



CENTER FOR CONNECTED AND AUTOMATED TRANSPORTATION

Project Title	Large network multi-level control for CAV and Smart Infrastructure: AI-based fog-cloud collaboration		
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Most relevant CCAT research thrusts (choose all applicable)	<input checked="" type="checkbox"/> Enabling Technology <input type="checkbox"/> Planning and Policy <input type="checkbox"/> Human Factors <input checked="" type="checkbox"/> Infrastructure Design and Management <input checked="" type="checkbox"/> Control and Operations <input checked="" type="checkbox"/> Models and Implementation		
Funding Request	\$150,000		
Matching Funds and Source (if any)	\$150,000 (Indiana DOT \$50,000; Delft University \$75,000; King Khalid University \$25,000)		
Total Project Cost	\$300,000		
Contract Number	69A3551747105		
Project start/end dates	January 1, 2021 to December 21, 2021		
Project Abstract	<p>The vast expanse of prospective CAV traffic networks is expected to exponentially increase the information availability and complexity of inter-agent interactions. In such an environment, a single system is inadequate to make decisions for all the agents individually, and therefore, multilevel system decomposition is needed. Further, due to the large amount of generated information that is redundant and therefore irrelevant to the specific decisions, the overall effectiveness and efficiency of the decision processors may be compromised. Thus, it is essential to design the subsystems that are capable of automatically identifying relevant data to make operational decisions based on the tasks and goals. To address this issue, the proposed research proposes a framework to decompose large transportation networks using a Fog-Cloud collaboration</p>		





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	structure. That way, AI and optimization techniques can be scaled up to larger transportation networks with minimal compromises being made in real-time decision making. In effect, the multi-scale architecture of Fog-Cloud collaboration causes separation of the tasks based on their respective scales and decision levels, decomposes the large network, and decentralizes the computation. This research will address regional decision tasks (which require low latency) and network decision tasks (which require high computational capacity). By assigning regional decision tasks to the fog layer and network decision tasks to the cloud layer, we anticipate that systemic efficiency can be improved.
High-level implementation plan	The study product will be evaluated using the context of multi-intersection signal and multi-CAV control in simulated environment.
Project Metrics	Number of papers presented at nationally and internationally renowned conferences; Number of journal papers published, Number of graduate student theses; Media stories and website hits; Number of public outreach events.
Web Links: [leave blank until project approval]	ccat.umtri.umich.edu https://engineering.purdue.edu/ccat https://www.purdue.edu/discoverypark/cav/nextrans/index.php

