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Announces the Ph.D. Dissertation Defense of

Praveen Borra

for the degree of Doctor of Philosophy (Ph.D.)

Resource-Constrained Evacuation Route Planning *A Capacity-Aware Charge-Encoded State-Space Approach*

March 23, 2026, at 1:00 p.m.

[online]

<https://fau-edu.zoom.us/j/82805926823?pwd=3OIFQzp6AE0Nu00q4Y8zSaGyYftIGZ.1>

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ABSTRACT OF DISSERTATION

EMERGENCY EVACUATION PLANNING REPRESENTS A CRITICAL CHALLENGE IN DISASTER MANAGEMENT DUE TO THE COMPLEXITY OF TRANSPORTATION NETWORKS AND THE NEED TO SAFELY RELOCATE LARGE POPULATIONS DURING DISASTERS SUCH AS HURRICANES, FLOODING, WILDFIRES, AND EARTHQUAKES. THIS DISSERTATION PROPOSES NOVEL APPROACHES TO ENHANCE EVACUATION ROUTE PLANNING BY INCORPORATING ELECTRIC VEHICLE (EV) ENERGY CONSTRAINTS INTO TRANSPORTATION NETWORK MODELING. FIRST, THE RESOURCE CONSTRAINT EVACUATION ROUTE PLANNING (RC-ERP) PROBLEM IS FORMULATED TO EVALUATE EVACUATION STRATEGIES BY INTEGRATING TRAFFIC CONGESTION, ROAD CAPACITY LIMITATIONS, AND EV CHARGING FEASIBILITY WITHIN TRANSPORTATION NETWORKS. BUILDING UPON THIS FORMULATION, THE DISSERTATION INTRODUCES TWO COMPLEMENTARY ROUTING AND SCHEDULING FRAMEWORKS: THE CHARGE-ENCODED ROUTING FRAMEWORK WITH THE NODE-ENCODED SHORTEST PATH (NESP) ALGORITHM, WHICH MODELS VEHICLE ENERGY STATES TO IDENTIFY CHARGING-FEASIBLE EVACUATION ROUTES, AND THE TIME-EXPANDED CAPACITY-AWARE EVACUATION SCHEDULING (TE-CERA) FRAMEWORK, WHICH INCORPORATES TEMPORAL ROAD CAPACITY CONSTRAINTS TO COORDINATE LARGE-SCALE EVACUATIONS. TOGETHER, THESE APPROACHES ADDRESS KEY CHALLENGES OF CHARGING FEASIBILITY, TRANSPORTATION NETWORK CONGESTION, AND LARGE-SCALE EVACUATION COORDINATION, PROVIDING SCALABLE AND PRACTICAL SOLUTIONS FOR EVACUATION PLANNING IN TRANSPORTATION SYSTEMS INCREASINGLY CHARACTERIZED BY ELECTRIC VEHICLE ADOPTION.

BIOGRAPHICAL SKETCH

Praveen Borra received a B.Tech. degree in Electronics Engineering from Acharya Nagarjuna University, India, and an M.S. degree in Computer Science from New Mexico Highlands University, Las Vegas, New Mexico. He is currently pursuing a Ph.D. in Computer Science at Florida Atlantic University, Boca Raton, Florida. His research focuses on transportation networks, evacuation routing, and resource-constrained optimization, with an emphasis on developing scalable algorithms for emergency evacuation planning under infrastructure and charging constraints.

CONCERNING PERIOD OF PREPARATION & QUALIFYING EXAMINATION

Time in Preparation: May 2023 – Present (approximately 3 years)

Qualifying Examination Passed: Spring 2024

Published Papers: One paper submitted to IEEE (under review).