CENTRO FEDERAL DE EDUCAÇÃO TECNOLÓGICA CELSO SUCKOW DA FONSECA
UNIVERSIDADE FEDERAL FLUMINENSE
DIRETORIA DE PESQUISA E PÓS-GRADUAÇÃO
DEPARTAMENTO DE PÓS-GRADUAÇÃO
COORDENADORIA DO PROGRAMA DE PÓS-GRADUAÇÃO EM INSTRUMENTAÇÃO E ÓPTICA APLICADA

A Coordenadoria do Programa de Pós-Graduação em Instrumentação e Óptica Aplicada tem a satisfação de convidá-lo para assistir à

DEFESA DE TESE DE DOUTORADO

TÍTULO:
"AN AERIAL ROBOT COGNITIVE NETWORK ARCHITECTURE FOR SWARM APPLICATIONS DEVELOPMENT: ARCOG-NET"
Gabryel Silva Ramos

This thesis proposes an advanced cognitive architecture for networked aerial robots, aimed at enabling autonomous swarm operations in dynamic and uncertain environments. By integrating perception, planning, decision-making, and adaptive learning, the architecture supports coordination and cooperation among drones, with or without direct human intervention. Based on a distributed edge-fog-cloud computing model, it assigns functions according to the robots' processing capabilities: edge devices handle real-time data collection and local decision-making; fog nodes supervise actions and provide intermediate support; and cloud servers perform complex analyses and longterm data storage. This layered distribution ensures rapid response and optimizes the use of computational and network resources. The proposed architecture addresses a gap in the literature by introducing a general-purpose model–validated through simulations and real-world tests–designed to facilitate future application development by abstracting architectural complexity, thus allowing developers to focus on high-level robot functionalities. The system was validated through simulations in multiple environments and real-world experiments involving six DJI Ryze Tello drones performing 3D reconstruction missions in the Laboratory of Control and Automation (LACEA), demonstrating scalability, autonomy, and cognitive synergy between navigation and perception. The architecture is also capable of dynamically allocating processing tasks based on urgency, network conditions, and resource availability, thereby optimizing performance and energy consumption.

Banca Examinadora composta pelos Doutores:
Milena Faria Pinto, D.Sc. (CEFET/RJ) (Orientadora)
Diego Barreto Haddad, D.Sc. (CEFET/RJ) (Coorientador)
Amaro Azevedo de Lima, D.Sc. (CEFET/RJ)
Accacio Ferreira dos Santos Neto, D.Sc. (CEFET/MG)
Mario Antonio Ribeiro Dantas, D.Sc. (INESC/UFJF)
Ricardo Queiroz de Araujo Fernandes, D.Sc. (GSI) – Convidado

Local e data: 03 de novembro de 2025 às 14h00 – Segunda-Feira, no auditório Vda DIPPG

(Bloco E – 5 Andar) e na Plataforma Teams.

Link para a defesa