

## **Distributed Vision Networks**

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Networked smart cameras provide opportunities for novel vision-based application design by enabling data fusion across multiple views. Through exchange of information and collaboration among the camera nodes, more confident deductions about the events of interest can be made, or ambiguities in a single view caused by various factors such as occlusion may be overcome. In this premise, efficient vision-based algorithms and smart environment applications can be developed based on combining information across the three dimensions of space (different camera views), time (each camera collecting data over time), and feature levels (selecting and fusing different feature subsets).

From a sensor networks design perspective, image sensors provide valuable event and context information from the environment. By acquiring an information-rich data type, these sensors allow the extension of network's operation from measuring simple effects to analyzing the observed events and learning behaviors. They also enable context awareness and user interaction, and hence provide opportunities for moving towards developing user-centric applications.

Scalable implementation of multi-camera networks can be realized under a change of paradigm from centralized processing of raw data to distributed and collaborative implementation of vision-based reasoning algorithms at the network nodes.

In this talk, we introduce a layered and collaborative data analysis architecture based on opportunistic feature fusion and spatiotemporal data exchange models in vision networks. In-node fusion of multiple features transforms the dense pixel-level data into sparse descriptive attributes and intermediate features that are shared with other nodes. Collaboration among the cameras is defined as mutual reasoning when joint estimates or joint decisions are made, and as assisted reasoning when a key feature observed by one camera is employed by others to refine their estimates. Example applications in human gesture analysis using a model-based approach to spatiotemporal fusion will be presented.