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AURA
INTELLIGENT SYSTEMS

Algoptimal

The University of Massachusetts Dartmouth (UMassD) is one of the five campuses in the UMass system, located in the SouthCoast region of Massachusetts.

The UMassD team specializes in cutting-edge fields, including AI/ML for communications and networking, software-defined radio, acoustic communications, optical communications, and system resilience testing and evaluation.

Aura is a Boston based company that has developed low power waveform for high-performance 5D situational awareness without the harmful effects of interference, jamming and multipath.

With deep expertise is in Synthetic Aperture Radar imaging and 3G/4G/5G wireless communication systems, Aura developed wideband software-defined platform for RF sensing, imaging, and communications. The architecture their solution is massively scalable for the management and security of future mobility applications.

Algoptimal is a trust capability developer and systems integrator, modernizing and optimizing industries for humanity.

With deep expertise in airport modernization, Algoptimal empowers stakeholders to maximize operational efficiency while maintaining the highest standards of safety.

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Generative AI

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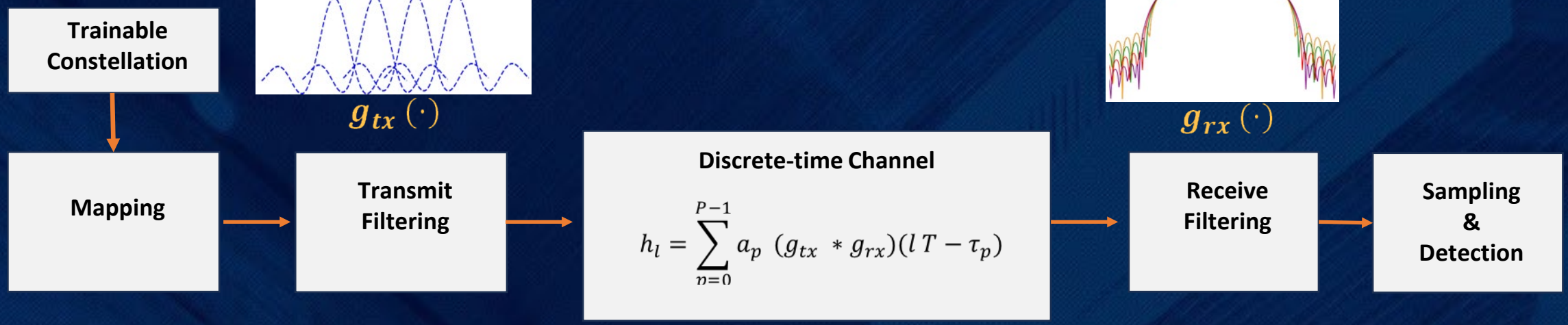
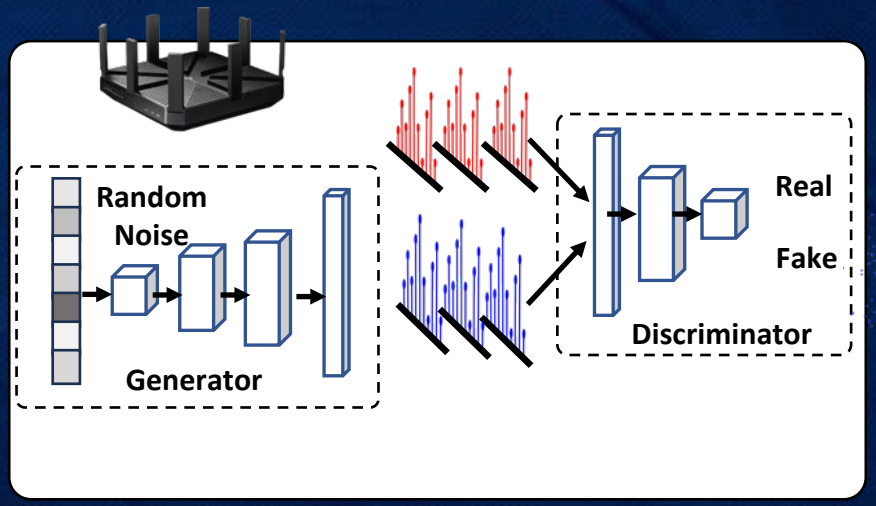
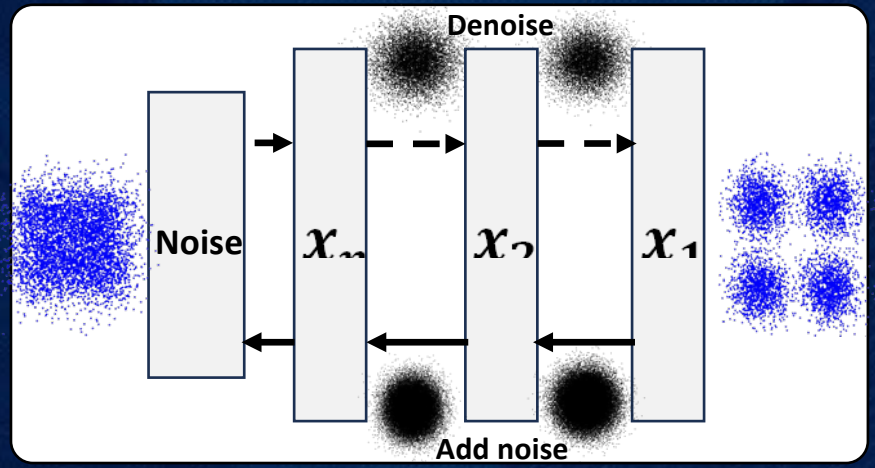


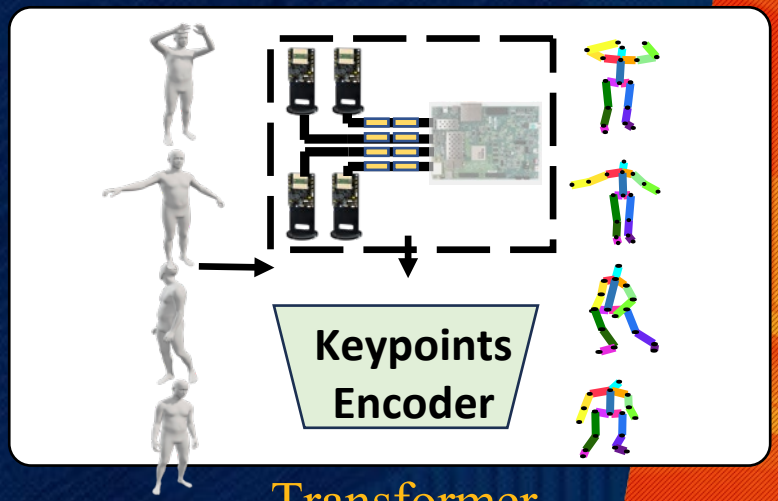
5G Spoofing Detection

Anti-Eavesdropping

ISAC Human Pose Sensing







GAN

Diffusion Model

Transformer

Explainable AI/ML

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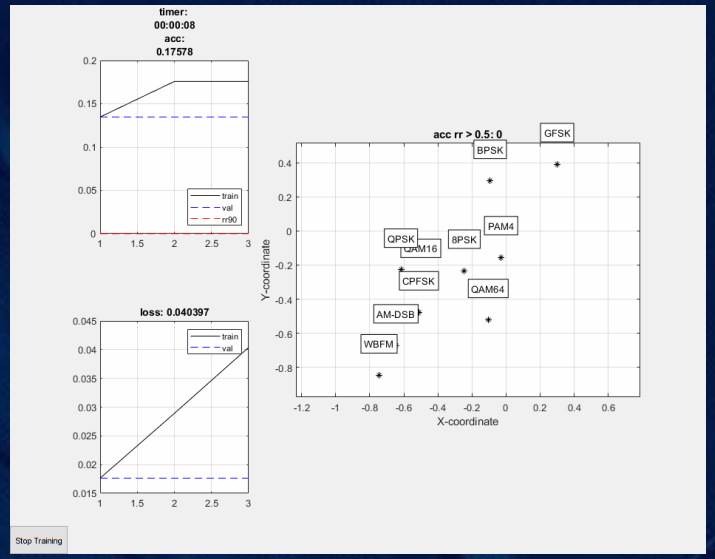
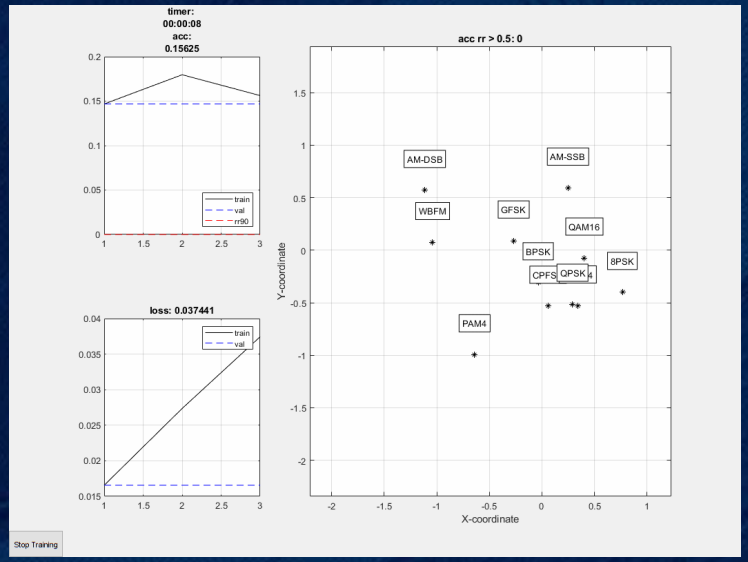
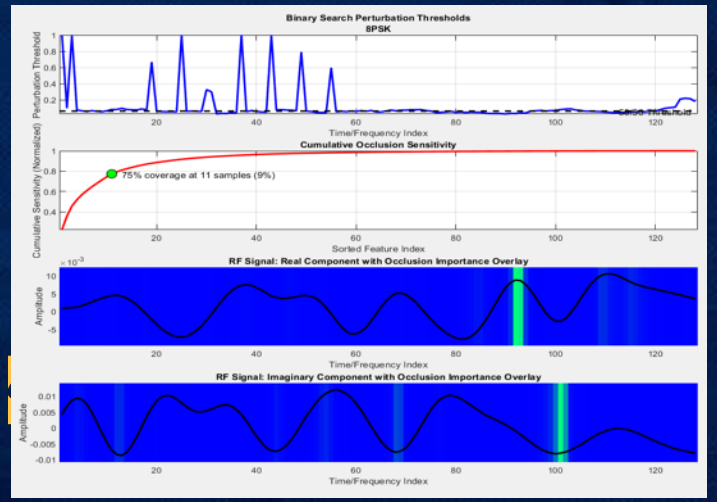
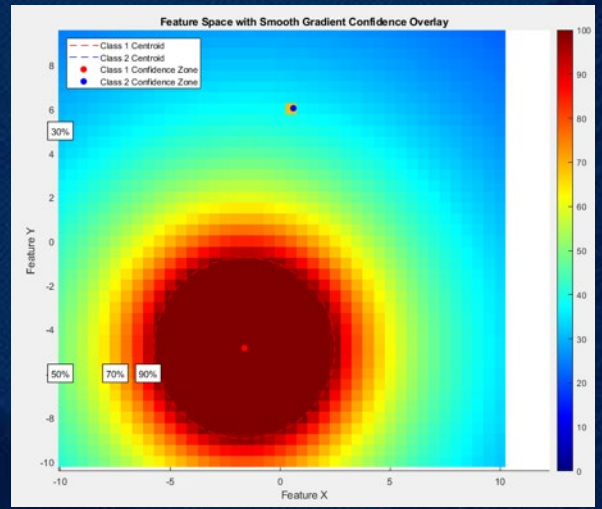
Training Visualization and Reasoning Process

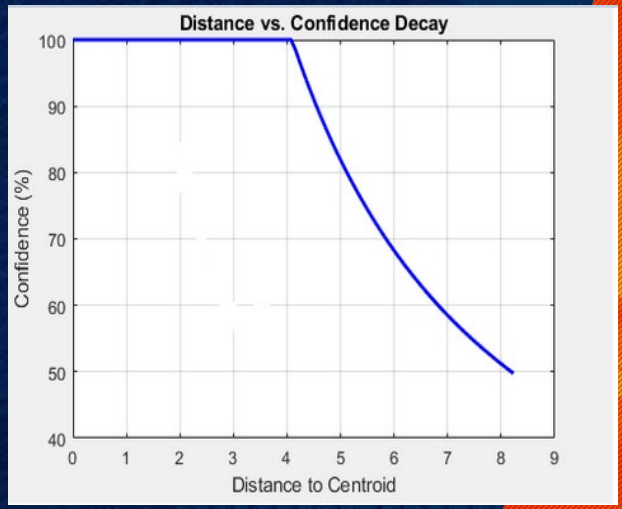




Transparent and Understandable Machine Learning Models







EMS Sensing & Monitoring

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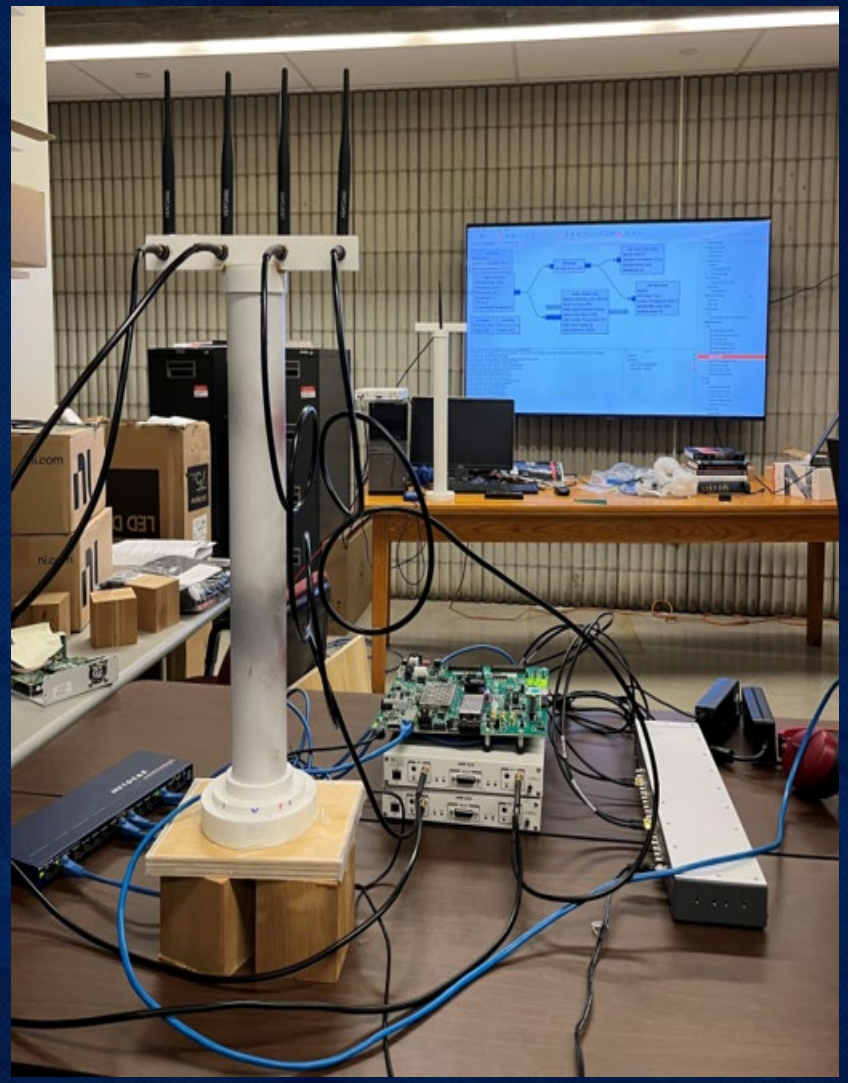
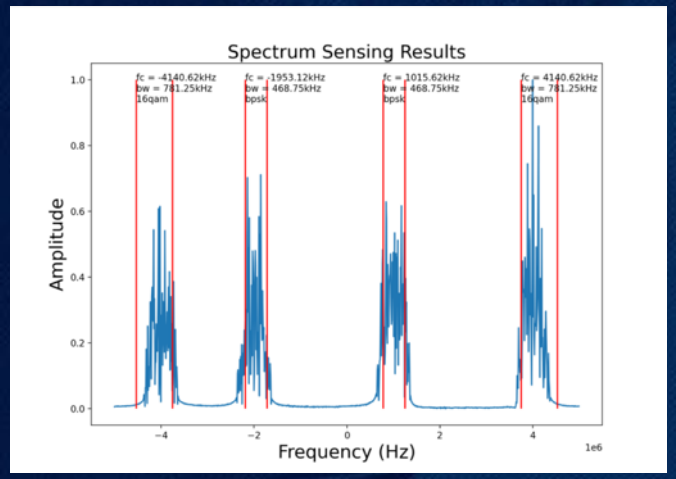
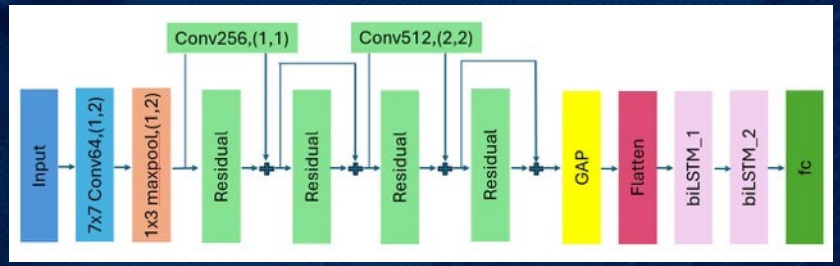


EMS Sensing & Classification

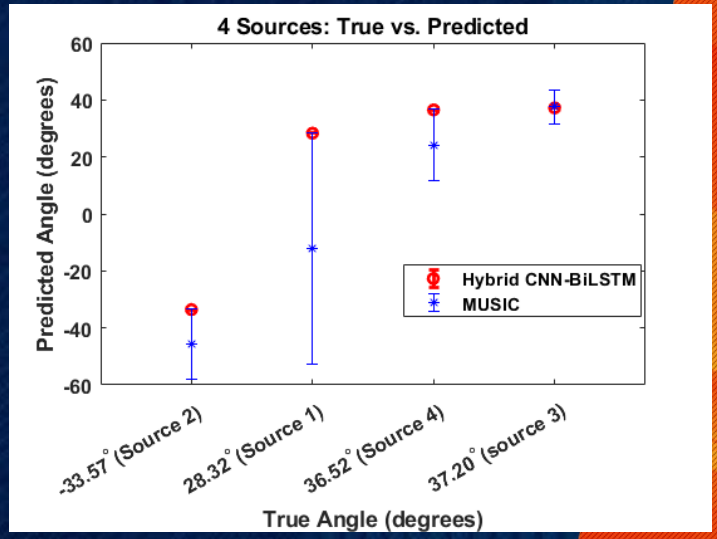


8-Element Array Setup

ML-based Angle-of-Arrival Estimation



Number of Sources	Method	Mean RMSE (Degrees)
2	ML	$14.60e{-3}^{\circ}$
	MUSIC	24.67°
3	ML	$4.5e{-3}^{\circ}$
	MUSIC	17.73°
4	ML	$2.90e{-3}^{\circ}$
	MUSIC	24.91°



Aura Intelligent Systems

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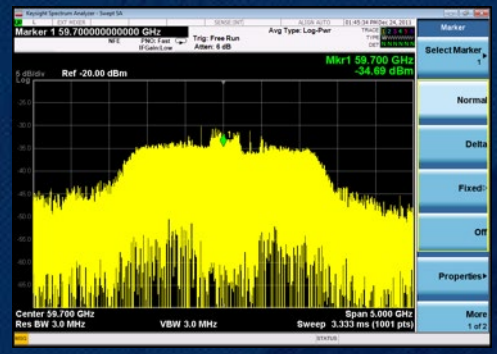
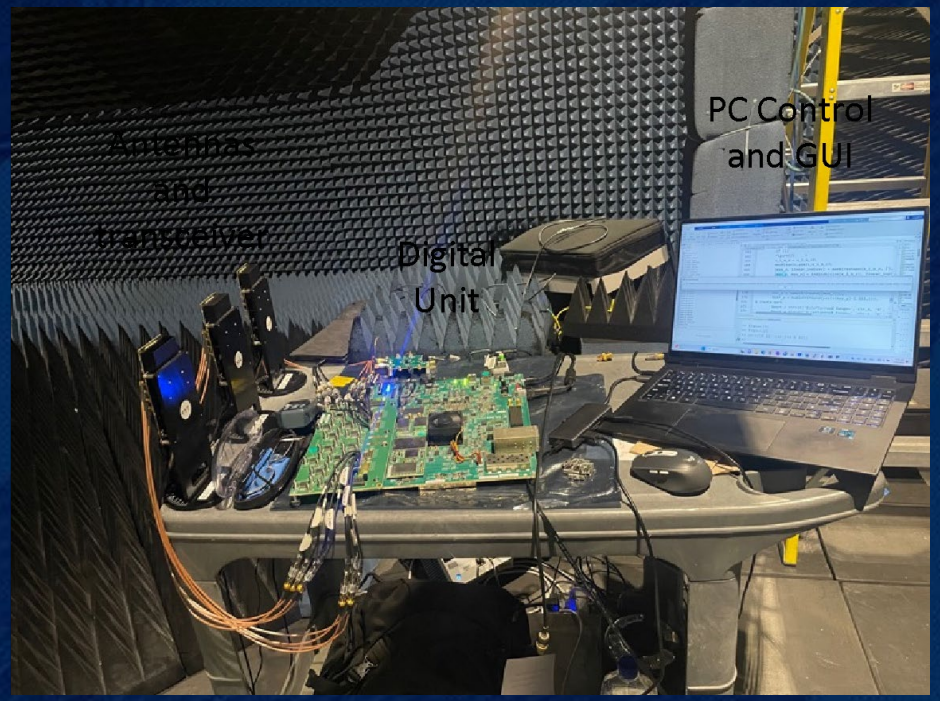
Patented technology for wideband RF sensing and communications for autonomous systems

- Interference and clutter resilient adaptive waveform
- 3x power more efficient than commercial systems
- Scalability in compute and data transfer

Signal constellation



RF spectrum (2GHz)



Test Environment

QuadRay™ Platform for Sensing, Communications, and Signal Intelligence

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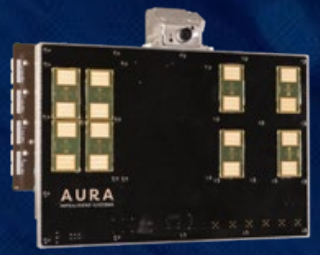
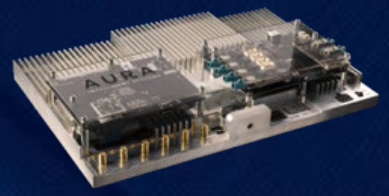
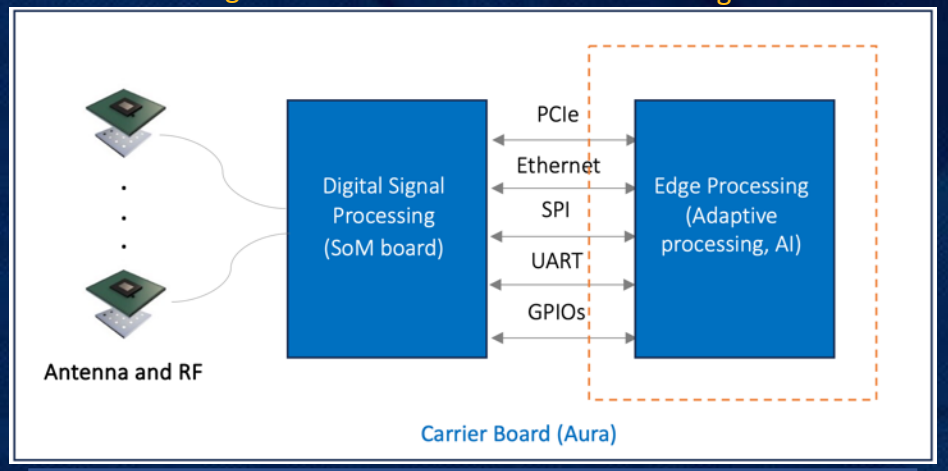


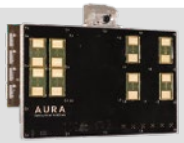
RF and Digital



Edge AI Processing



AURA INTELLIGENT SYSTEMS | sivers SEMICONDUCTORS | AMD XILINX

Category	Antenna and RF	Digital Processing	Edge Computing
Sub-system			
Capability	Distributed antenna array MIMO sensing and communications 2GHz RF per channel 40dBm per module	Fully programmable Imaging radar Waveform processing 16 x 2Gsps ADC	Integrated FPGA and CPU RF data processing AI inference
Components	Sivers 2D phased array	AMD-Xilinx Zynq UltraScale+™ RFSoC	AMD-Xlinx Versal™ AI Edge XA
Size	12” x 8” x 2”		8.1" x 7.5" x 2.35"
Power Supply	AC Input: 100~240V, 50-60Hz DC Output: 12V, 120W Can be battery powered		AC Input 100~240V, 50-60Hz DC Output: 12V, 120W
Connectivity	Ethernet, PCIe		Ethernet, PCIe
Note	RF front-end		

Cutting Edge Waveform for Communications and Sensing

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KIAT	Awarded a Korean government global R&D grant to develop connected mobility solution for LEO SAT
DARPA / MIT LINCOLN LABORATORY	Prototype development & Cooperative R&D with MIT Lincoln Lab (Completed)
AFWERX AGILITY PRIME	Air Force STTR Phase I for integrated Urban Air Mobility (Integrated sensing, communication, and PNT - Completed)
NSF U.S. National Science Foundation	Technology and end-to-end algorithm (Completed)

ESPERANTO Concept of Operations

ESPERANTO (Embedded Software-defined PHY-Layer enabled on ultrawideband wireless Transceiver Solution)

AI-Driven Manufacturing

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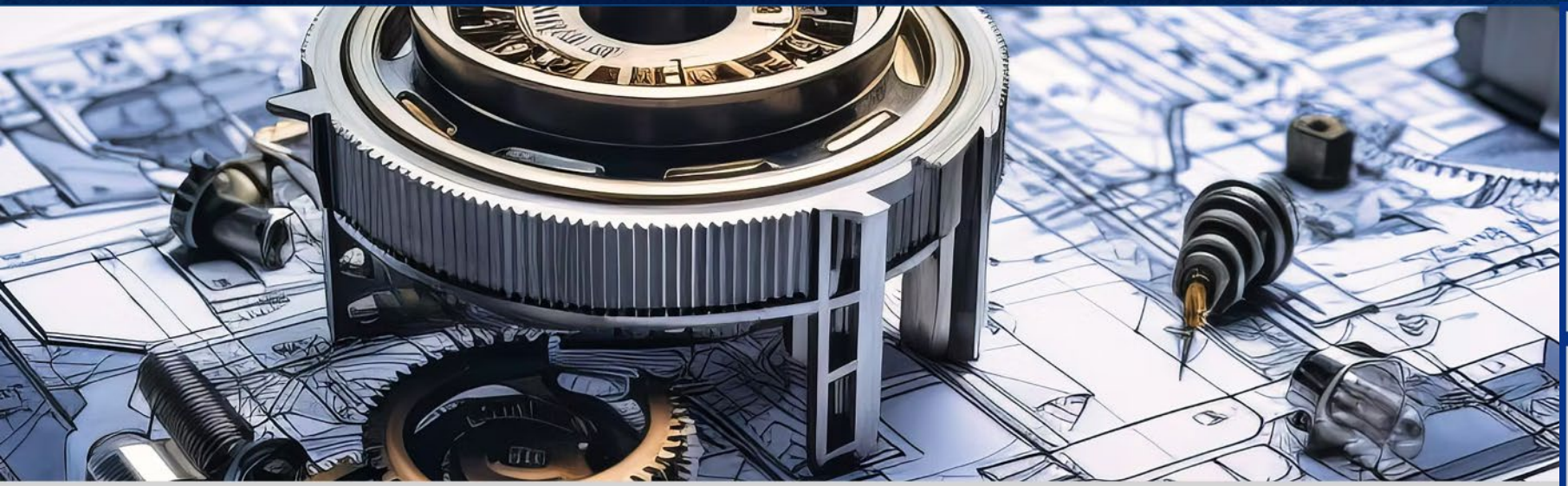

Advanced Analytics

Leveraging AI to analyze complex datasets for optimizing design and production processes.

Information Modeling

Utilizing BIM to create detailed digital representations of physical and functional characteristics of manufacturing spaces and processes.

Auto Optimal Design

Implementing AI algorithms to automate and enhance design processes, including 'jigsaw' permutation analysis for innovative product development.

Predictive Control

Using AI to predict equipment maintenance needs and ensure high-quality manufacturing outcomes.

Digital Modernization

Transformation of aviation operations through advanced digital technologies.

Mission Software

Showcasing tailored software for aviation-specific applications and operations.

Integrated Systems

Highlighting the integration of various systems for streamlined airport and flight operations.

Enabling Technology

Emergent and prototyped technologies that enable improvements in air travel and operations.

Field Support

Detailing the support services provided for on-the-ground aviation operations

ODM & OEM

Original Design Manufacturers and Original Equipment Manufacturer in the aviation sector.

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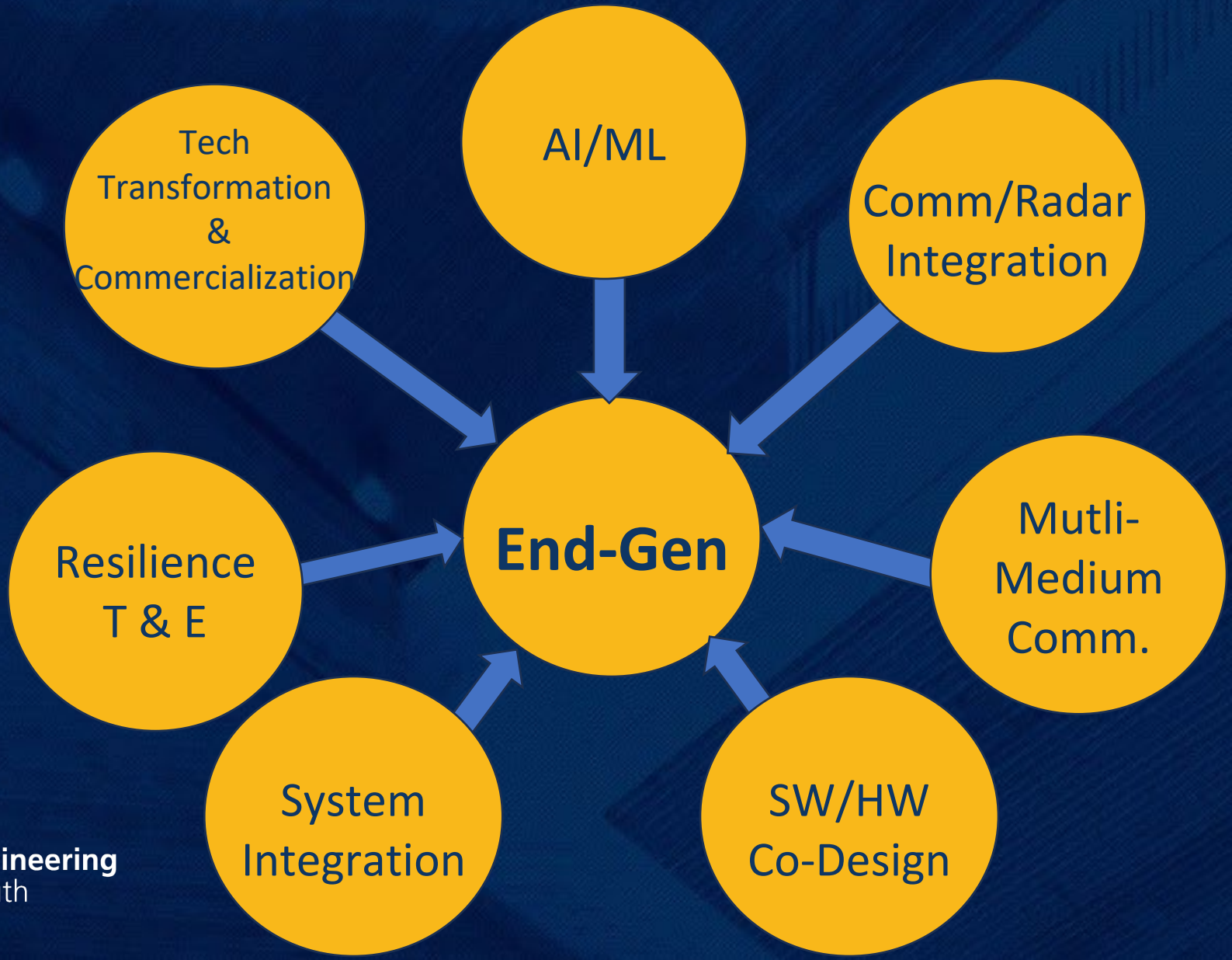

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