CAREER: Toward Autonomous Decision Making and Coordination in Intelligent Unmanned Aerial Vehicles' Operation in Dynamic Uncertain Remote Areas

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https://iswin-lab-clemson.github.io/Home.html

Objectives: Developing integrated communication, mission-planning, coordination, and task management strategies in autonomous UAV networks
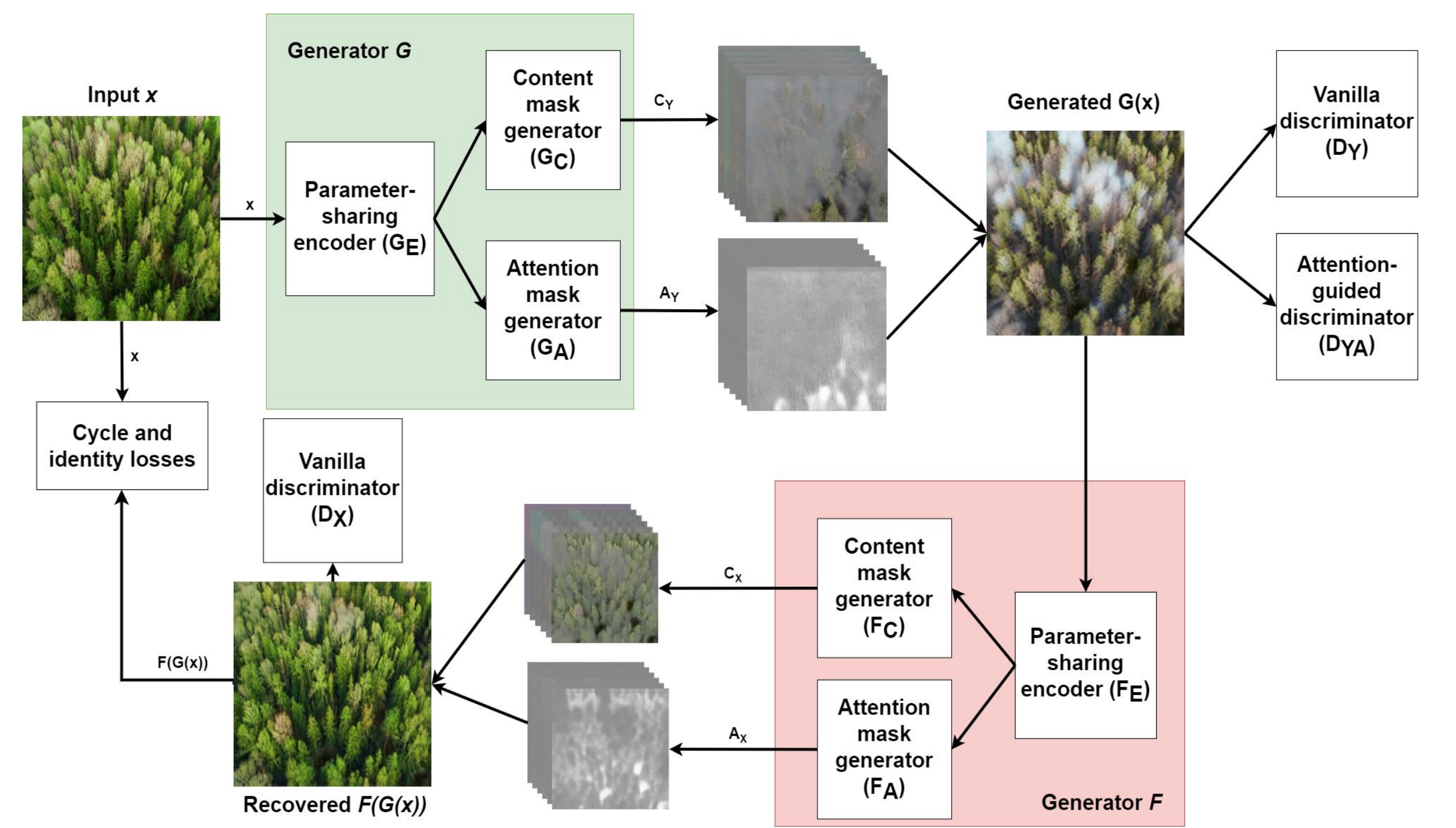
Solutions: Reinforcement learning-based solutions for communication-aware path planning and task allocation, UAV-assisted communication during natural disasters

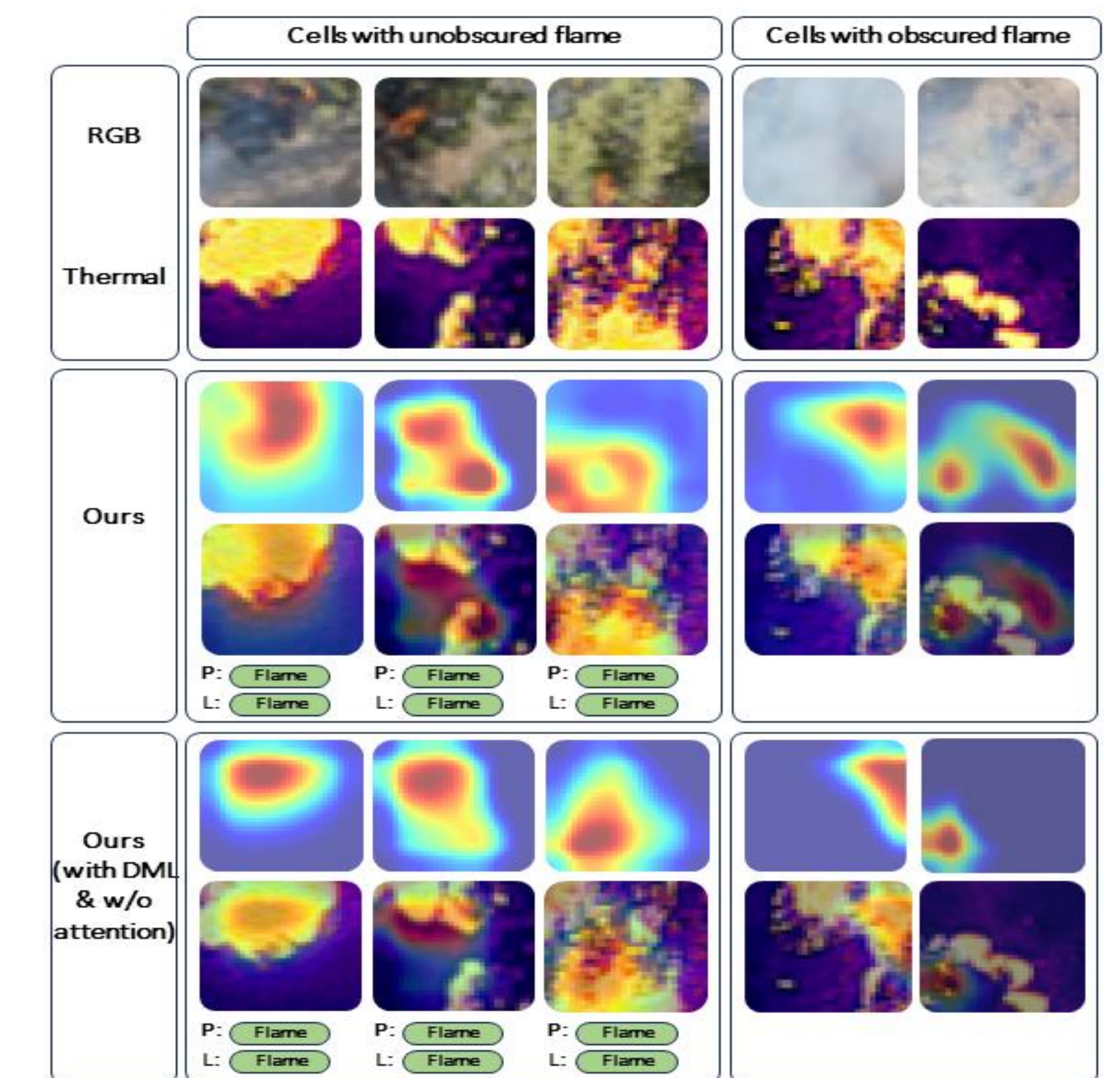(a) Drone Setup   (b) Phone Setup   (c) Flight Test Map   (d) RF Insight   (e) Coverage Map

Evaluation of drone communication performance on LTE-, 5G TMobile Network [9]
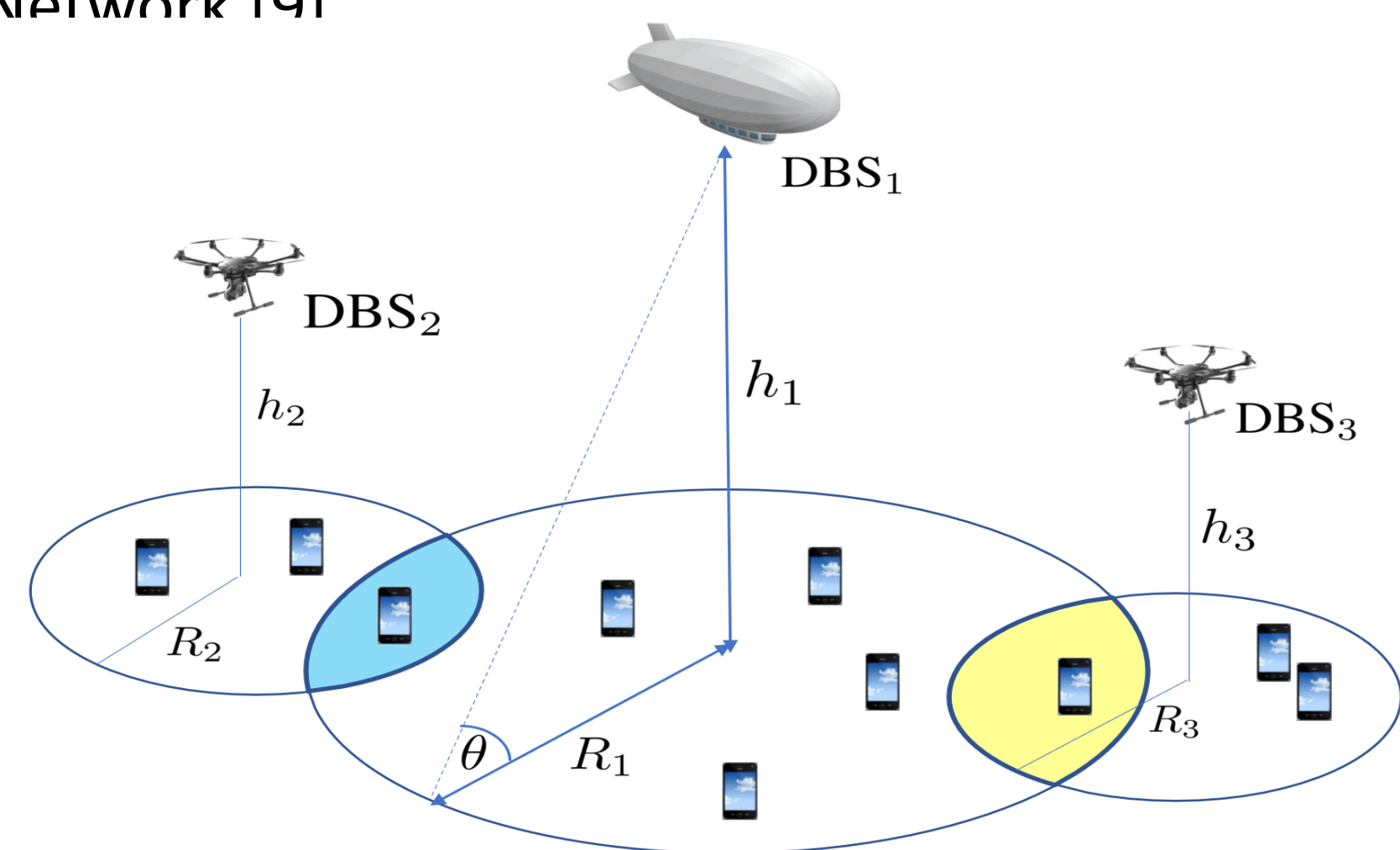
Heterogeneous Small Cells[9]

AttentionGAN-based model for fire images generation from forestry images [4]

FFLAMEFinder [8]

Broader Impact

- Practical solutions for utilizing a network of small and autonomous UAVs in disaster management,

- Collaboration with US Forest Services in Arizona, California, and Nevada, to test and evaluate the developed solutions during prescribed fires

1. A. Shamsoshoara, F. Afghah, "Airborne Fire Detection and Modeling using Unmanned Aerial Vehicles Imagery: Datasets and Approaches", "Handbook of Dynamic Data Driven Applications Systems",2023.

2. E. Bentley, Fatemeh Afghah, "Cooperative Target Execution System for Unmanned Aerial Vehicle Networks", Patent No. 11323886, May 3, 2022.

3. M.J. Sobouti, et al., "Efficient Fuzzy Based 3D Flying BaseStation Positioning and Trajectory for Emergency Management in 5G and Beyond Cellular Networks", IEEE Systems Journal, 2024.

4. J. Boone, B. Hopkins, F. Afghah, "Attention-Guided Synthetic Data Augmentation for Drone-based Wildre Detection", IEEE INFOCOM Workshop, Best Paper Award, 2023.

5. N. Namvar, F. Afghah, I. Guvenc, "Heterogeneous Drone Small Cells: Optimal 3D Placement for Downlink Power Efficiency and Rate Satisfaction", Drones, 2023.

6. G. Li, J. Ji, et al, "Towards High-Quality and Efficient Video Super-Resolution via Spatial-Temporal Data Overfitting", CVPR, 2023.

7. F. Lotfi, F. Afghah, , "Attention-based Open RAN Slice Management using Deep Reinforcement Learning",GLOBECOM, 2023.

8. H. Rajoli, P. Afshin, F. Afghah, "Thermal Image Calibration and Correction using Unpaired Cycle-Consistent Adversarial Networks", ASILOMAR, 2023.

9. M. Gharib, B. Hopkins, J. Murrin, A, Koka, F. Afghah, "5G Wings: Investigating 5G-Connected Drones Performance in Non-Urban Areas", SWARMNET, 2023.

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