Low-Power Sensing & Compute
opportunities and challenges

AI is exposing powerful representations for semantic understanding

Transformer models are based on “attention”

System resources should align to such representations

Such alignment ensures maximal system efficiency

Aligning to such representations requires “algorithmic sensing”

New technologies and system models are needed

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Vision

Robust machine perception in the most complex real-world environments.

Mission

Create integrated sensing and computing technologies to unlock advanced and scalable perception.

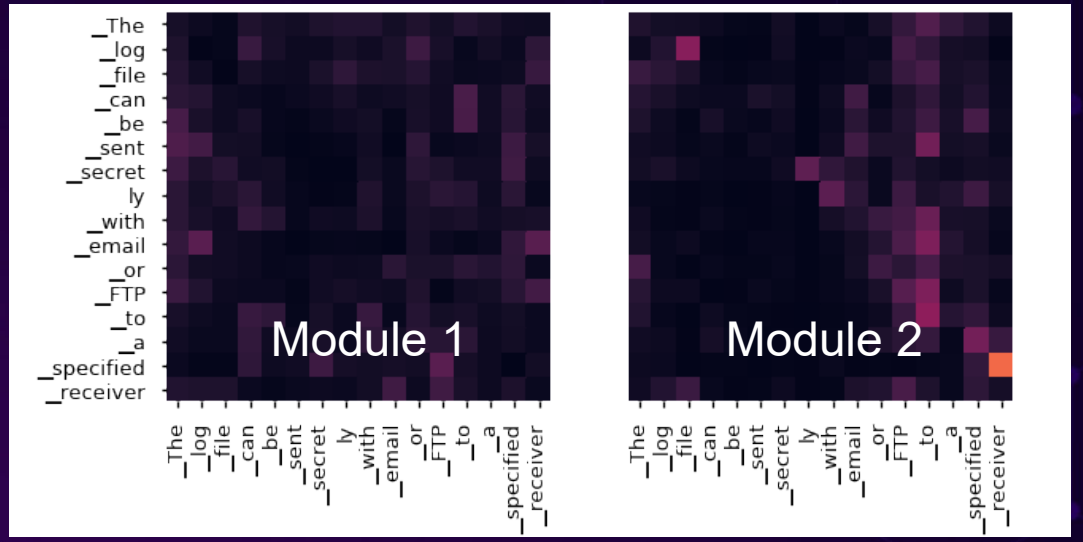
OBSERVATION

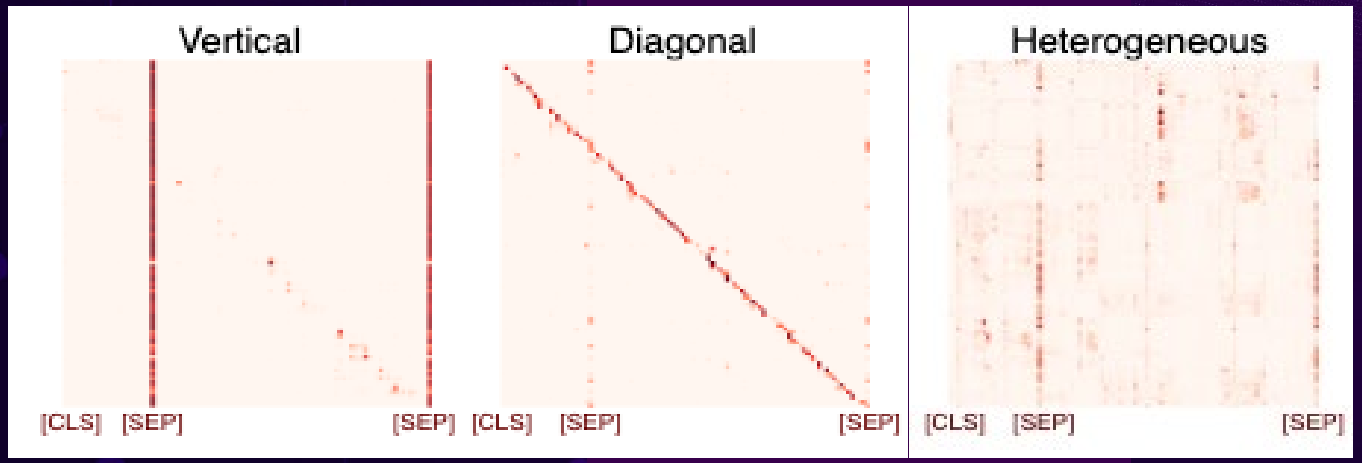
"Attention" is a powerful thing

- Basis of recent breakthroughs in AI (transformer models)
- About focusing on relational semantics
- Inherently drives sparsity (being exploited in computation today)

Can we exploit this up-front in sensing?

"The log file can be sent secretly with email or FTP to a specified receiver."





Exploit sparsity towards "algorithmic" sensing

[O. Kovaleva, arXiv:1908.08593]

INSIGHT

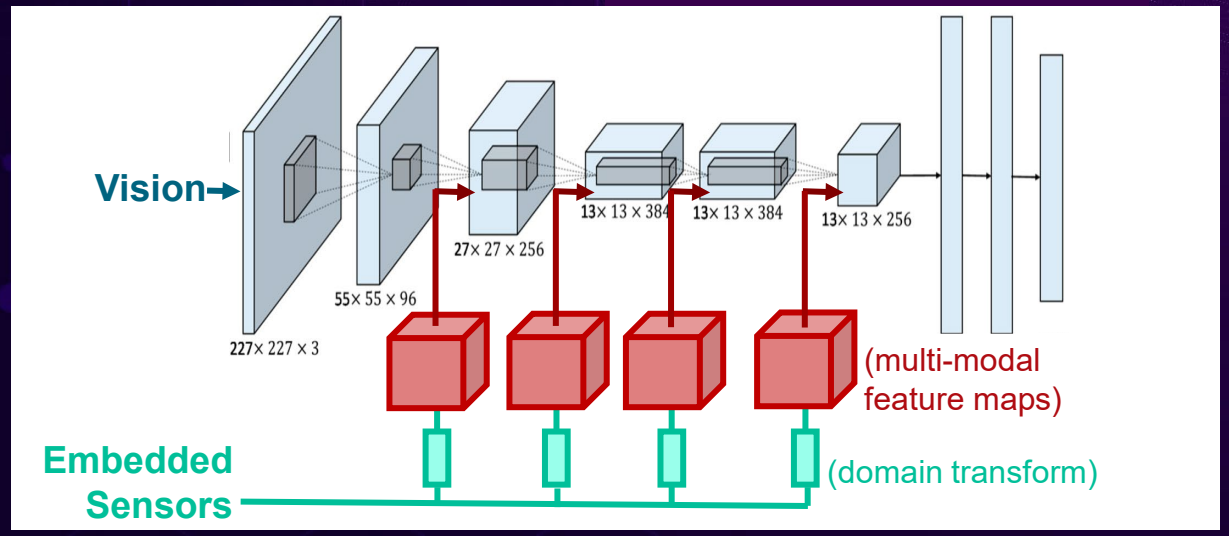
The real world is full of structure

- Complex tasks distribute signals across embedded processes
- Structure enables attention across embedded processes
- System representations should exploit structure, starting from sensing

Can real-world structure enable attention-driven sensing?

Communication node

Kitchen utensil



Fusion of embedded, structure-preserving sensing

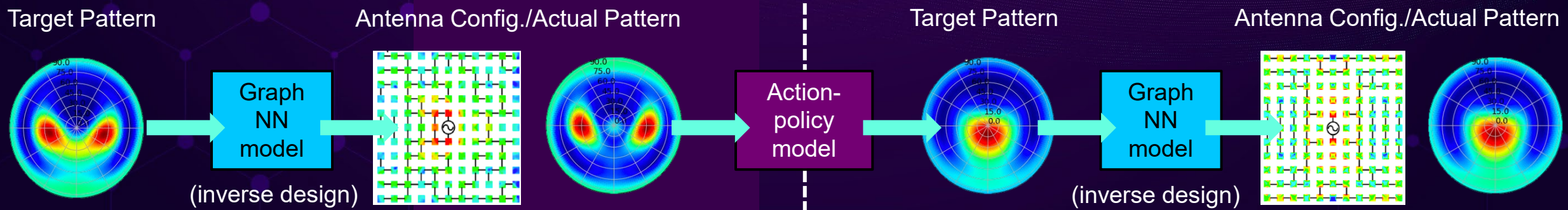
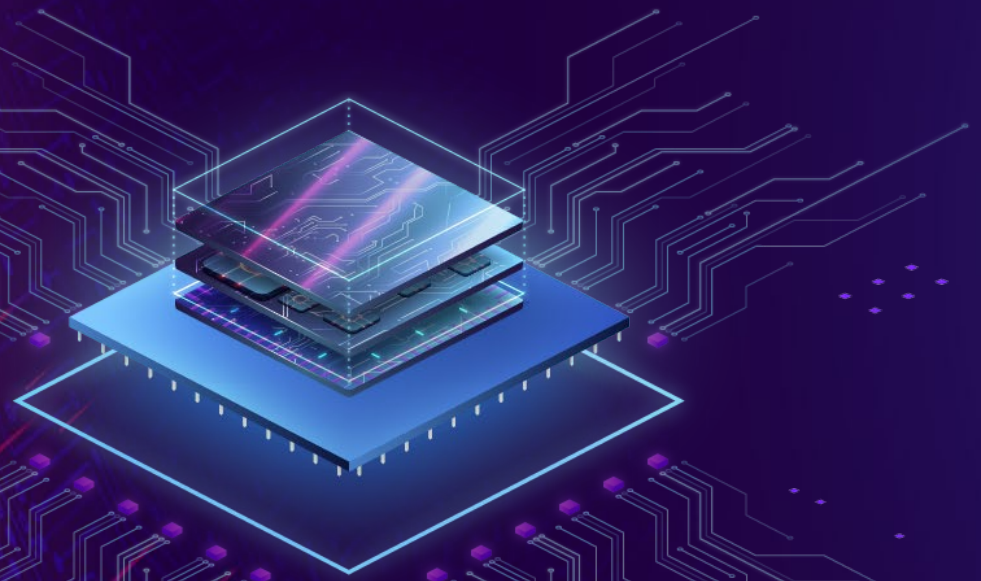
TRANSFORMATION

Algorithmic embedded sensing & fusion

- Embedded sensing preserves structure and modality diversity
- Sensor-fusion models jointly leverage embedded and remote sensing
- Co-designed AI models and wireless technologies can enable algorithmic embedded sensing

[C. Wu, IEDM'20]

Sensing integrated in AI algorithmic chain



THANK YOU