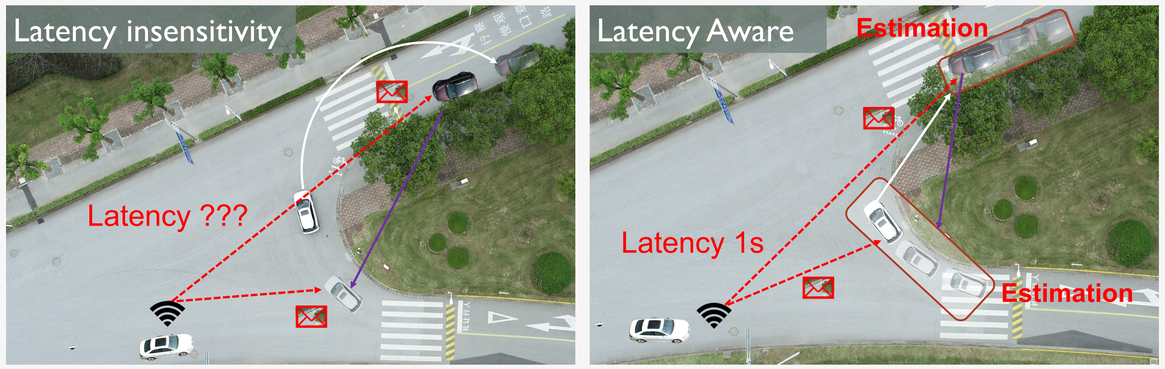
Latency-Aware Collaborative Perception

Zixing Lei, Shunli Ren, Yue Hu, Wenjun Zhang and Siheng Chen
Shanghai Jiao Tong University, Shanghai AI Laboratory

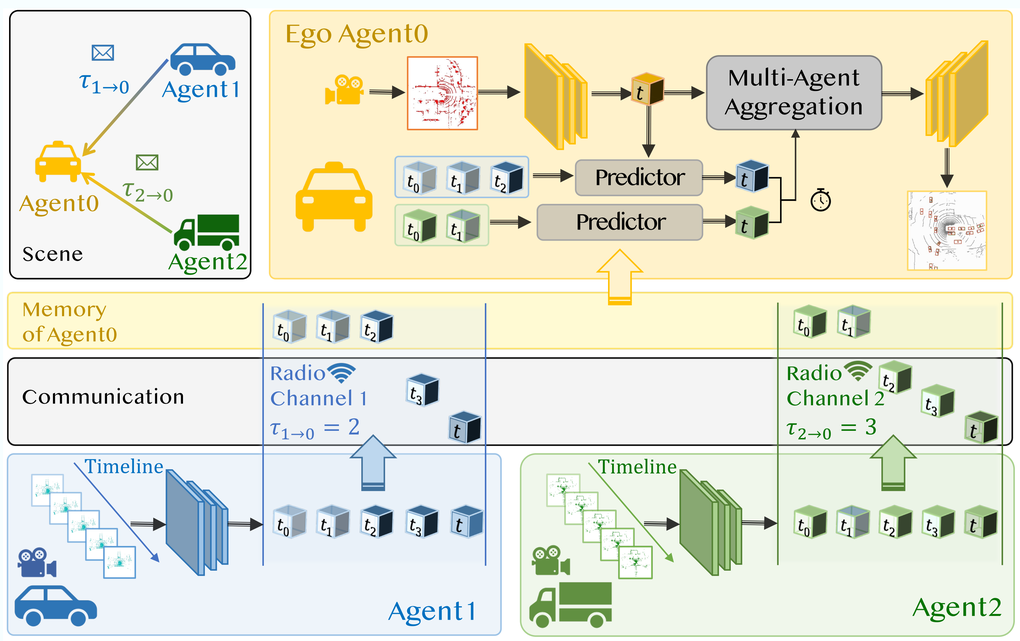
Motivation: A collision caused by latency

1. Existing collaborative perception methods usually consider an ideal communication.
2. Latency issue is inevitable in any V2X communication system.
3. Latency may causing performance degradation and high risks in safety-critical applications



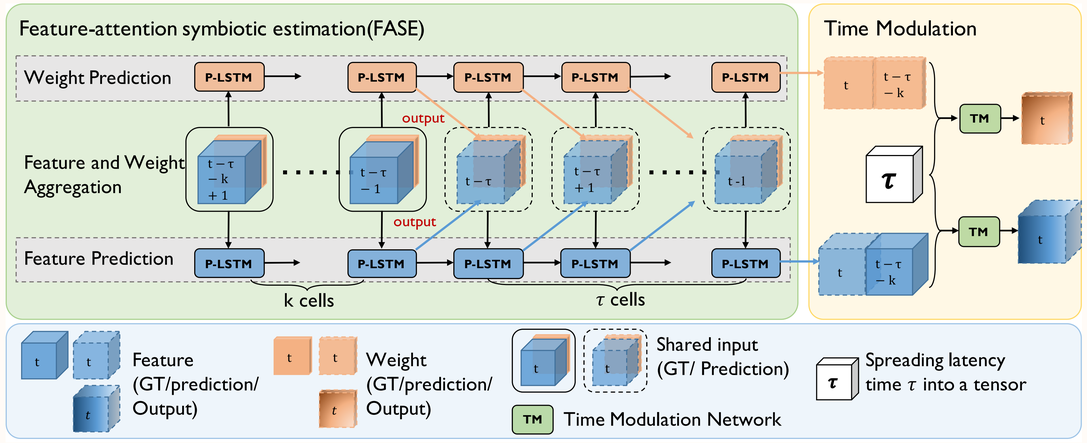
System Overview

1. The whole latency-aware, system can be divided into Encoding, Communication, Latency Compensation, Fusion, and Decoding modules.
2. The basic of compensation module is to leverage historical collaborative features sequence to achieve compensation with a time series model.



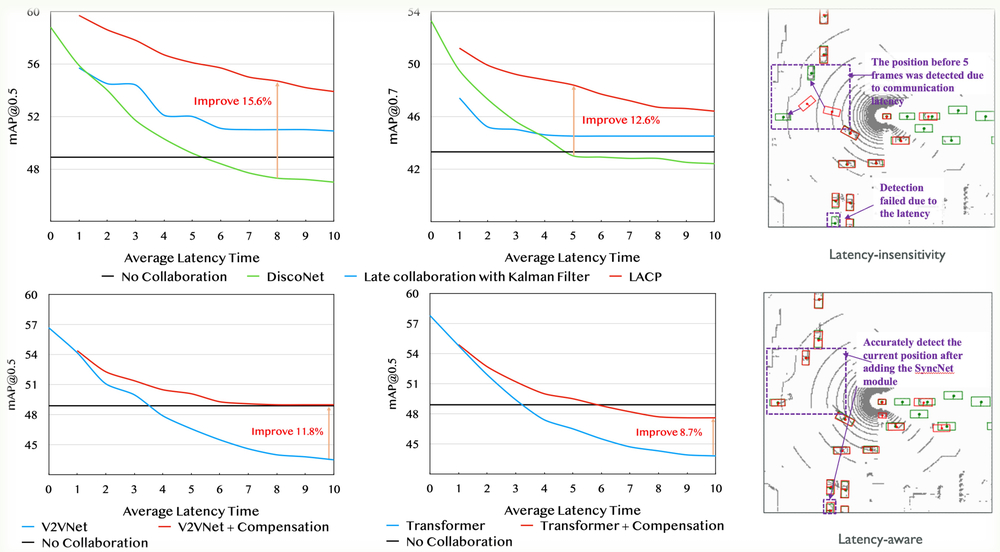
Method: Time series compensation, SyncNet

SyncNet simultaneously infers the collaboration features and attention unknown due to latency, mutually enhancing each other.



Experiments

1. In Quantitative results, Our compensation module consistently and significantly benefits following collaborative perception frameworks(DiscoNet, V2VNet, and a transformer.)
2. 2. In qualitative results, Green boxes denote the ground-truth, red boxes denote the detections. In latency-insensitivity situation, the model detect the position 5 frames before(in purple square).
3. Accurately detect with latency-aware collaborative perception



Relevant Work:

1. [NeurIPS 2022]: Where2comm: Efficient Collaborative Perception via Spatial Confidence Maps
2. [IJCAI 2022 Workshop on AI4AD]: Robust Collaborative Perception against Communication Interruption