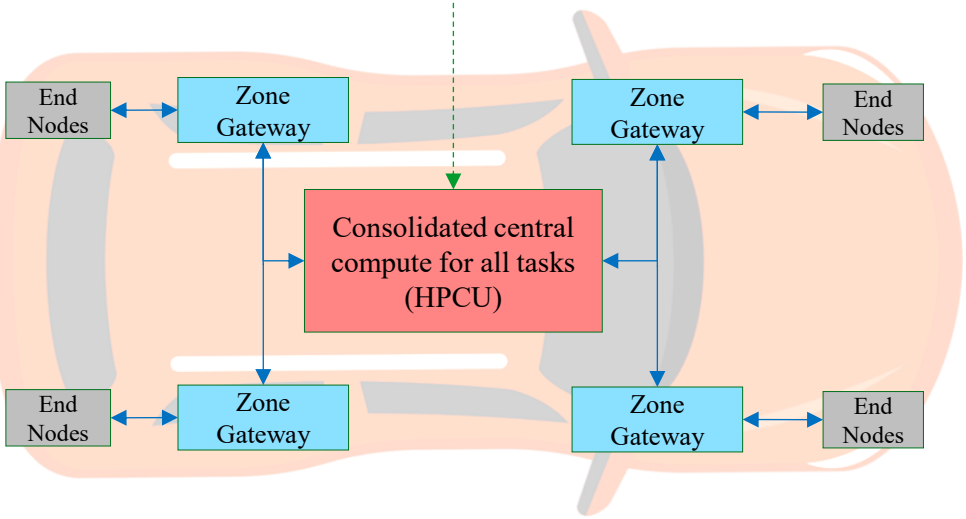
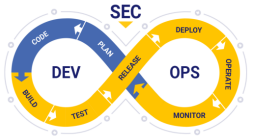


Backoffice Cloud Services

Shift Left	Cloud Native Development	Cloud-to-Vehicle



SOA SW Architecture (SOAFEE Compliant)

Safety App A	Safety App B	ASIL B, C, D (ADAS) App	ASIL A (V2X)	Safety Apps	Safety Monitoring
Classic AUTOSAR RTE		Container Runtime	Container Runtime	Classic AUTOSAR RTE	
Basic Software (BSW)		Middleware	Middleware	Basic Software (BSW)	
Safe RTOS		ASIL B OS	QM OS	ASIL D RTOS	
		Hypervisor			
		Application Processor		Safety island	
Zonal Controller		High Performance Compute			

Situational Awareness: SDV Observability

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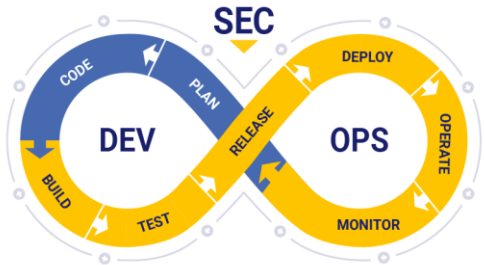
» SDV 3.0: Zonal Architecture – Software-Defined Vehicle: Promises

Faster Time to Market

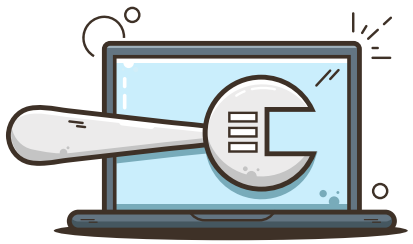
- Weeks to months instead of 3 years.
- Accelerating the R&D cycle through Virtual Models, enabling early-stage innovation and development (SHIFT LEFT).

Agile Approach



SDV supports an agile approach by enabling MVP development and continuous improvement, replacing the traditional First-Time-Right model.

Reduced Development Cost



SDV enables hardware and software platform reuse across vehicle model year upgrades and segments, reducing development effort and costs.

Increased Scalability

SDVs enable scalability by allowing the same code to be used across all car models, unlike traditional architectures that require separate code for each model.

Continuous Revenue Streams

- Digital value stream
- Post-sales revenue from Feature subscription (Feature-as-a-Service FaaS)
- Customer data can be used to create personalized offers that increase customer loyalty.

Situational Awareness: SDV Observability

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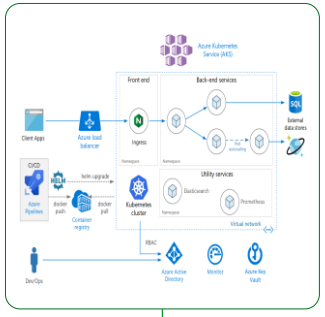
» SDV 3.0: Zonal Architecture – Software-Defined Vehicle: Challenges

Increased Complexity

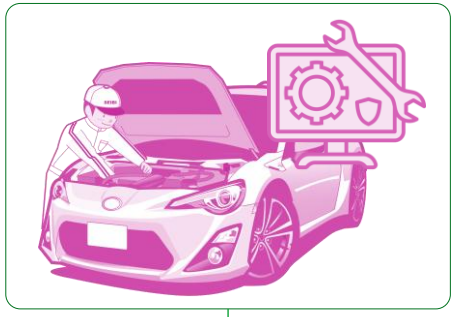


Numerous heterogenous distributed software components.

Safety and Reliability

With the integration of software into safety-critical systems, there's an inherent risk that software bugs or failures could lead to safety issues.

High Maintenance Efforts



The maintenance of SDVs involves not just the hardware but also continuous software updates, patches, and debugging. This requires specialized knowledge, potentially increasing operational costs and the need for skilled personnel.

Dependency on Connectivity

SDVs often rely on constant or periodic internet connectivity for updates, real-time data processing, and functionality like OTA (Over-The-Air) updates.

Cybersecurity Risks

- With more software comes greater exposure to cyber threats.
- Each component represents a potential entry point for hackers, which can lead to vulnerabilities in critical systems like braking, steering, or even data privacy breaches.

Situational Awareness: SDV Observability

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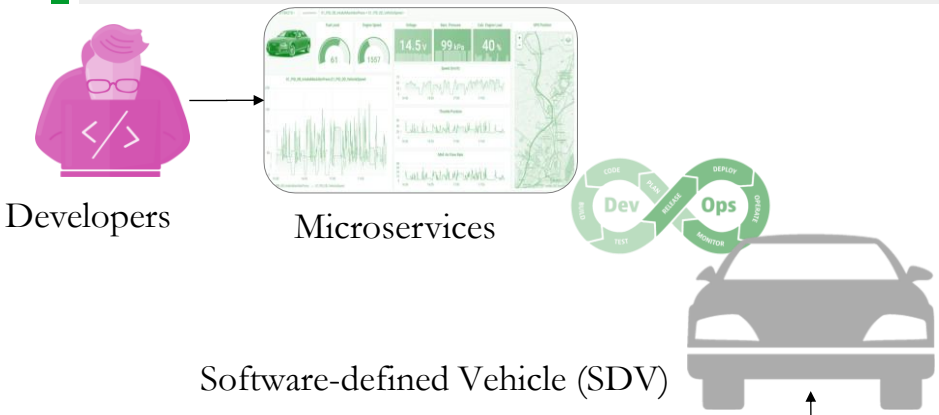
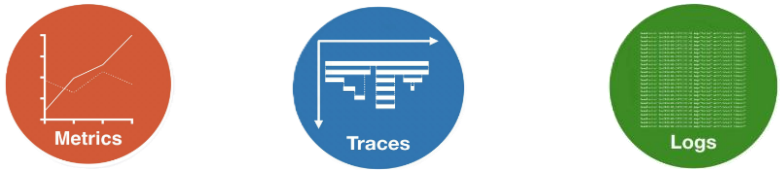


Operational Dashboard

Observability Data Collection



Is something happening?

Where is it happening?

What's happening?

Contextual Observability

Continuous Monitoring

Issue/ Anomaly Identification

Detected issues/ anomalies

Causal Inference

Automated Incident Response

Underlying causes and contributing factors

Contextual information (SLOs, OTA updates, network conditions, peak loads, service deployment zone, etc.)

Alaa Khamis and Partha Goswami. Rethinking Vehicle Architecture Through Softwarization and Servitization. IEEE Access, 2025.

Automation

Automation

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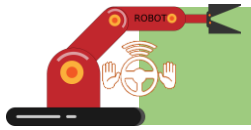

Physical Process Automation

- Embodied/Physical AI
- Mobility platform manufacturing (robotic welding, assembly and painting, automated material handling, automated quality inspection)
- Automated public transport
- Automated people movers (APM)
- Smart parking systems
- Smart intersections
- Self-flying vehicles
- Self-driving vehicles

Digital Process Automation

- Agentic AI
- Robotic Process Automation (RPC)
- Streamline content creation
- Intelligent agent assistants/ Conversational agents (Chatbot such as Retail Support Bots)
- Q&A engines
- Recommendation engines to generate personalized recommendations.
- Digital Go-to-Market (online booking and online shopping, etc.)
- Digital twins

Automated Mobility

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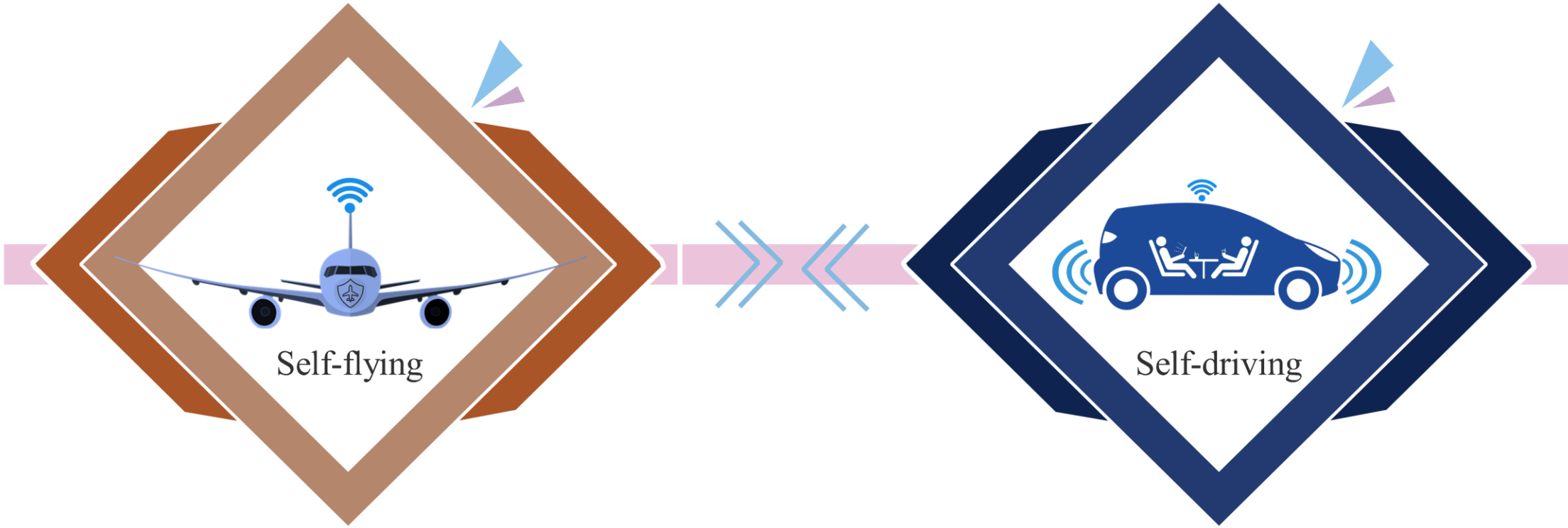
» Automated Mobility: A Comparison between Aviation and Automotive



Alaa Khamis and Partha Goswami, "Automated Mobility: A Comparison Between Aviation and Automotive", The 2023 IEEE International Conference on Smart Mobility.

Automation

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» The Evolutionary Road To Full Automation

Automation

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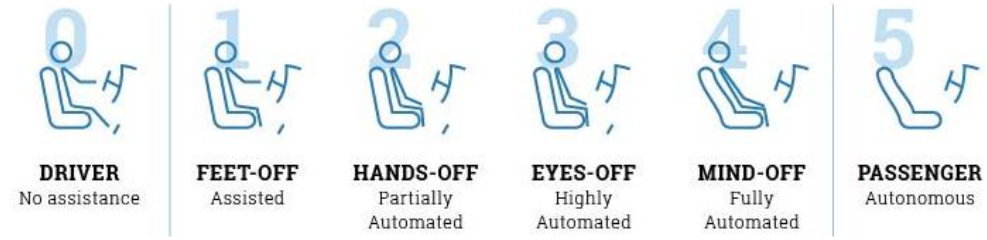
» The Evolutionary Road To Full Automation



Least Complex → **Most Complex**

Today

Mining/Agriculture/Warehouse

Tomorrow

First/Middle/Last Mile Delivery/Logistics

Robotaxi /People mover

NEXT Decade?

Personally Owned AV & Tailored Spaces

Alaa Khamis and Partha Goswami, "Automated Mobility: A Comparison between Aviation and Automotive," The IEEE International Conference on Smart Mobility, 2023.

Automation

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» Self-driving Platform at KFUPM

Self-driving and Tele-driving Technology Platform

Automation: Automated Driving

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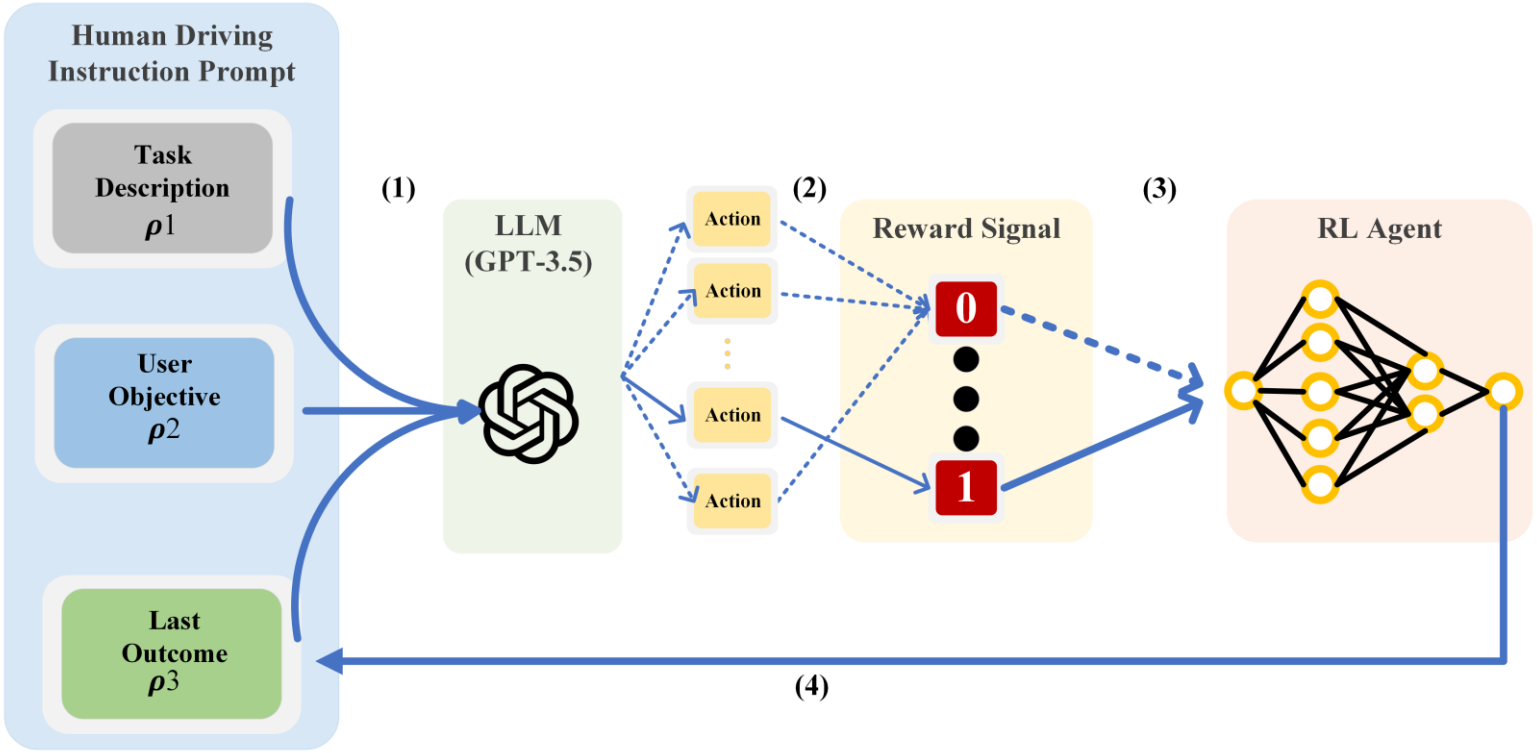
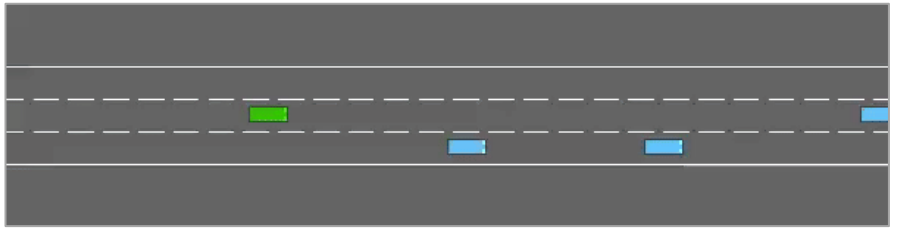
» In-context Learning for Automated Driving Scenarios



An example of conservative model

An example of aggressive model



Index	Mean Reward	Lane Change	Speed Up
DQN baseline	0.82824	0.30681	0.42045
Aggressive	**0.83888**	0.02326	**0.83721**
Conservative	0.71391	**0.01333**	0.00666
Base	0.80140	0.10345	0.10345

Ziqi Zhou, Jingyue Zhang, Jingyuan Zhang, Boyue Wang, Tianyu Shi, Alaa Khamis. Human-centric Reward Optimization for Reinforcement Learning-based Automated Driving using Large Language Models. ITRB Annual Meeting, Washington, D.C. 2026, arXiv:2405.04135, 2024.

Automation: Speed Control and Traffic Signal Control

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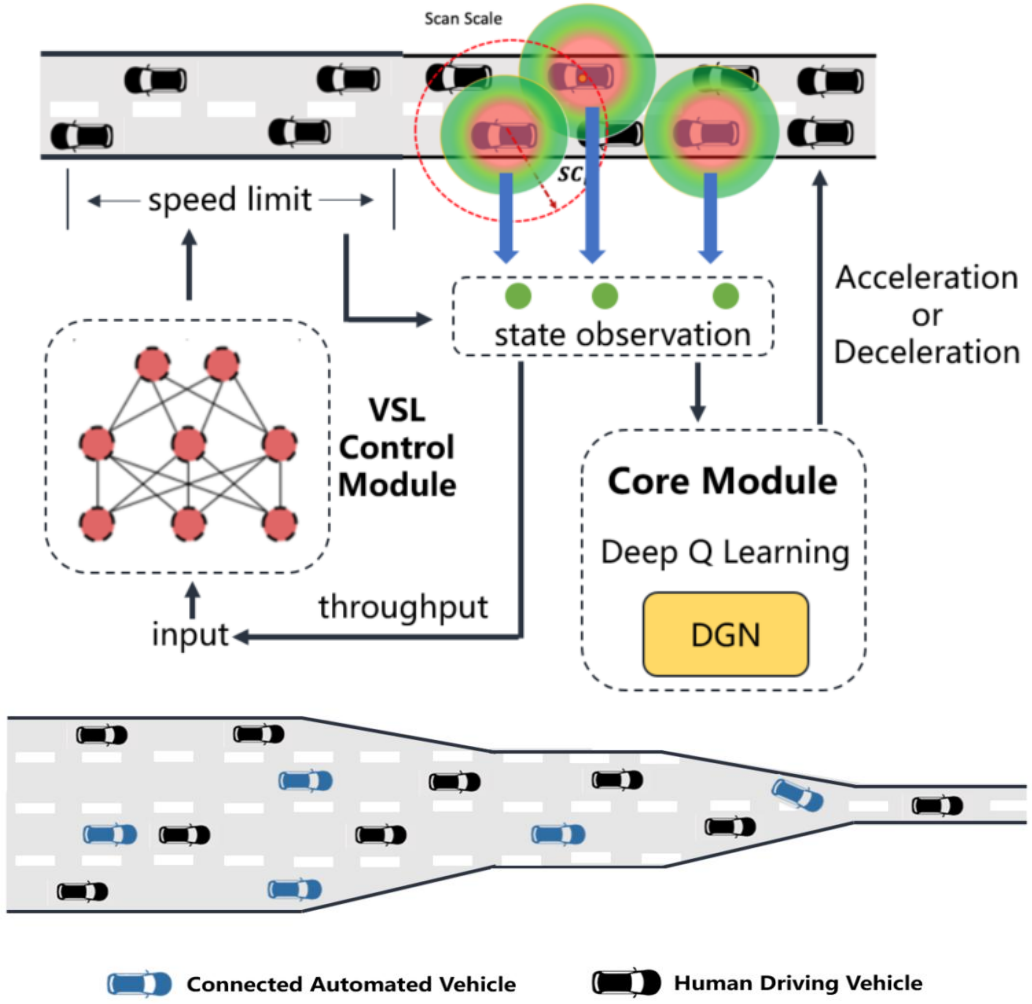
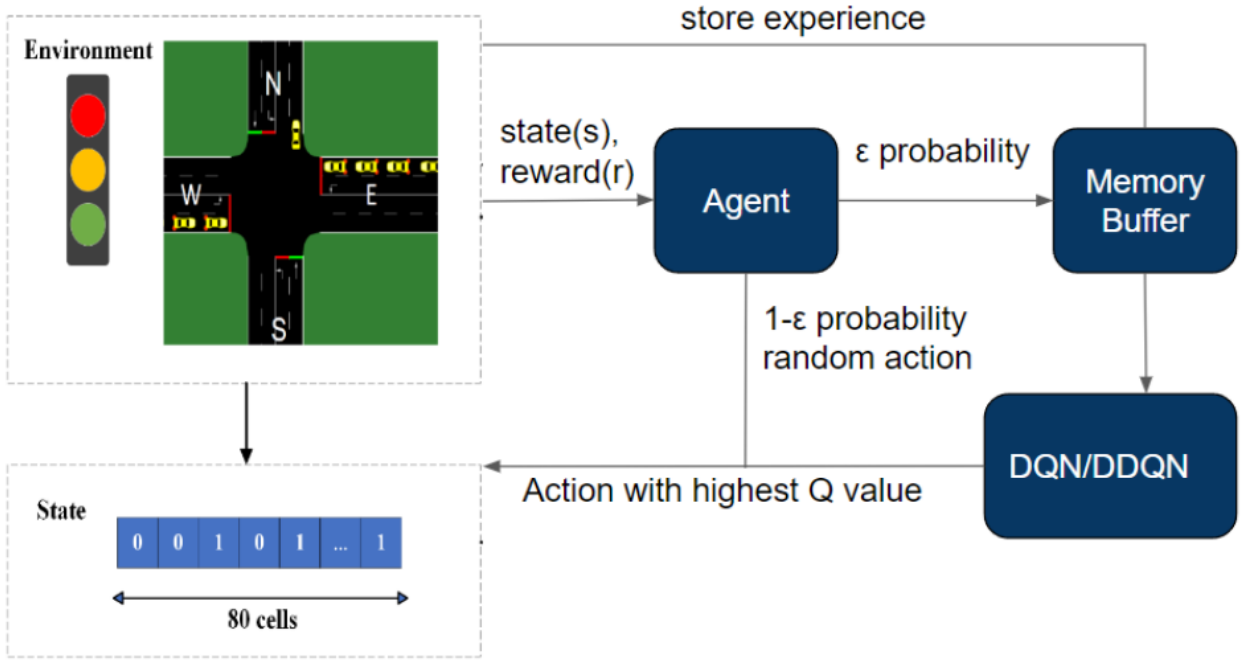
» Cooperative Variable Speed Limit Control using MARL



Kaize Lin, Zihe Jia, Peiqi Li, Tianyu Shi, Alaa Khamis, "Cooperative Variable Speed Limit Control using Multi-agent Reinforcement Learning and Evolution Strategy for Improved Throughput in Mixed Traffic," 2023 IEEE International Conference on Smart Mobility.

• DRL-based Traffic Signal Control



Junyun Ruan, Jinzhuo Tang, Ge Gao, Tianyu Shi, Alaa Khamis, "Deep Reinforcement Learning-based Traffic Signal Control," 2023 IEEE International Conference on Smart Mobility.

Automation: Agentic AI

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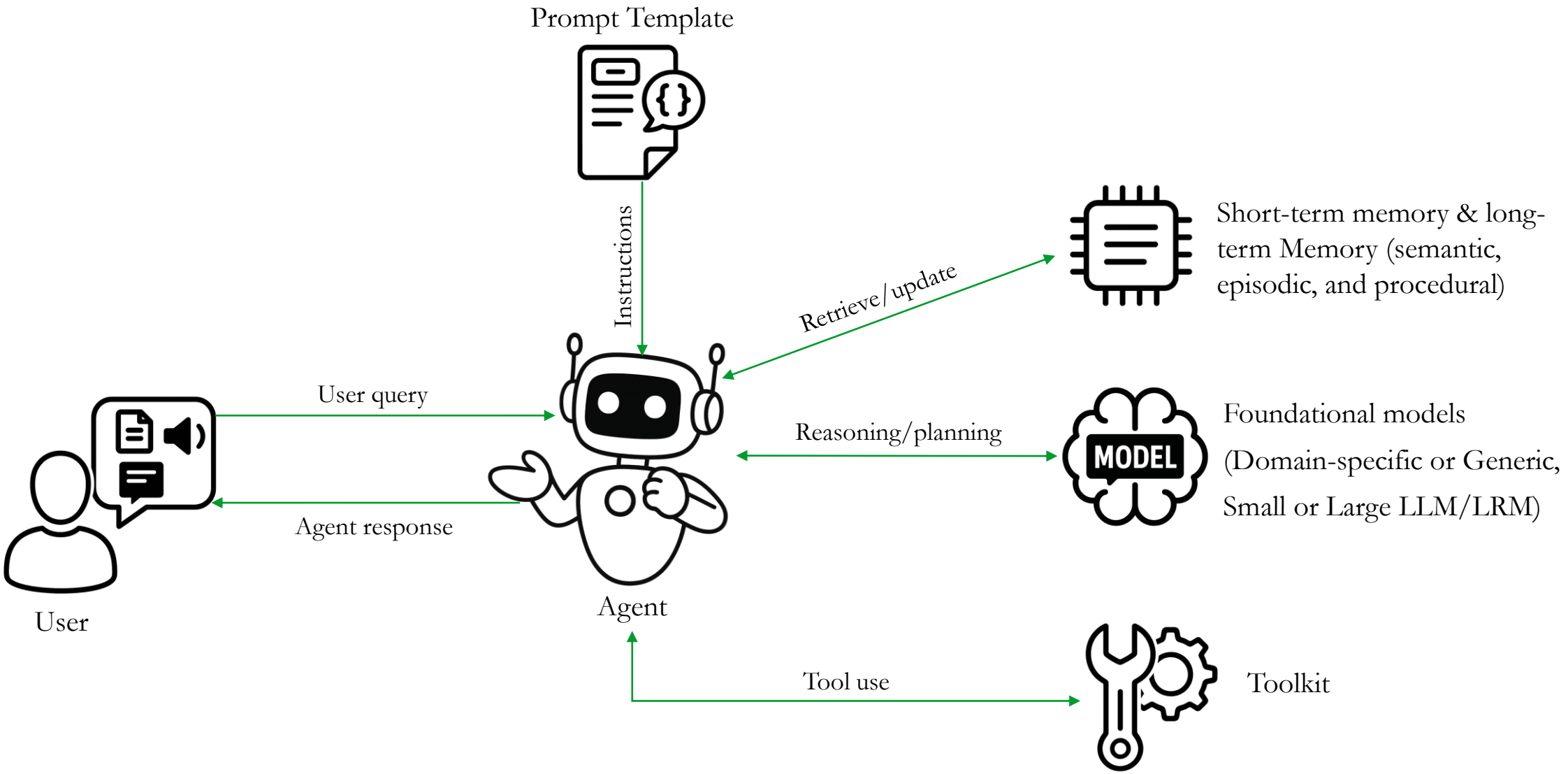
» AI Agent Components



Automation: Agentic AI

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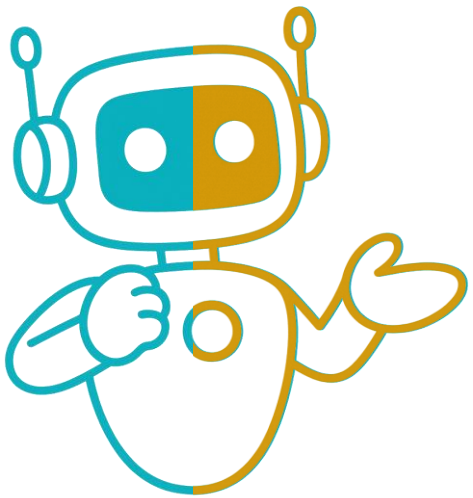
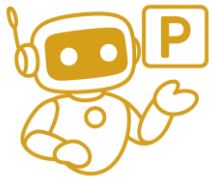
» Use Cases



Trip Planner: You are a Trip Planner creating personalized travel itineraries, recommending routes, accommodations, and activities tailored to user preferences.



Parking Assistant: You are a Parking Assistant helping drivers find, navigate to, and reserve the most convenient parking spots in real time.

Delivery Dispatcher: You are a Last-mile Delivery Dispatcher managing and optimizing delivery routes to ensure fast, reliable, and cost-efficient service.

Umrah Assistant: You are an Umrah Assistant guiding pilgrims through Umrah rituals, logistics, and scheduling while providing spiritual and practical support.

Service Bundler: You are a Service Bundler recommending and combining complementary services into customized packages that fit user needs.

Automation: Personalized Trip Planning

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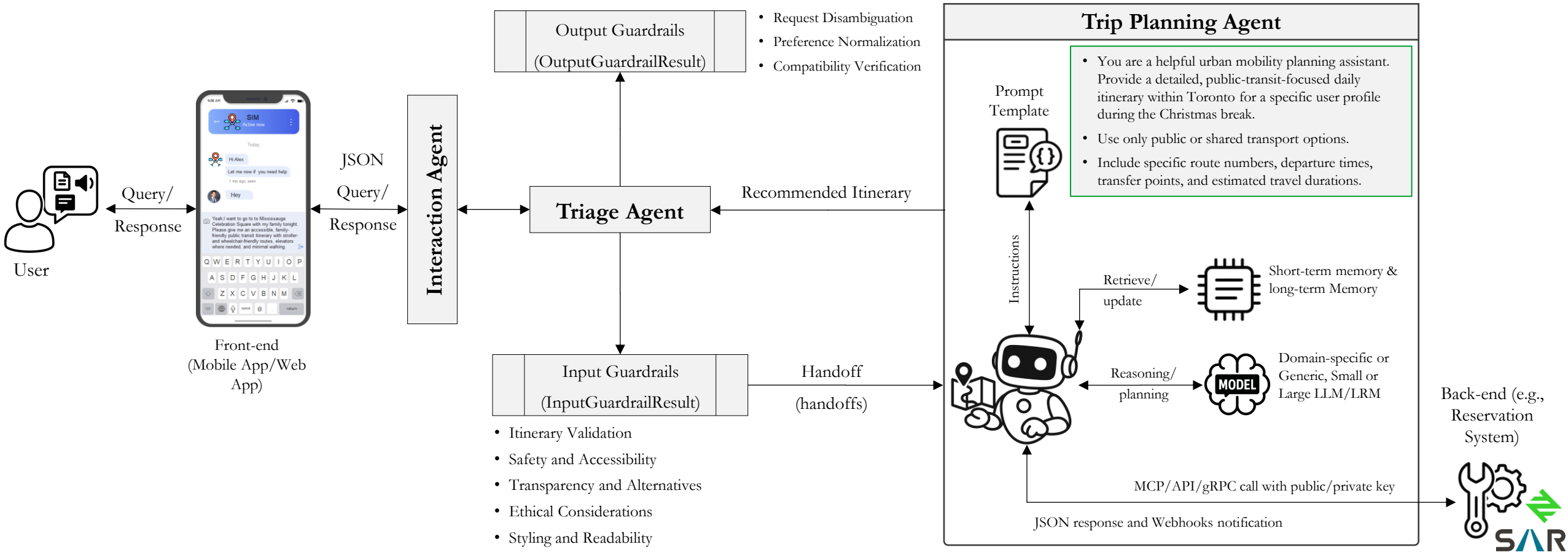

Natural Language Input → **Reason + Plan + Action** → **Tool-use**

Automation: Personalized Trip Planning

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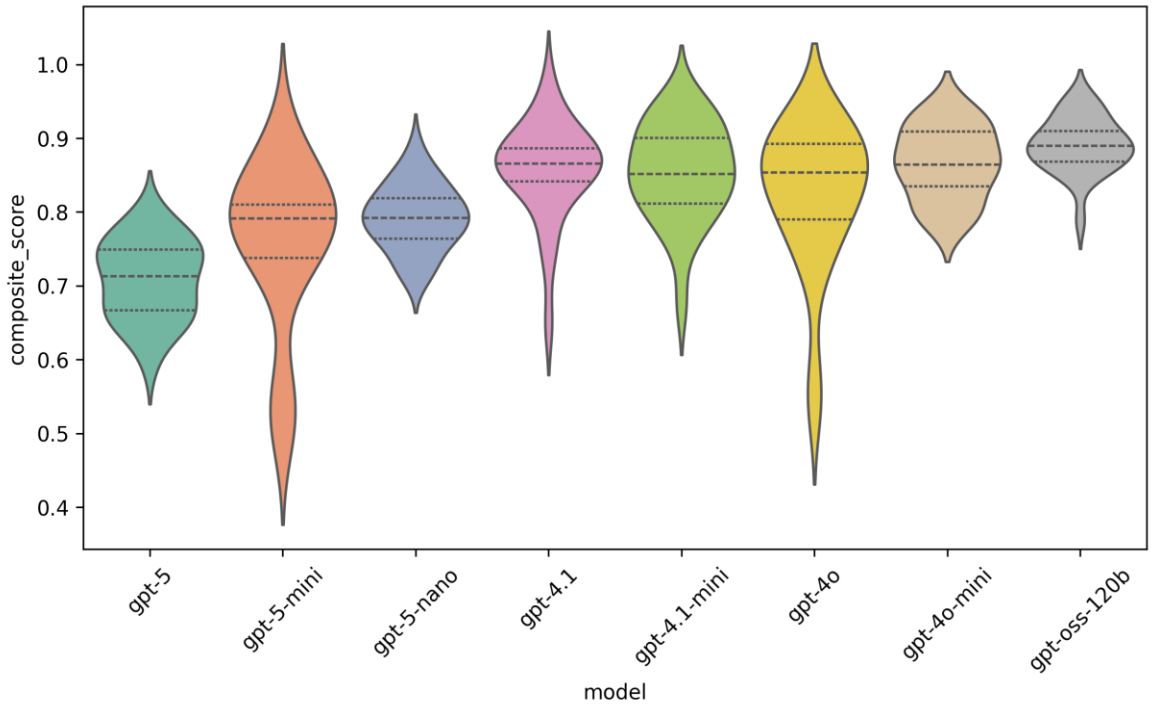
EVALUATION METRICS ACROSS MODELS (AVERAGES)

Model	Response Time (s)	Steps	Semantic Similarity	Composite Score
GPT-4.1	11.6	8.1	0.74	0.86
GPT-4.1-mini	13.2	7.6	0.75	0.85
GPT-4o	13.3	8.2	0.69	0.82
GPT-4o-mini	15.2	9.1	0.78	0.87
GPT-5	250.0	20.7	0.88	0.71
GPT-5-mini	67.7	9.9	0.67	0.76
GPT-5-nano	107.9	23.8	0.90	0.79
GPT-oss-120b	38.4	16.3	0.88	0.84

EVALUATION METRICS BY DISTANCE GROUP (AVERAGED ACROSS ALL MODELS AND PERSONAS).

Distance Group	Response Time (s)	Steps	Semantic Similarity	Composite Score
Far	65.8	14.5	0.82	0.81
Medium	64.9	13.3	0.80	0.80
Near	63.5	12.0	0.79	0.79



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User profiles

Business Executive: Senior professional living in Markham. Frequently travels across the GTA for meetings and networking events. Prefers fast, reliable public/shared transport (GO Transit, TTC subway/streetcar) with minimal transfers. Typically travels during peak hours in business attire. Prioritizes comfort and punctuality, and avoids crowded or delayed routes.

Budget Solo Traveler: Cost-conscious solo resident of Markham. Navigates the GTA for errands, shopping, and free events. Uses TTC, YRT, and GO buses extensively. Prefers lowest-cost routes, even if slower. Open to walking and occasional bike share. Avoids premium services unless absolutely necessary.

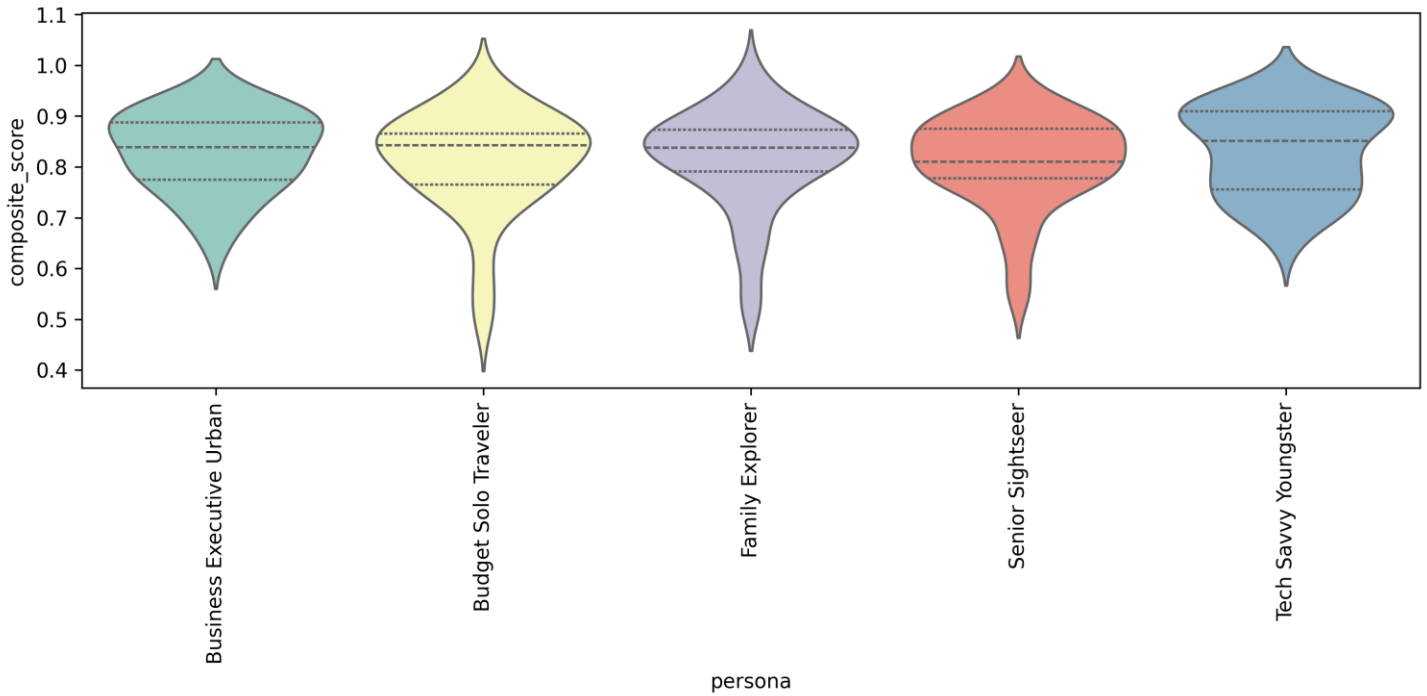
Family Explorer: Parent with young children living in Markham, planning outings (e.g., museums, parks). Needs stroller-friendly, safe routes with minimal walking and reliable arrival times. Prefers transit with elevators, space for kids, and proximity to family-friendly destinations.

Senior Sightseer: Elderly resident of Markham looking to visit cultural sites and family in the GTA. Uses accessible transit (e.g., GO buses, TTC) and avoids complex transfers. Prefers daytime travel. May benefit from services like Mobility On-Request or elevator-equipped stations.

Tech savvy Youngster: University student living in Markham. Travels around the GTA for social outings, study sessions, and late-night events. Uses trip-planning apps (e.g., Transit, Rocketman) and a mix of TTC, GO Transit, and bike/scooter share. Cost-aware but convenience-driven.

EVALUATION METRICS AVERAGED ACROSS MODELS FOR EACH PERSONA.

Persona	Time (s)	Steps	Semantic Similarity	Composite Score
Budget Solo Traveler	69.7	12.9	0.77	0.81
Business Executive Urban	66.1	12.8	0.81	0.83
Family Explorer	75.6	14.0	0.78	0.81
Senior Sightseer	56.7	11.6	0.76	0.81
Tech-Savvy Youngster	68.9	15.7	0.83	0.83



Automation: Frictionless Parking

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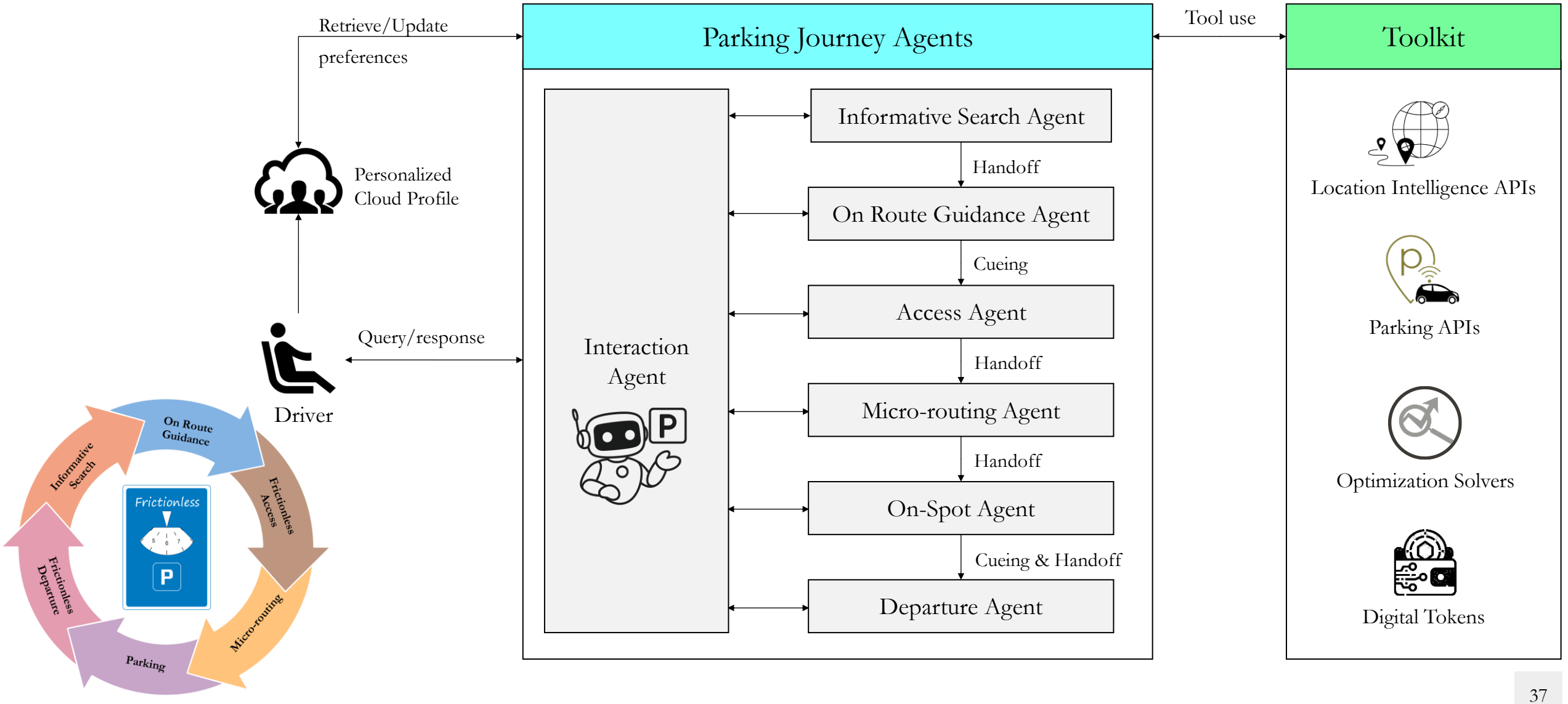

Alaa Khamis. Agentic AI Systems: Architecture and Evaluation using a Frictionless Parking Scenario. IEEE Access, 2025.

Automation: Frictionless Parking

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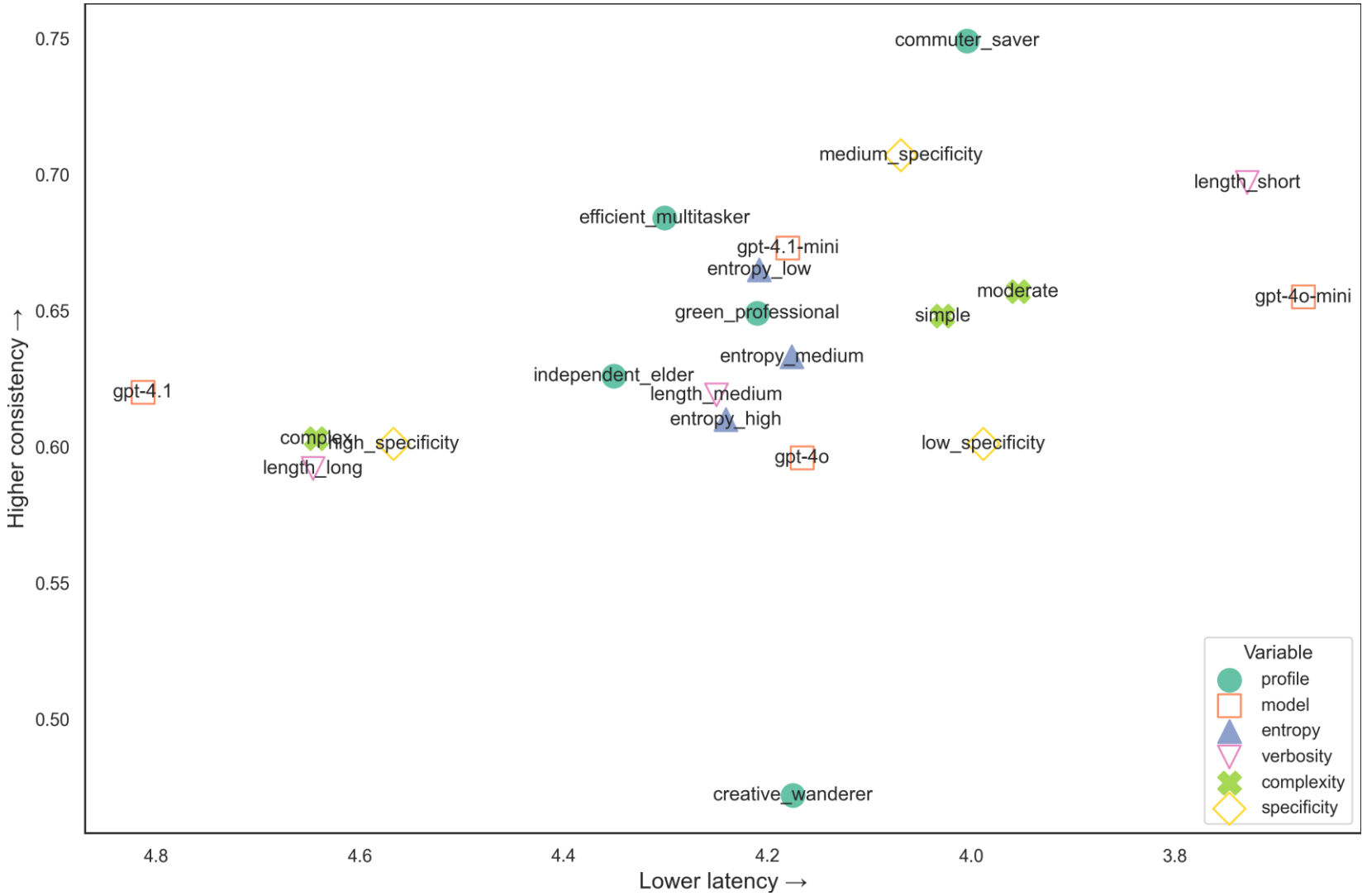
TABLE 4. Results of the non-parametric Kruskal–Wallis *H* test for each experimental factor. Boldface indicates $p < .05$.

Factor	Latency (s)		Consistency	
	H	*p*	*H*	*p*
profile	29.515	0.000	248.775	0.000
model	309.482	0.000	28.692	0.000
entropy	1.630	0.443	13.755	0.001
verbosity	254.753	0.000	69.197	0.000
complexity	185.045	0.000	17.797	0.000
specificity	119.926	0.000	64.388	0.000

TABLE 5. Robust GLM coefficient estimates relative to the reference condition. Negative values indicate faster replies (delta latency less than 0) or more stable wording (delta consistency greater than 0). Significance levels are marked as follows: ***p < 0.001, **p < 0.01, *p < 0.05.

Level	ΔLatency (s)	ΔConsistency
Profiles		
creative_wanderer	0.172**	−0.277***
efficient_multitasker	0.297***	−0.065***
green_professional	0.206**	−0.100***
independent_elder	0.347***	−0.123***
Model		
gpt-4.1	1.139***	−0.035*
gpt-4.1-mini	0.507***	0.018**
gpt-4o	0.492***	−0.060***
Entropy		
entropy_medium	−0.032	−0.032*
entropy_high	0.033	−0.056***
Verbosity		
length_medium	0.521***	−0.078*
length_long	0.918***	−0.105***
Complexity		
simple	0.074***	−0.009
complex	0.689***	−0.055***
Specificity		
low_specificity	−0.081***	−0.106***
high_specificity	0.498***	−0.106***



Alaa Khamis. Agentic AI Systems: Architecture and Evaluation using a Frictionless Parking Scenario. IEEE Access, 2025.

Optimization

Optimization

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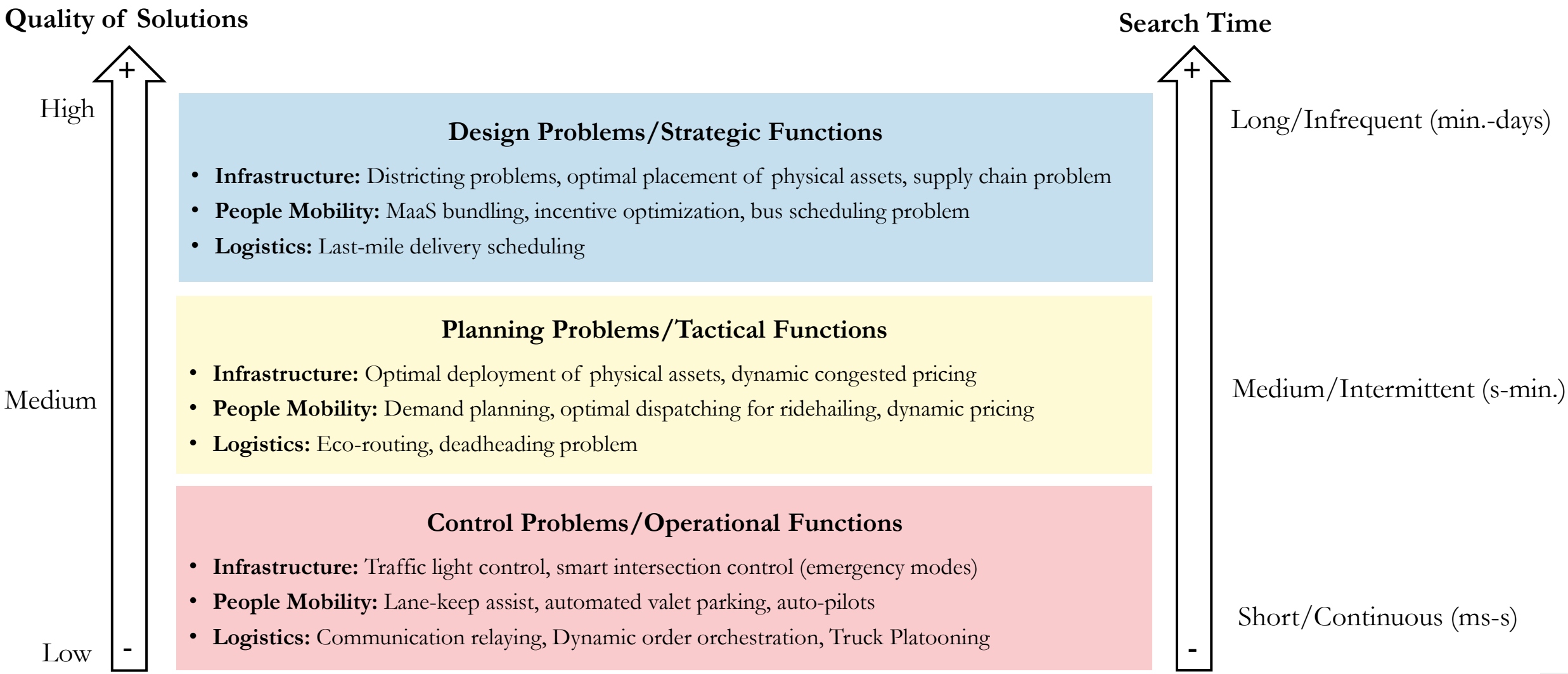

Design Problems/Strategic Functions

- **Infrastructure:** Districting problems, optimal placement of physical assets, supply chain problem
- **People Mobility:** MaaS bundling, incentive optimization, bus scheduling problem
- **Logistics:** Last-mile delivery scheduling

Planning Problems/Tactical Functions

- **Infrastructure:** Optimal deployment of physical assets, dynamic congested pricing
- **People Mobility:** Demand planning, optimal dispatching for ridehailing, dynamic pricing
- **Logistics:** Eco-routing, deadheading problem

Control Problems/Operational Functions

- **Infrastructure:** Traffic light control, smart intersection control (emergency modes)
- **People Mobility:** Lane-keep assist, automated valet parking, auto-pilots
- **Logistics:** Communication relaying, Dynamic order orchestration, Truck Platooning

Alaa Khamis. Optimization Algorithms: AI Techniques for Design, Planning, and Control Problems. Manning Publication, ISBN 9781633438835, 2024.

Optimization

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AI for Smart Mobility

A collective hub exploring AI's transformation of transportation infrastructure, people mobility and logistics

Optimizing Traffic Sensor Placement in the City of Toronto

By Yichen Liao, Xinyi Gong and Amir Hossein Mobasheri as part of course project of ECE1724H: Bio-inspired Algorithms for Smart Mobility...

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Predicting Ride-Sharing Platform Pricing in New York City with Deep Learning

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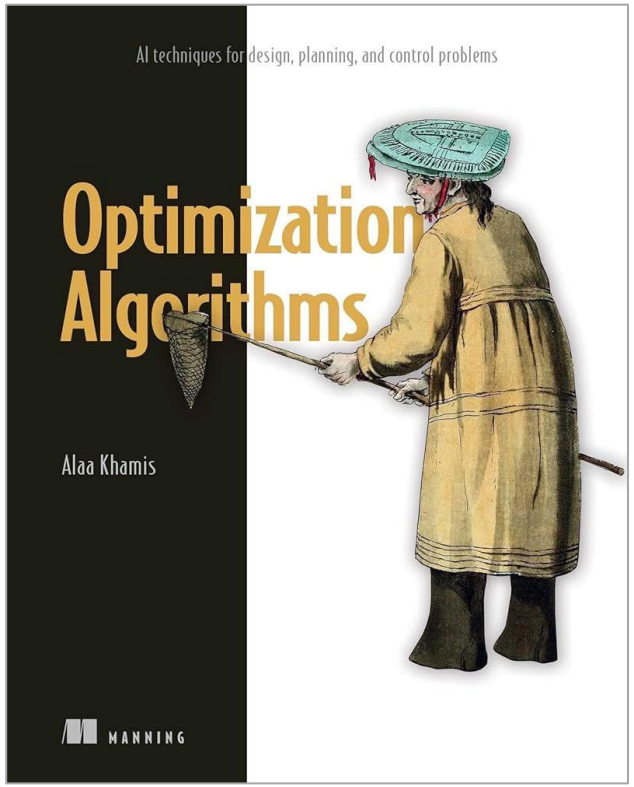

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GitHub

https://github.com/ai4smlab

Optimization

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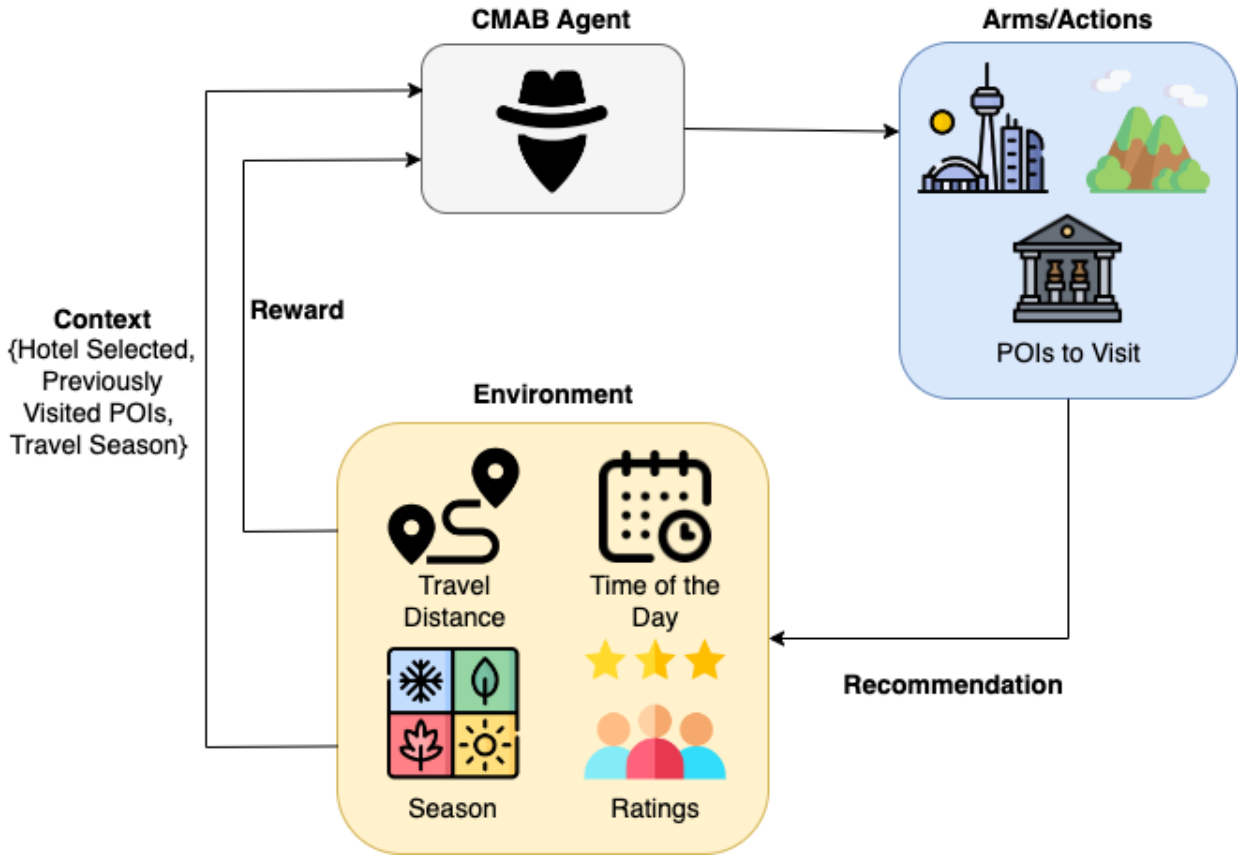
» A Contextual Multi-armed Bandit Approach to Personalized Trip Itinerary Planning



Algorithm	Configuration	Run Time (s)	Reward
One Tour			
AGA	Default	0.109	2.433
Epsilon-Greedy	$\epsilon = 0.05$	0.372	2.711
	$\epsilon = 0.1$	0.646	2.439
Explore-First	**first 1/10 of dataset**	**0.714**	**2.716**
	first 1/3 of dataset	0.804	2.716
Softmax Explorer	$\lambda = 10$	0.283	2.560
Two Tours			
AGA	Default	0.213	4.365
Epsilon-Greedy	$\epsilon = 0.05$	0.550	4.803
	$\epsilon = 0.1$	0.553	4.954
Explore-First	first 1/10 of dataset	1.867	4.464
	first 1/3 of dataset	1.011	5.222
Softmax Explorer	$\boldsymbol{\lambda = 10}$	**0.361**	**5.224**
Four Tours			
AGA	Default	0.346	7.306
Epsilon-Greedy	$\epsilon = 0.05$	0.497	9.156
	$\epsilon = 0.1$	0.543	8.239
Explore-First	first 1/10 of dataset	0.959	8.990
	first 1/3 of dataset	0.916	7.882
Softmax Explorer	$\boldsymbol{\lambda = 10}$	**0.391**	**9.357**

Haowei Li, Mufeng Wang, Jiarui Zhang and Tianyu Shi and Alaa Khamis, "A Contextual Multi-armed Bandit Approach to Personalized Trip Itinerary Planning," submitted to SM'24.

Optimization

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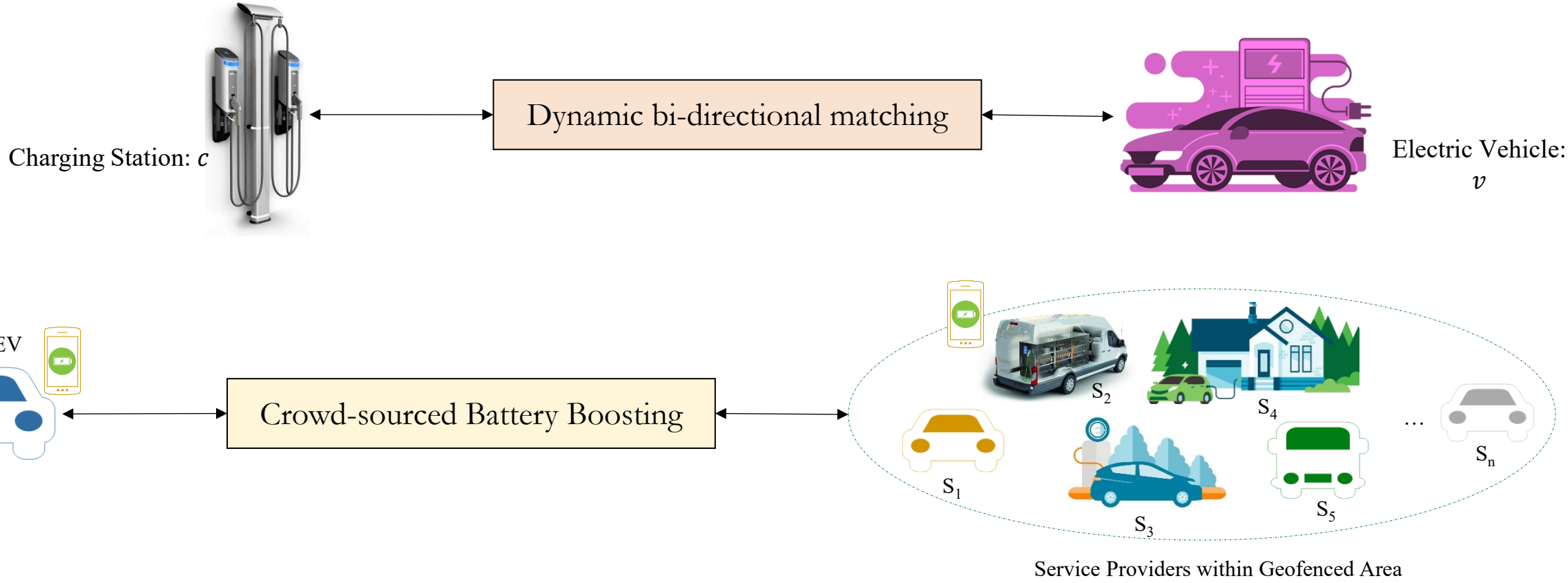
» Dynamic Supply and Demand Matching & Crowd-sourced Battery Boosting



1. Alaa Khamis, RL Macinnes, V Berezin. Dynamic multiple bi-directional supply and demand matching for EV charging. US Patent 12,115,874, 2024.
2. Alaa Khamis, R Abdelmoula, V Berezin, AB Koesdwiady, PEV Pena. Intelligent charging systems and control logic for crowdsourced vehicle energy transfer. US Patent 11,827,117, 2023.
3. A Goudarzi, AM Khamis, J Chau. aming credit system for efficient and compliant renewable energy powered charging station. US Patent App. 18/417,176, 2025.

Potential Barriers

Potential Barriers

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- Adversarial and Edge Cases
- VRU Adversarial Behaviors
- Domain Adaptation
- Learning Over Time
- Model Predictability and Interpretability
- Impact on Human Cognition
- Cybersecurity
- Data Privacy, Equity and Ownership
- Responsible AI Governance Framework

Potential Barriers: Adversarial and Edge Cases

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Construction

Sudden temporary traffic shifts

Human guidance that may override traffic lights, and signs

Banners with life-size human picture or Air puppet inflatable balloon

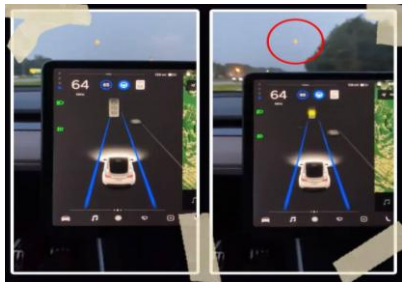
Tesla nearly hits a moving train during foggy weather

Confusing roundabout

Traffic light swinging in wind

Slippery snow with no lane markings or visible shoulder

Sandstorms



Tesla confuses moon for traffic light

Pedestrian wearing clothes with same color as the pole

Plastic bag filled with Air

Cohabitation with diverse transportation

Unusual road users

Uber self-driving car struck and killed a woman in Tempe, Arizona

Potential Barriers: Technology

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» Adversarial and Edge Cases

Source: Cruise's Safety Record Over 1 Million Driverless Miles

Potential Barriers: Technology

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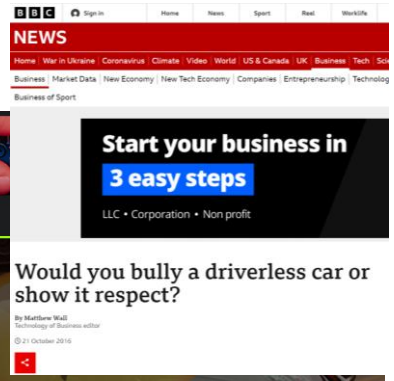
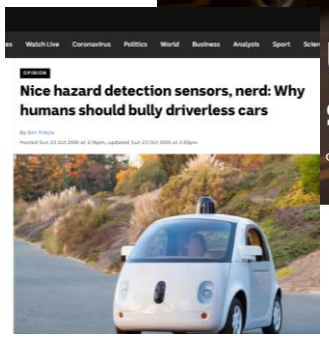
» VRU Adversarial Behaviors





1. Alaa Khamis and Wei Tong. Vulnerable road user's adversarial behavior recognition. Granted patent: US12280786B2 United States, 2o25.
2. Alaa Khamis, et al. Vulnerable road user's adversarial behavior opportunity and capability. Granted patent: US20240383503A1, United States, 2025.
3. Alaa Khamis, et al. Responses to vulnerable road user's adversarial behavior. Granted patent: US12391281B2, United States, 2025..

Potential Barriers: Responsible AI Governance Framework

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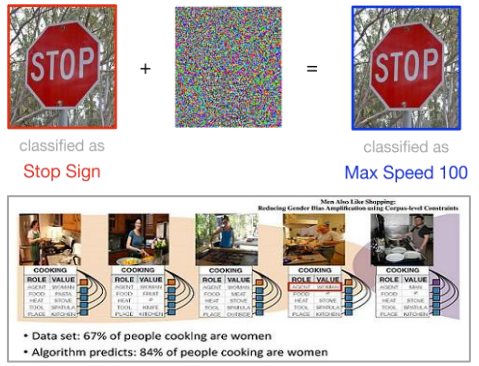
Responsible **AI** ⇒ Ethics + Safety + Security + Privacy + Compliance + Bias + Performance + Transparency

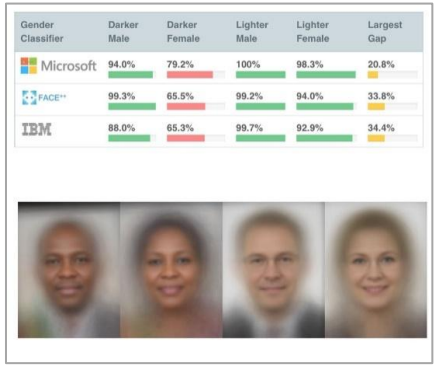
TECHNOLOGY

The Future of Artificial Intelligence Depends on Trust

If it is to drive business success, AI cannot hide in a black box. For more insight, see "3 Steps to Building Trust in AI."

by Anand Rao and Euan Cameron





Concluding Remarks

Concluding Remarks

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- The future mobility is **people-centric, software-defined, connected, and electric**.
- **Smart mobility** is a wide umbrella for different systems and services to meet various **end-user needs** without compromising the **collective good of the society and the environment**.
- **AI** is an evolving technology that empowers us with gigahertz level reasoning and learning capabilities and ability to analyze large amount of multidimensional data and generate actionable insights. **AI = Augmented Intelligence**.
- **AI** is a foundational technology and a driving force behind several existing and emerging smart mobility systems and services.
- **AI is a Good Follower, but a Dangerous Leader. Responsible AI** governed by a well-developed **governance framework** will be a good follower and a good leader as well.

Ending with a smile

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https://www.linkedin.com/posts/alaakhamis_iworkforgm-smartmobility-aiforgood-activity-6826985448750108672-utbL

King Fahd University of Petroleum and Minerals
ISE Department & IRC for Smart Mobility and Logistics

Thank you!

https://www.ai4sm.org/

https://github.com/ai4smlab

https://www.youtube.com/@AI4SM_lab

https://medium.com/ai4sm

November 3, 2025