Event-based Vision 2025

CVPR Nashville JUNE 11-15, 2025

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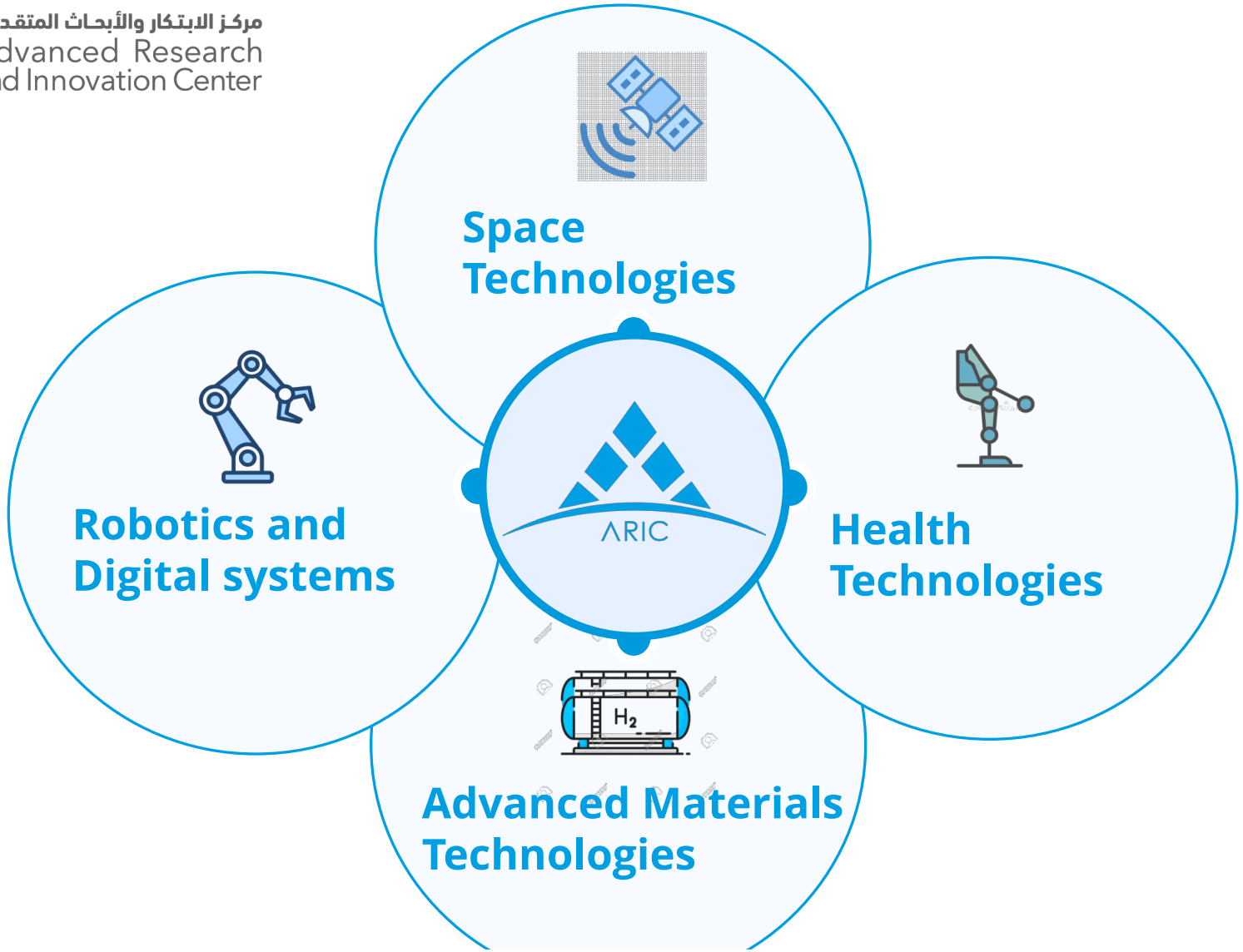

Why Aerospace Needs Automation

Every aircraft has **1M+ fasteners**, each requiring micron-level precision

Yet,

- Drilling and riveting tasks remain either manual or with preprogrammed automation
- Most inspection is still manual and slow

Global surge in air travel demand led to a pressure to deliver faster

- Only 10% of holes and fasteners are inspected

Forbes

FORBES › BUSINESS

BREAKING

Boeing 737 Was Missing Bolts Before Door Plug Flew Off During Alaska Airlines Flight, Federal Probe Says

Ty Roush Forbes Staff

Ty Roush is a breaking news reporter based in New York City.

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Automating Aerospace Manufacturing

In collaboration with Strata, we have brought real automation to the floor on Airbus and Boeing production lines:

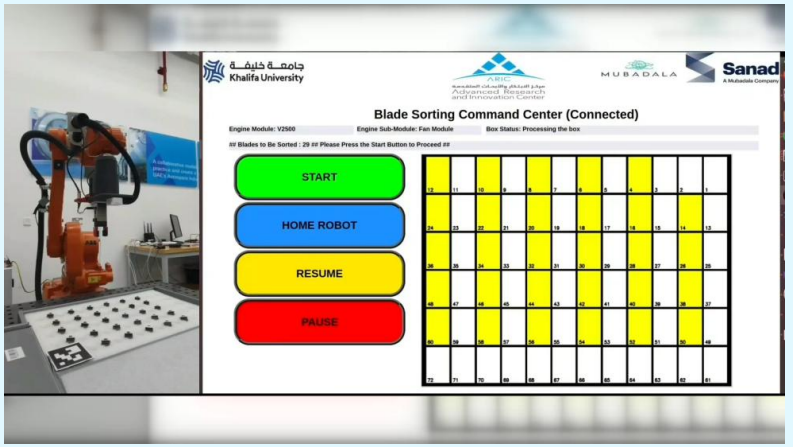
- We turn student prototypes to production-grade systems
- On the **Boeing** production lines we have automated
  - Drilling
  - Deburring
  - Fastener hole coating
- We're now enabling robotic riveting with adaptive sensing on **Airbus** production lines

Automating Aerospace MRO

In collaboration with Sanad Aerotech, we are automating the servicing of **IAE V2500** and **Rolls-Royce Trent 700** engines to enhance precision, speed, and traceability.

- Laser-based fan blade chord measurement
  - High-resolution, repeatable inspection replacing manual tools
- Automated dynamic blade sorting
  - Reduce vibrations and long term damage in the engine

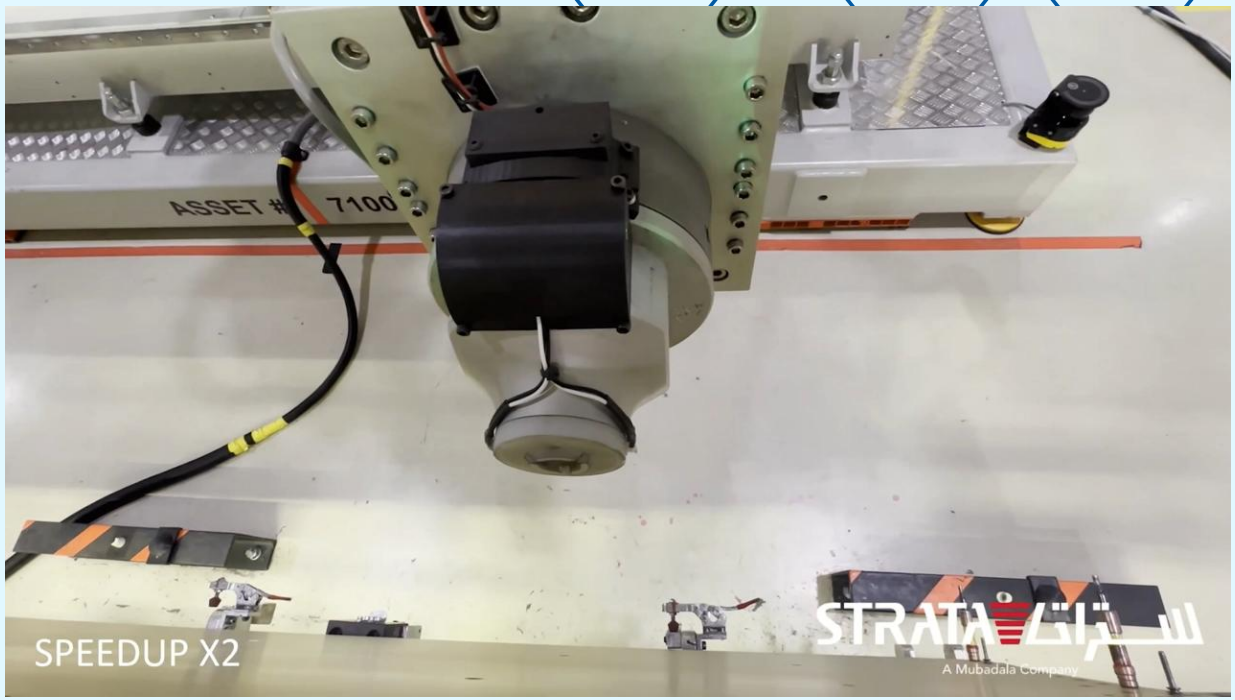
Estimated impact:
1M USD annual saving through reduced labor and logistics cost



Open loop machining

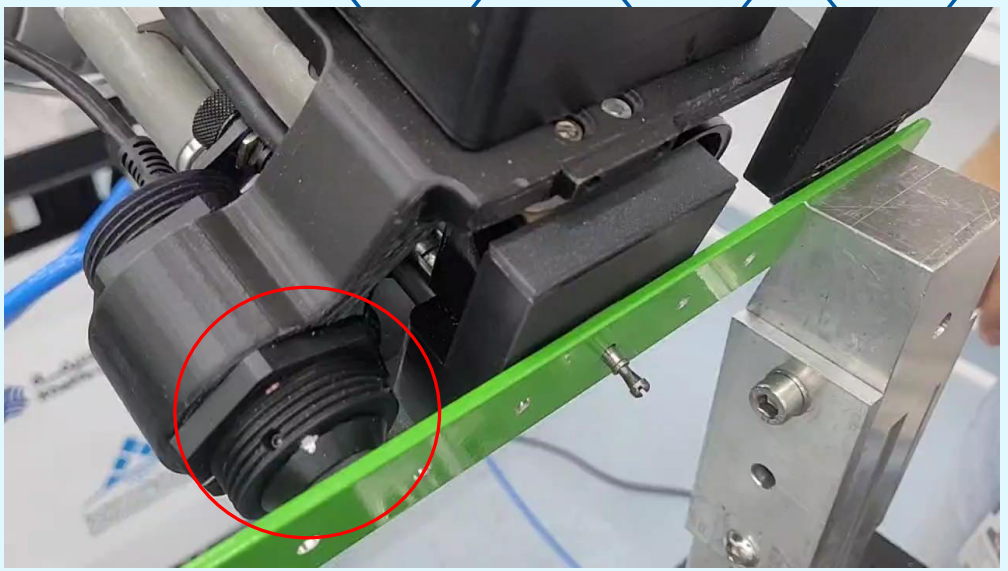
Unlike skilled human operators who react to sound, vibration, and tool behavior

- No feedback on chatter, clogging, or tool wear
- No correction if the hole is out of spec
- If something goes wrong, it’s only caught after the part is finished



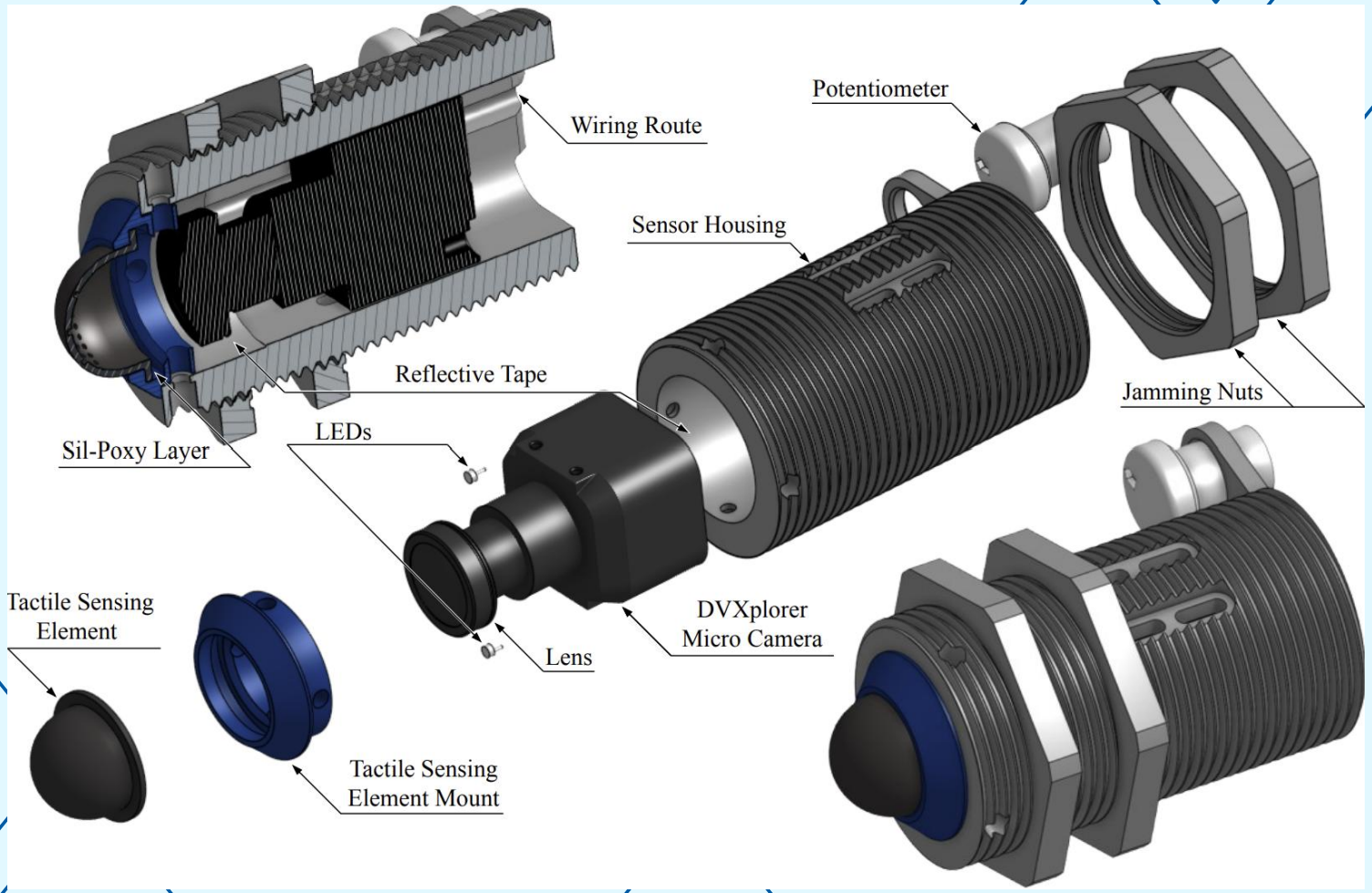
Human tactile monitoring → Robotic neuromorphic tactile sensing

Tactile feedback to monitor

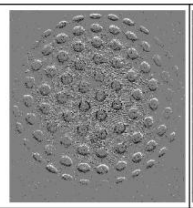
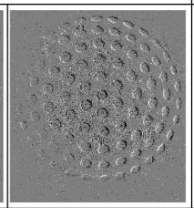
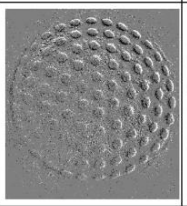
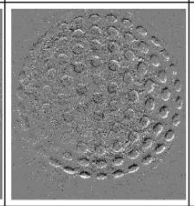
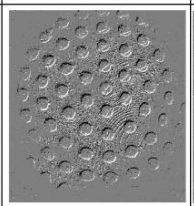
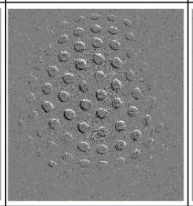
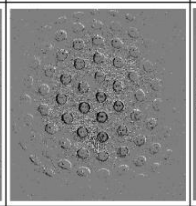
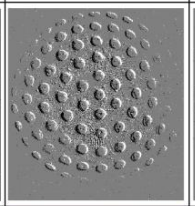
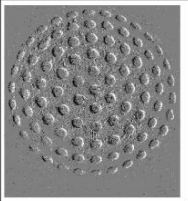
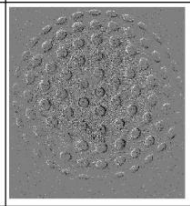
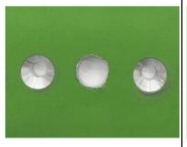
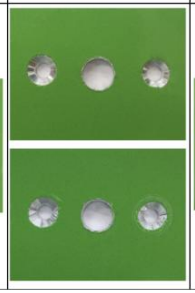
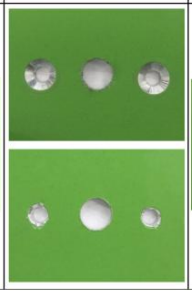


Robotic Bioinspired Tactile feedback

Neuromorphic Tactile Sensing



Neuromorphic Tactile Sensing

a)	Nominal Conditions		X-Axis Tilt +6°	X-Axis Tilt -6°	Y-Axis Tilt -4°	Higher Feed Rate	Lower Feed Rate	Reduced Drilling Torque	Deeper Right Countersink	Deeper Left Countersink
b)										
c)										
d)										

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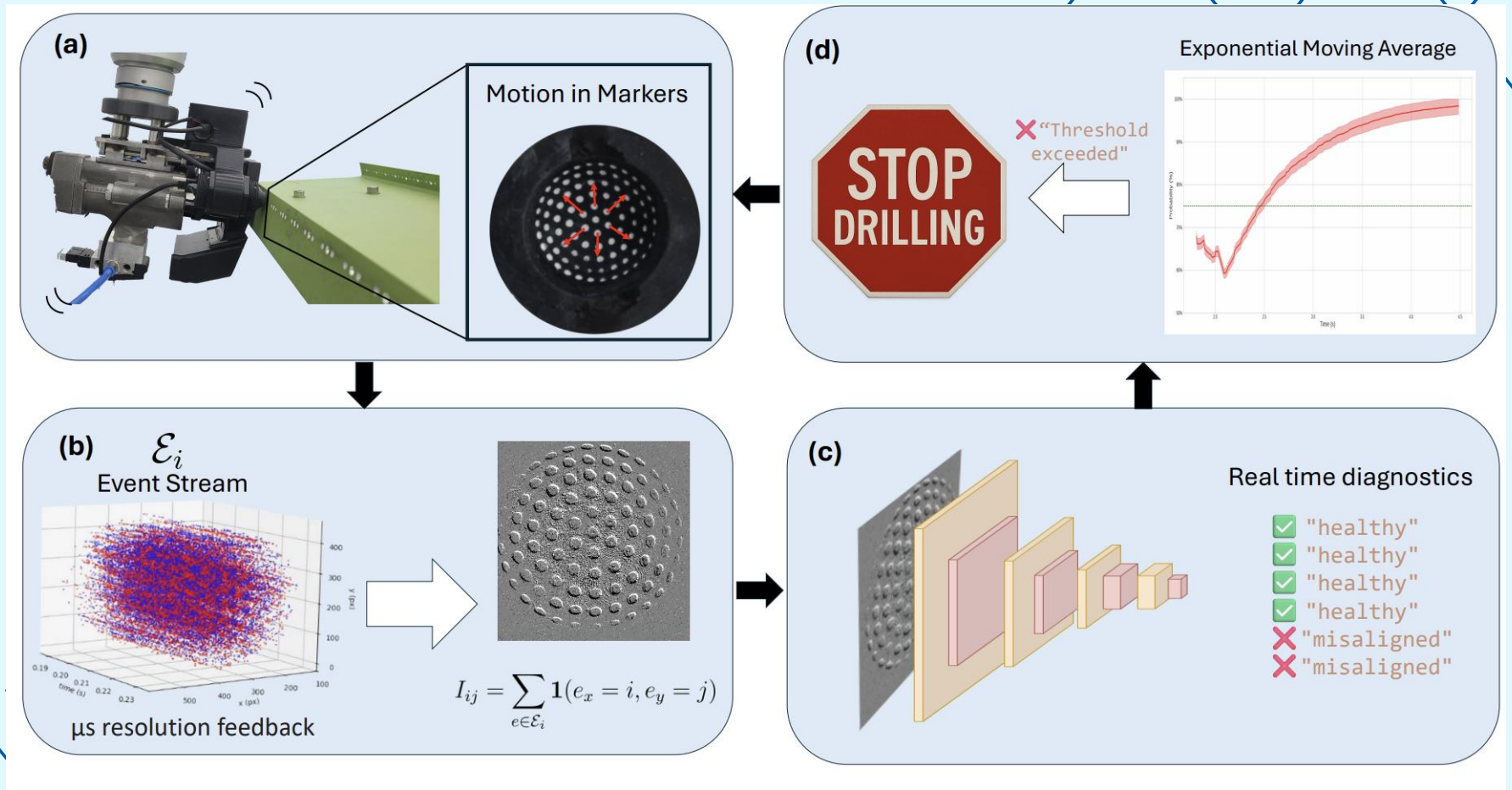
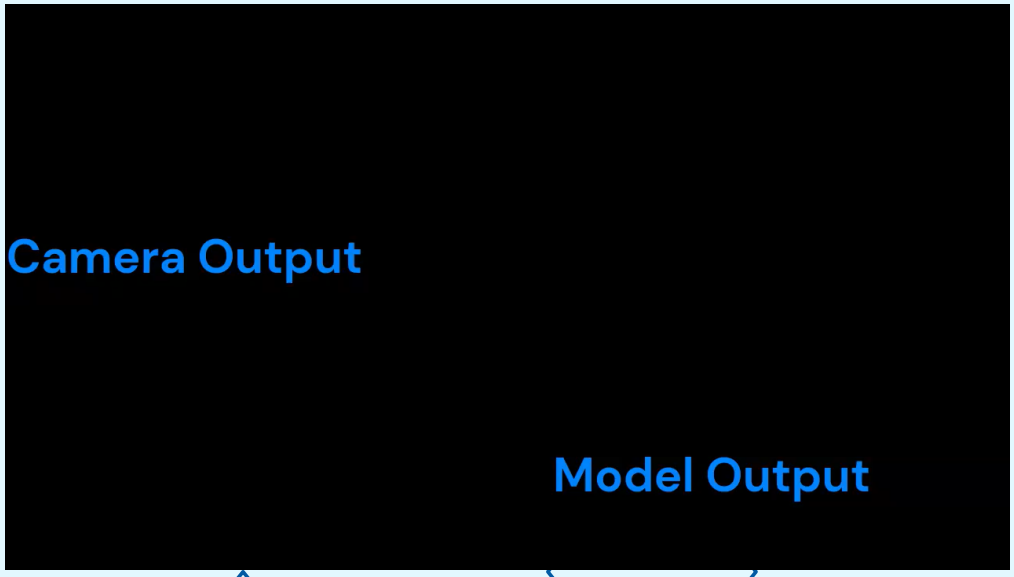
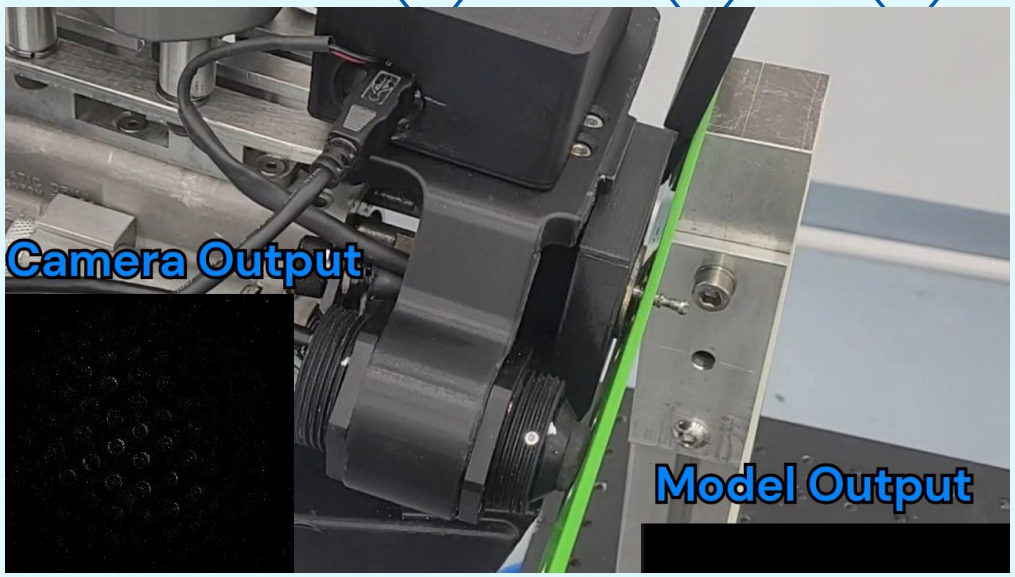


Video results



Nominal drilling case



Faulty drilling case

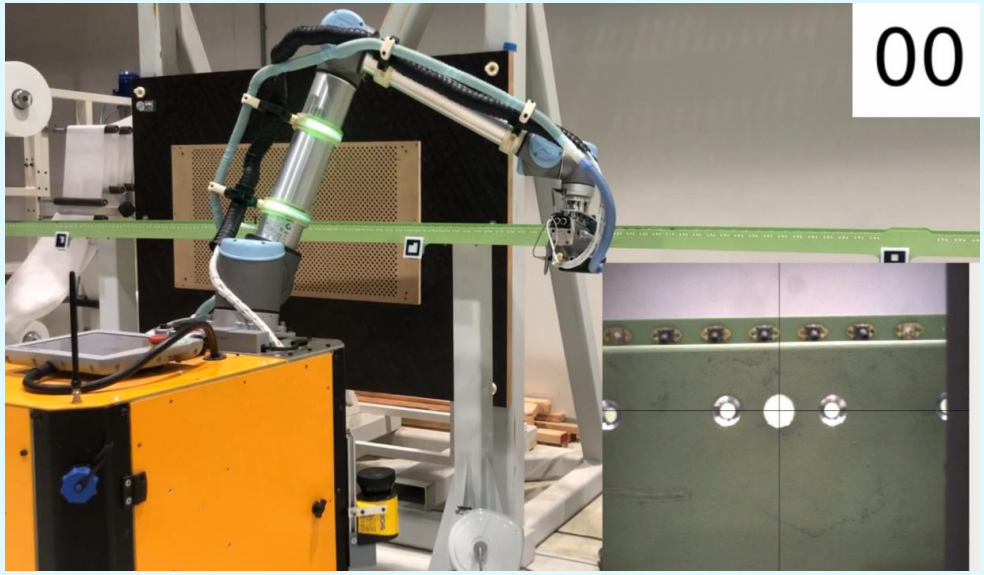
Nutplates in aerospace

In MRO and Production settings, fastener, rivet, and countersink holes, are currently being inspected manually **one-by-one.** There can be **1M+ holes**

To meet global aircraft demand, some standards are to inspect only 10%-15% of holes

Slow, manual inspection

Manual Inspection



Robotic Inpsection

Fast, vision-based inspection

We present a neuromorphic vision-based inspection of fastener and countersink holes

Using neuromorphic cameras allows us to perform **high-speed, low-latency, inspection without data overload**

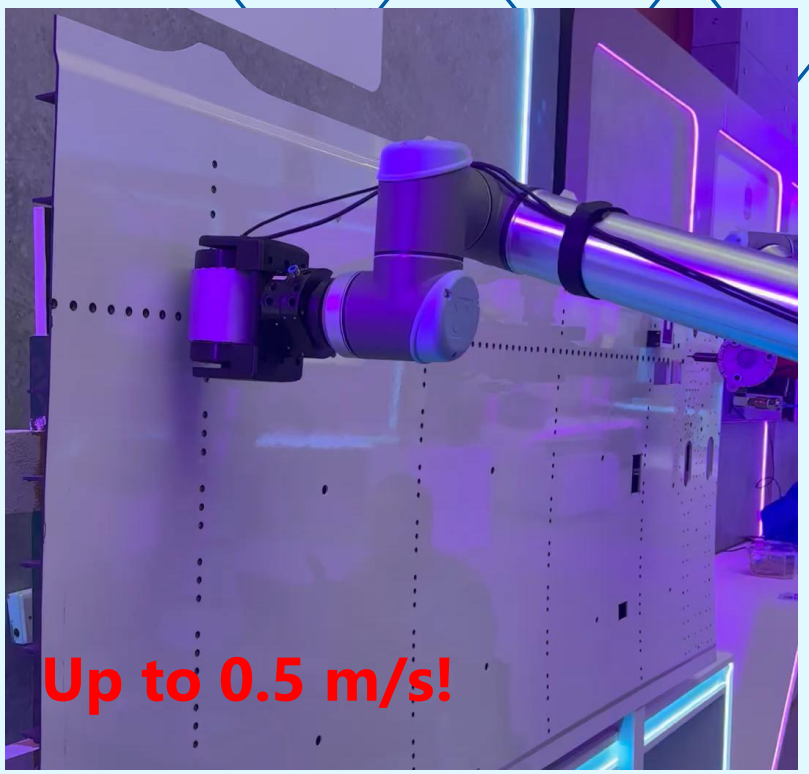
Our system is up to **10x faster** without compromising quality

More coverage, faster inspection

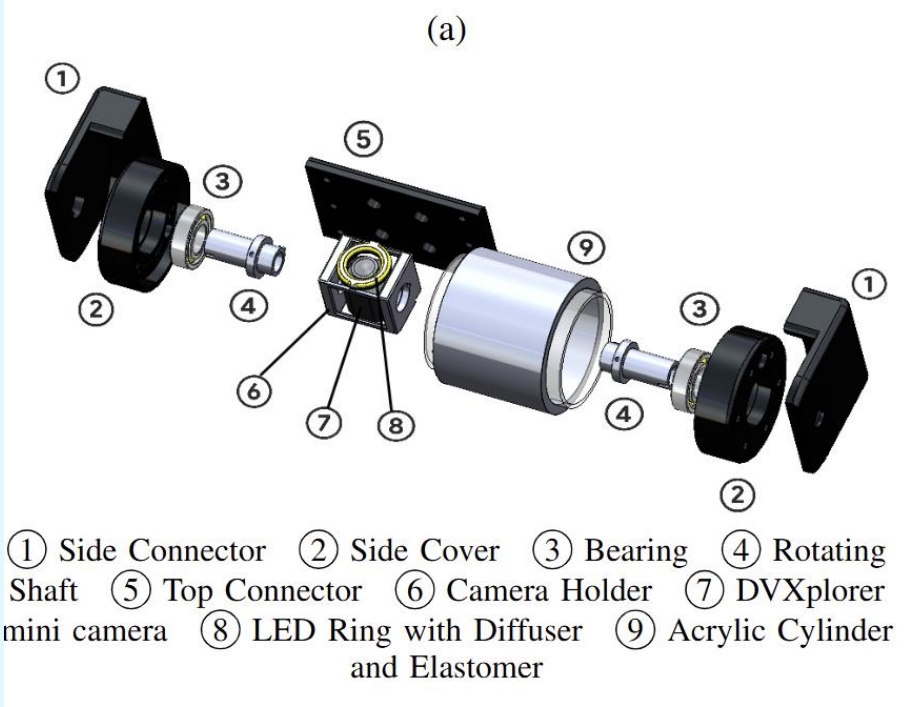
They see me rollin': High speed Rivet Flushness

Rivet flushness is a leading cause of **non-conformance** in aerospace inspection.
We are developing a **roller-based neuromorphic tactile sensor** that:

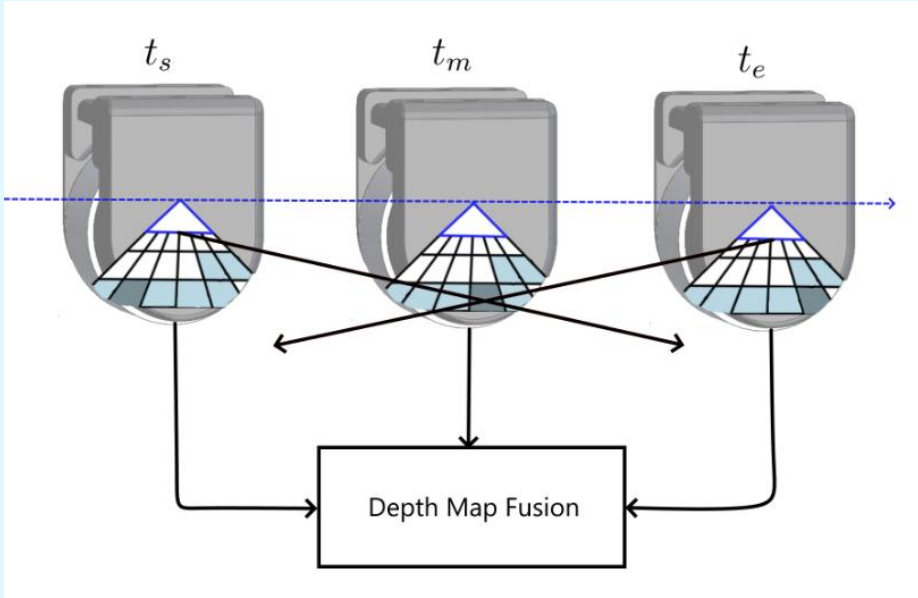
- Measures surface depth variations **at up to 0.5 m/s**
- Covers **large surfaces in a single pass**
- Reconstructs 3D geometry with **<50 µm resolution**



They see me rollin': High speed Rivet Flushness



Neuromorphic roller



Modified EMVS

Kumrah AI, our bet in neuromorphic

We're Hiring!