



# Pillar Attention Encoder For Adaptive Cooperative Perception

Tech ID: 33696 / UC Case 2024-722-0

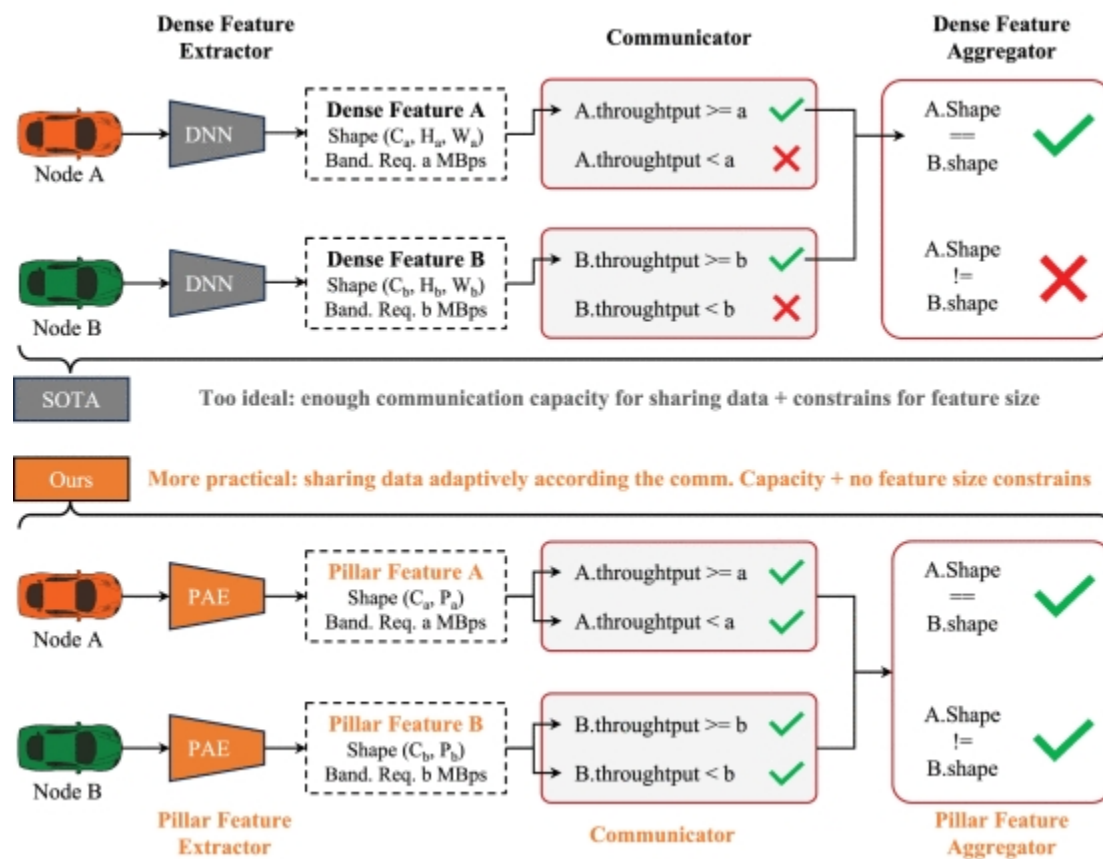
## FULL DESCRIPTION

### Background

Comprehending the surrounding environment is a key requirement for automated and connected vehicles - which requires the ability to sense the environment under different conditions with a comprehensive field of view. Cooperative perception (CP) unlocks perception bottlenecks such as physical occlusion and limited sensing by fusing the information from spatially separated entities - such as other vehicles and roadside units. Fusion methods can be broadly classified as early fusion, intermediate fusion and late fusion.

### Technology

Researchers at UCR have developed a novel, adaptive cooperative perception (ACP) framework which improves perception capabilities in connected and autonomous vehicles, particularly in situations with limited communication bandwidth. The ACP framework features pillar attention encoder and an adaptive feature filtering mechanism which together ensures that crucial information is shared even in situations where communication bandwidth is limited.



Conceptual illustration of the ACP framework. The top shows the state-of-the-art CP methods and bottom shows the current method that can support more adaptive cooperative conditions.

## CONTACT

Venkata S. Krishnamurty  
[venkata.krishnamurty@ucr.edu](mailto:venkata.krishnamurty@ucr.edu)  
 tel: .

## OTHER INFORMATION

### KEYWORDS

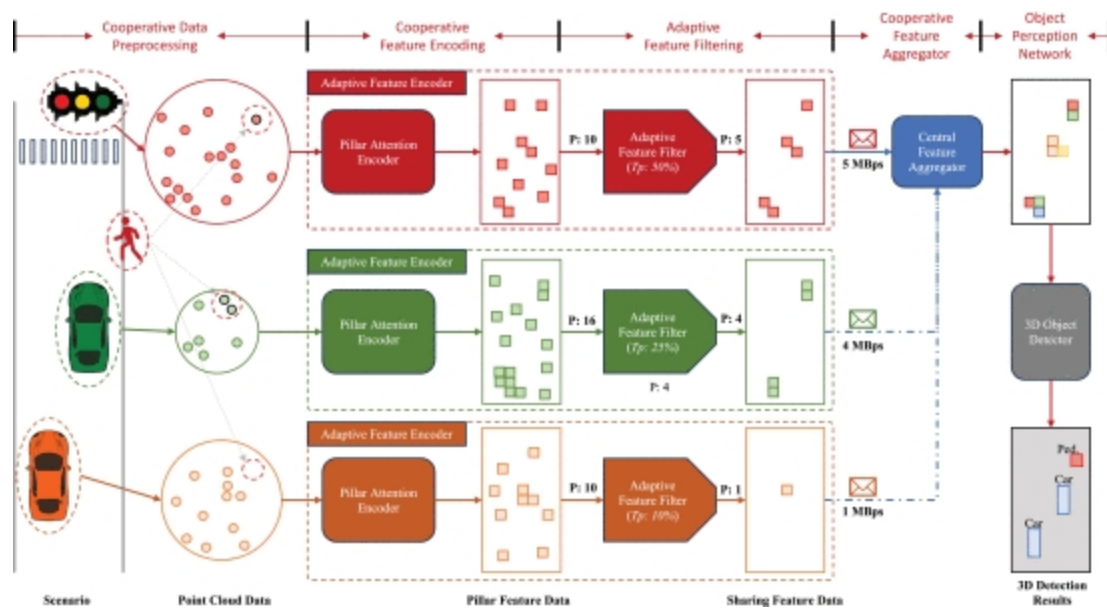
3-D object detection, automated vehicles, autonomous vehicles, autonomous driving, autonomous navigation, C2V, connected vehicles, cooperative perception, V2X

### CATEGORIZED AS

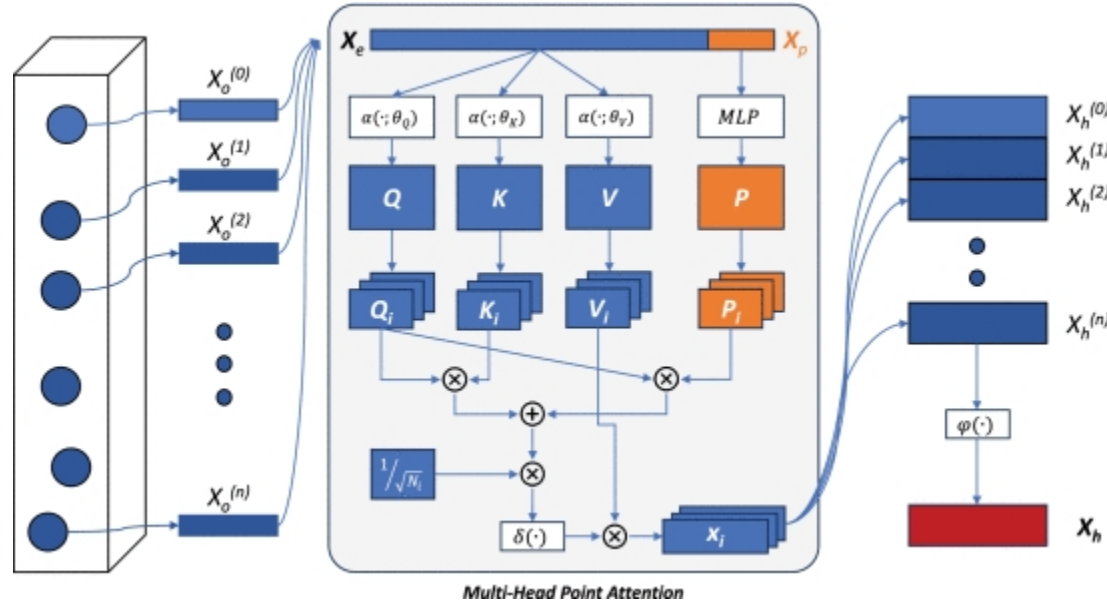
- ▶ Environment
- ▶ Sensing
- ▶ Transportation
- ▶ Automotive

### RELATED CASES

2024-722-0



Schematic of the ACP framework



Pillar Attention Encoder process

## ADVANTAGES

- ▶ **Enhanced adaptivity and flexibility** by addressing limitations in current CP methods that assume all vehicles have sufficient bandwidth to share all features.
- ▶ **Improved perception accuracy** by prioritizing features based on their significance to the perception task.
- ▶ **Efficient use of communication bandwidth** by prioritizing features relevant to the perception needs.
- ▶ **Real-time inference** capability while delivering improved perception compared to existing methods.
- ▶ **Low computational complexity** for generating and sharing information.

## SUGGESTED USES

- ▶ Connected vehicles
- ▶ Advance driver assistance systems (ADAS)
- ▶ Autonomous vehicles
- ▶ Traffic safety
- ▶ Transportation management

## INVENTOR INFORMATION

Please review [all inventions](#) by the Transportation Systems Research team at UCR.

Please visit the [Transportation Systems Research](#) group's website to learn more about their research.

## RELATED MATERIALS

- ▶ [Pillar Attention Encoder for Adaptive Cooperative Perception](#)

## PATENT STATUS

**University of California, Riverside**

**Office of Technology Commercialization**

200 University Office Building,

Riverside, CA 92521

[otc@ucr.edu](mailto:otc@ucr.edu)

[research.ucr.edu/](https://research.ucr.edu/)