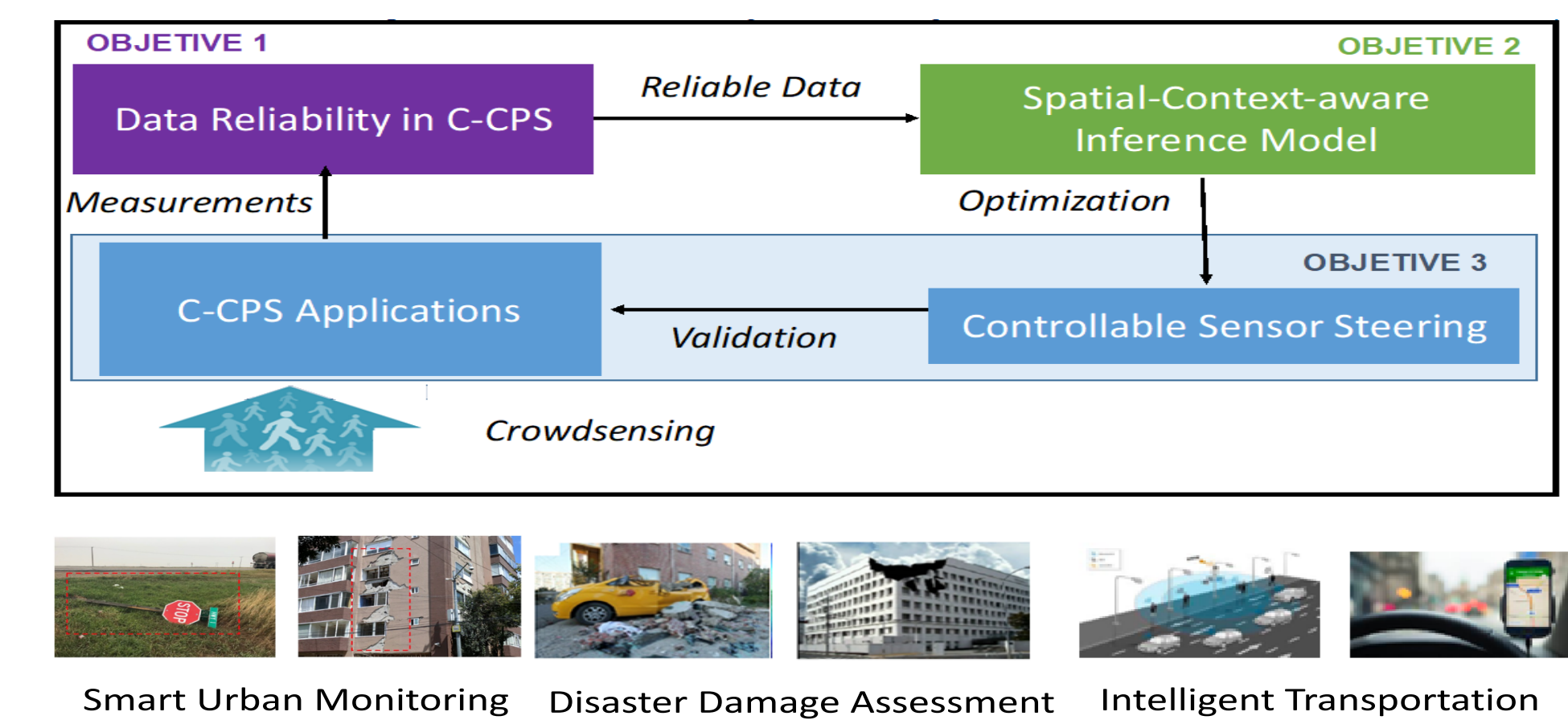


# CAREER: Towards Reliable and Optimized Data-Driven Cyber-Physical Systems using Human-Centric Sensing

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<https://www.wangdong.org/sslab/index.html>

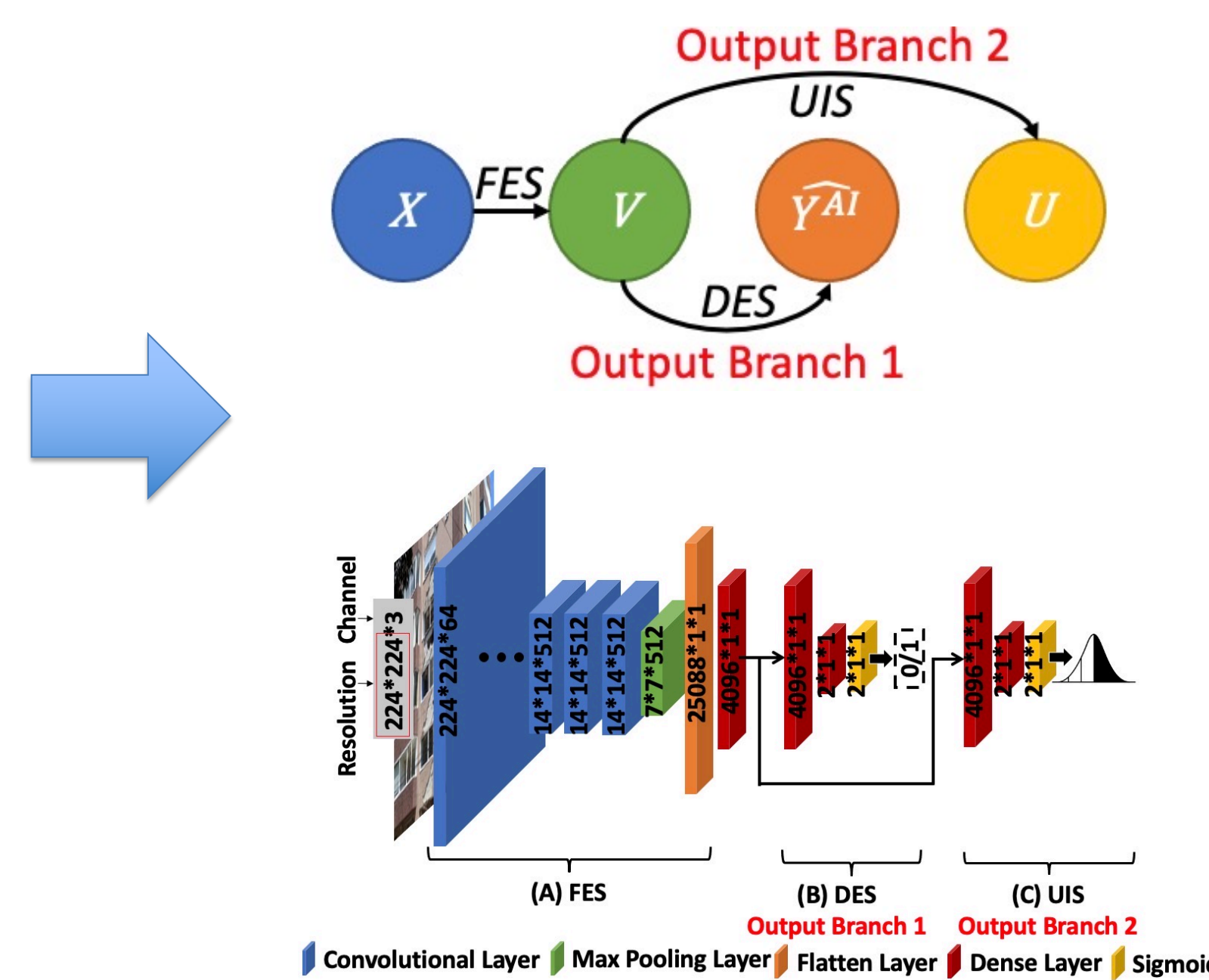
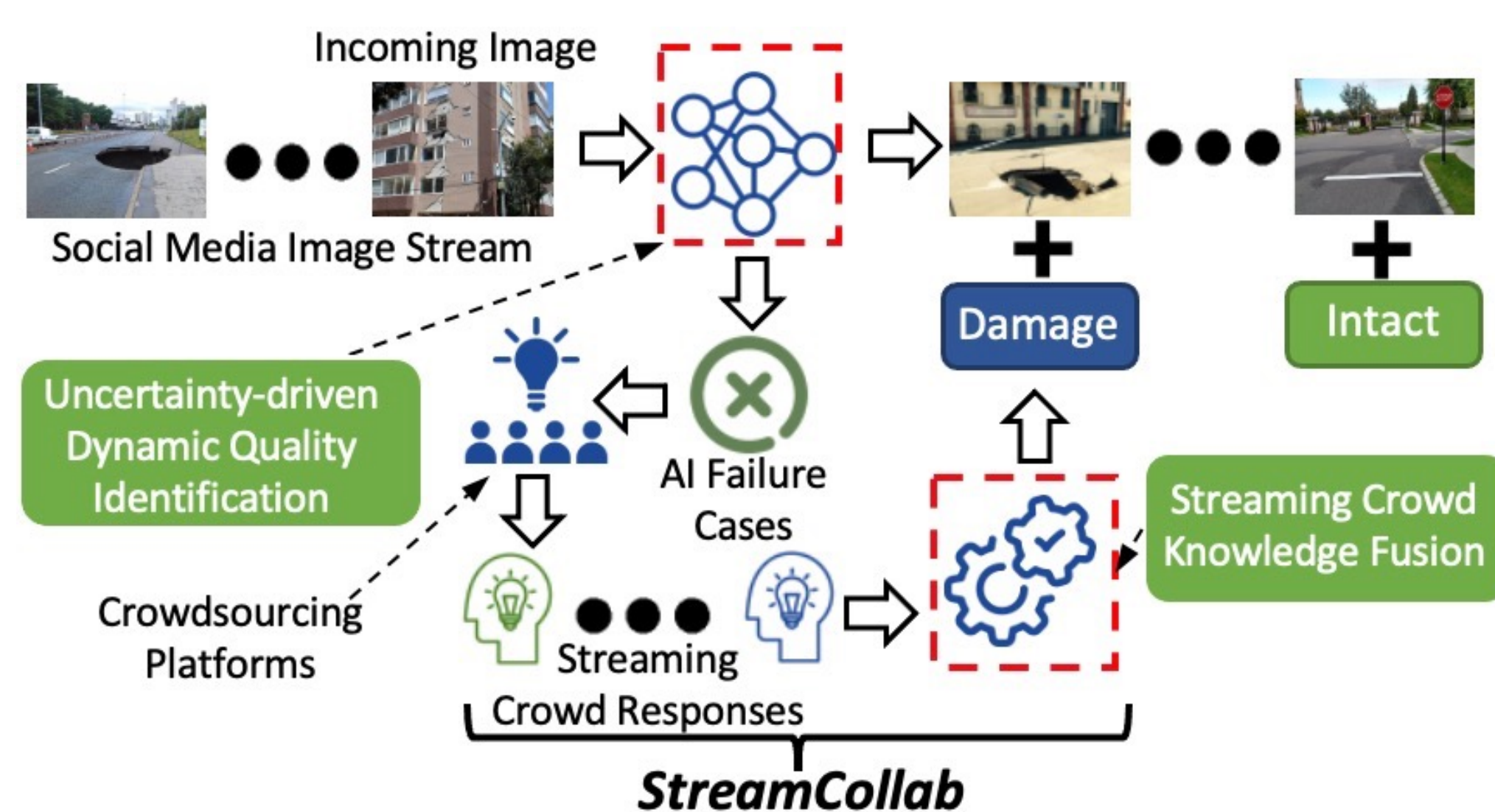
**Project Overview:** Create a new Data-driven Crowdsensing-based CPS (C-CPS) Design and Implementation (DCCDI) framework to address the data reliability, crowd rationality and optimized sensor steering challenges in building reliable and optimized CPS using humans as sensors.



## Challenge:

- Data Reliability
- Crowd Rationality
- Closed-loop Crowdsensing based-CPS (C-CPS) Design

## Solution:



## Scientific Impact:

- The current C-CPS framework has been studied in a smart urban monitoring application
- It can be further generalized and applied to other C-CPS domains (e.g., crowdsensing based anomaly detection, intelligent transportation, disaster damage assessment)



Category	Algorithm	$\theta = 10\%$			$\theta = 15\%$			$\theta = 20\%$		
		K-Score	MCC	F1-Score	K-Score	MCC	F1-Score	K-Score	MCC	F1-Score
Random	Random	0.0174	0.0174	0.5082	0.0114	0.0114	0.5059	0.0168	0.0168	0.5091
	MobileNet	0.4974	0.5056	0.7463	0.5290	0.5290	0.7645	0.5242	0.5251	0.7621
AI-Only	DenseNet	0.5098	0.5170	0.7528	0.5298	0.5318	0.7643	0.5379	0.5389	0.7686
	VGG	0.5424	0.5451	0.7704	0.5440	0.5514	0.7710	0.5660	0.5667	0.7830
Crowd-AI	Hybrid Para	0.5117	0.5128	0.7566	0.5334	0.5350	0.7669	0.5465	0.5486	0.7728
	Deep Active	0.4693	0.4723	0.7342	0.5321	0.5348	0.7658	0.5443	0.5495	0.7715
	CrowdLearn	0.5428	0.5465	0.7705	0.5491	0.5568	0.7732	0.5657	0.5673	0.7832
<b>Our Model</b>	<b>StreamCollab</b>	<b>0.6076</b>	<b>0.6100</b>	<b>0.8037</b>	<b>0.6245</b>	<b>0.6275</b>	<b>0.8120</b>	<b>0.6368</b>	<b>0.6394</b>	<b>0.8184</b>

Algorithm	$\theta = 10\%$	$\theta = 15\%$	$\theta = 20\%$
MobileNet	0.1250	0.1778	0.2246
DenseNet	0.1510	0.2149	0.2708
VGG	0.1624	0.2379	0.2983
Hybrid Para	3.1531	3.1533	3.1536
DeepActive	0.1207	0.1723	0.2214
CrowdLearn	0.1614	0.2323	0.2910
<b>StreamCollab</b>	<b>0.0225</b>	<b>0.0227</b>	<b>0.0232</b>

• Yang Zhang, Lanyu Shang, Ruohan Zong, Zeng Wang, Ziyi Kou, Dong Wang. StreamCollab: A Streaming Crowd-AI Collaborative System to Smart Urban Infrastructure Monitoring in Social Sensing, The 9th AAAI Conference on Human Computation and Crowdsourcing (HCOMP 2021), Full Paper, Virtual Conference, November, 2021.

## Broader Impacts:

- Contribute to a powerful C-CPS paradigm that can transform many aspects of our society (e.g., smart urban sensing, disaster response, environment, transportation).
- Integrate the research with the course “Social Sensing and Human-Cyber-Physical Systems” at UIUC
- Train undergraduate and graduate students at ND and UIUC
- Organize “SocialSens” workshops 2021 and 2022 in the CPS and CISE research community.
- Distribute research results through publications in CPS venues.

