

## **Mechanical Engineering Department**

<b>Research Duration:</b>	Summer 2025 (June – August 2025)
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Title of Project:	Obstacle detection, classification, and localization using deep learning and Convolutional Neural Networks (CNN)

## Goals and Objectives of the Project, Expectations and Outcomes

**Goals:** In this project, the students will learn the fundamentals of deep learning, convolutional neural networks, multiclass classification, and localization in machine vision and robotics.

Project Management Plan: The project is structured in 4 phases:

<u>Phase I:</u> The project starts with hands-on work on elementary neural network topics. At this stage, the students will learn how to use Machine Learning frameworks to train, validate, and test fully connected neural networks.

<u>Phase II:</u> In this phase, the students learn how to structure machine learning projects. Topics such as overfitting, underfitting, regularization, dropout, and gradient-based optimization techniques like ADAMS will also be discussed.

<u>Phase III:</u> In this phase, the students will learn about convolutional neural networks and how to structure them in TensorFlow. They will also learn about Mobile Nets and how to train them using TensorFlow.

<u>Phase IV:</u> This is the last phase of the project, in which the students will train a Mobile Net to detect, classify, and localize objects from a video they take from the CSUN campus.

We rely on labeled data from Visdrone, a GitHub repository with labeled data for training patterns. The students will also be provided access to a unique computation capacity at the Advanced System Lab located in JD 1123A. Finally, the students will be paired with existing graduate students at the Advanced System Lab to improve their sense of belonging and explore possible opportunities to conduct research at CSUN.

**Evaluation plan:** The students will have weekly meetings with their mentor in which they will be evaluated, and sufficient recommendations will be provided. Also, at the end of each phase, the students will take a qualifying exam to ensure their understanding from the subject.

Expected outcome: The students will provide a poster at the end of their project and present it.