



NULL CLASS INTERNSHIP REPORT



1.INTRODUCTION

The rapid evolution of Artificial Intelligence (AI) and Machine Learning (ML) is transforming industries across the globe. As a student of AIML, it is crucial to gain practical exposure alongside theoretical understanding. This internship, offered by Null class, provided me with an excellent opportunity to dive deep into real-world ML applications through a structured and project-based learning approach.

Throughout the one-month internship, I worked independently on a series of advanced machine learning tasks that focused on image analysis, object detection, and computer vision techniques. The internship encouraged me to research, design, develop, and evaluate solutions using Python, OpenCV, TensorFlow, and GUI libraries. The tasks were not only technically demanding but also required creativity, time management, and continuous self-learning. This report documents my journey, challenges, solutions, and the learning outcomes achieved.

This report outlines the internship journey I undertook with Null Class, focused on AI and Machine Learning applications. The internship was structured around practical implementation of ML models across different real-world use cases, enhancing both my technical and problem-solving skills.

2.BACKGROUND

As a third-year engineering student specializing in Artificial Intelligence and Machine Learning (AIML), I have a strong academic foundation in programming and machine learning theory. This internship allowed me to apply that knowledge practically, bridging the gap between academics and industry expectations.

3.LEARNING OBJECTIVES

The internship was designed with the following clear learning goals in mind:

1. Apply theoretical concepts in real-world tasks such as drowsiness detection, emotion recognition, and car Colour classification.
- 2.Build and train CNN-based models and understand their layer-wise functioning using activation map visualization.
3. Implement image and video processing pipelines using OpenCV and integrate them into functional applications.
4. Develop intuitive GUIs using to make the models user-interactive and enhance usability.
5. Improve problem-solving skills through debugging, researching, and implementing various ML solutions independently.
6. Use GitHub effectively for version control, collaborative code sharing, and documentation of projects.
7. Evaluate ML model performance using metrics such as accuracy, confusion matrix, precision, and recall.
8. Gain confidence in independent project execution, from data handling and model training to deployment and reporting.

4.ACTIVITIES AND TASKS

Task 1 – Activation Map Visualization

Objective:

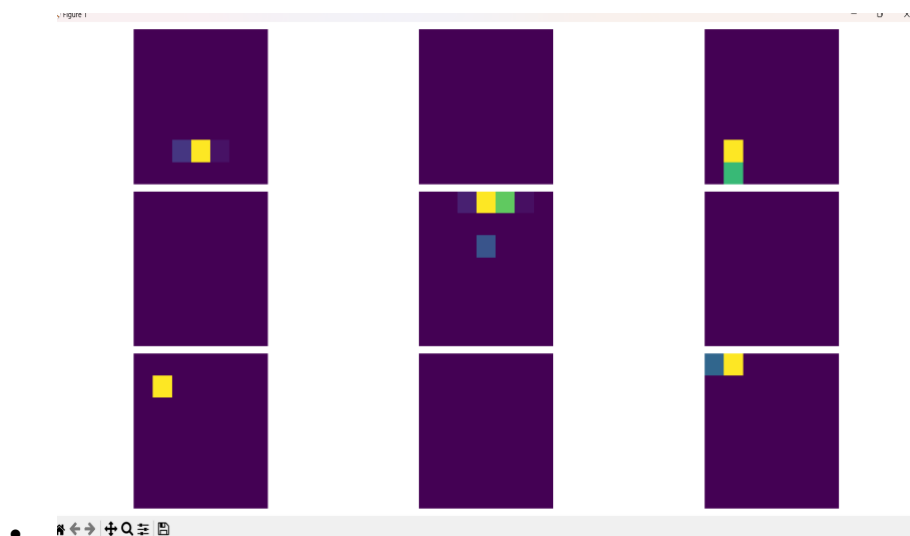
To visualize activation maps from a CNN to understand how different layers respond to various features in an image (e.g., for emotion detection).

Description:

A pre-trained CNN model was used to generate feature maps for the first convolutional layer. The goal was to observe how the model perceives inputs by highlighting activated regions.

Process:

- Load and resize a sample image.
- Pass the image through the first convolutional layer.
- Extract activation maps and visualize them using matplotlib.
- **Output:**
Nine activation maps showed purple-tinted patterns, revealing edges, textures, and feature sensitivity of the CNN.:



Task 2 – Drowsiness Detection with GUI

Objective:

To create a real-time drowsiness detection system using Haar cascades and OpenCV with a GUI and alert system.

Description:

This task involved using webcam input to detect facial and eye states. If the eyes remained closed beyond a set threshold, an alert was triggered to notify drowsiness.

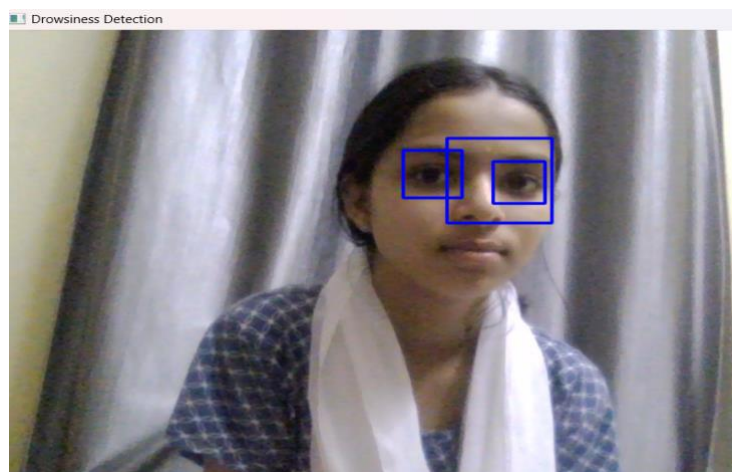
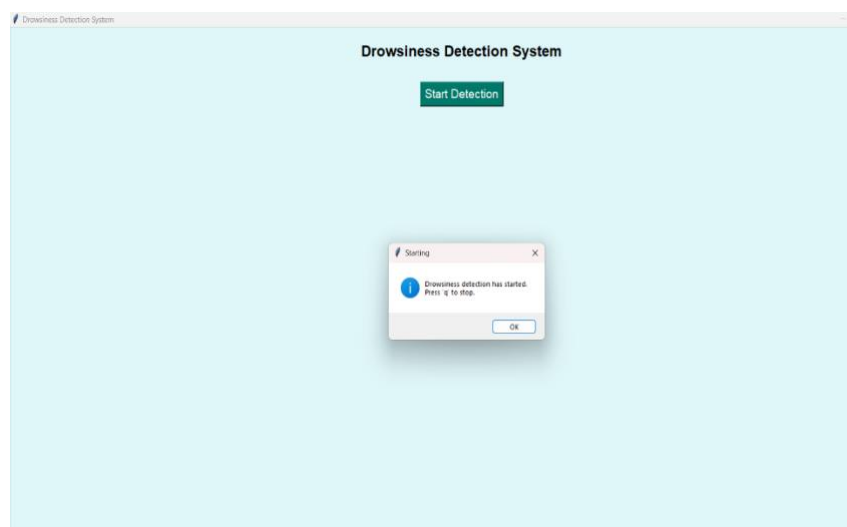
Process:

- Use cv2.VideoCapture() for live webcam feed.
- Detect face and eyes using Haar cascade classifiers.
- Monitor eye closure duration and trigger sound alerts.
- Build GUI to display real-time feedback.

Output:

GUI showed:

- **"Drowsiness Not Detected"** when eyes were open.
- **"Drowsiness Detected"** with an audible alert when eyes remained closed.



Task 3 – Car Color Detection with GUI

Objective:

To develop a system that detects the dominant colour of a car from an image using OpenCV and a GUI interface.

Description:

Using KMeans clustering, the system identifies and displays the most prominent color in a selected region of the uploaded image.

Process:

- Upload image via GUI.
- Resize and preprocess the image.
- Apply KMeans clustering to find dominant colour.
- Use web colors to map RGB values to color names.

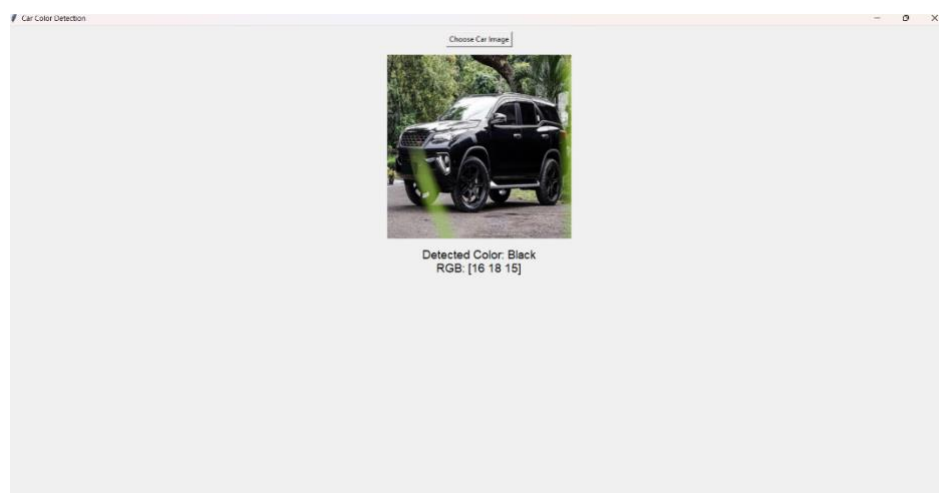
Challenges

Overcome:

Initial results incorrectly labeled cars as black. By refining the preprocessing steps and improving KMeans parameter tuning, accuracy improved significantly.

Output:

GUI displayed the uploaded car image alongside the detected color (e.g., **Red**, **Blue**, **Yellow**).



5.SKILLS AND COMPETENCIES

During the course of this internship, I developed a variety of technical and non-technical skills that are essential for any AI/ML professional:

1.Technical Skills:

Python Programming: Gained proficiency in writing clean, modular, and efficient code.

Machine Learning Model Development: Learned how to create and train deep learning models, especially convolutional neural networks (CNNs).

OpenCV for Computer Vision: Used OpenCV for image preprocessing, object detection, and color recognition tasks.

TensorFlow/Keras: Applied TensorFlow for model building and used Keras layers to manage model architecture and training.

Tkinter GUI Development: Designed user-friendly graphical interfaces to allow users to interact with ML models visually.

Evaluation Metrics: Implemented and interpreted accuracy, precision, recall, F1 score, and confusion matrices.

Version Control with Git and GitHub: Managed code using Git, created public repositories, and learned how to document projects effectively.

2. Soft Skills:

Time Management: Managed multiple tasks within a strict deadline without external supervision.

Problem Solving: Tackled coding errors and logical bugs through online research and trial-and-error.

Self-Motivation and Discipline: Maintained consistency in working on projects daily without relying on a mentor.

Documentation: Learned to document code, results, and outcomes properly for clarity and future reference.

6. FEEDBACK AND EVIDENCE

These artifacts collectively validate my engagement and progress throughout the internship.

As part of the internship process, I documented every stage of my learning and task completion. Some of the evidence of my performance includes:

1. GitHub Repository: Uploaded all source code, requirement files, Jupyter notebooks, and GUI scripts to GitHub for evaluation and transparency.

2. Daily Work Reports: Regularly filled the daily report form provided by Null Class, maintaining consistency and accountability.

3. Screenshots of GUIs: Captured and uploaded images showing GUI outputs, model predictions, pop-up alerts, and input previews for all tasks.

4. Accuracy Results: Included confusion matrices and classification reports to demonstrate model performance.

5. Model Files & Weights: Saved trained model files and shared large files through Google Drive links for easy access and evaluation.

6. Internship Report: This comprehensive report itself acts as evidence of understanding and reflects the work completed.

These artifacts collectively validate my engagement and progress throughout the internship.

7. CHALLENGES AND SOLUTIONS

The self-learning model of this internship taught me how to handle difficulties independently. Below are a few key challenges I faced and how I overcame them:

Challenge 1: Detecting Car Colors Accurately

Problem: Initial attempts failed to detect correct car color. Many cars appeared black.

Solution: I researched color spaces (HSV vs BGR), tuned HSV color ranges, and applied preprocessing techniques like Gaussian blur and resizing for better detection.

Challenge 2: Showing Pop-up Alerts Without Freezing GUI

Problem: While trying to show alerts and GUI together, the app would freeze or crash

Solution: Learned how to use Tkinter's threading and event loop system to keep the GUI responsive while processing detection.

Challenge 3: Understanding KNN Layer Outputs

Problem: Activation map visualization was confusing at first.

Solution: Studied tutorials on how to extract and plot intermediate layer outputs in TensorFlow and applied the logic to visualize filters.

Challenge 4: Working Without Mentor Support

Problem: No direct support during the project.

Solution: Became more self-reliant, used Stack Overflow, GitHub discussions, official docs, and ChatGPT to resolve errors and implement features.

8.OUTCOMES AND IMPACT

This internship significantly contributed to both my academic and professional growth. The key outcomes of my learning include:

1. Practical Exposure to Real-World Projects: Gained hands-on experience building complete ML projects, not just writing algorithms.
2. Understanding of Model Evaluation: Learned how to interpret performance metrics and improve model results through tuning.
3. Confidence in Developing GUIs: Developed user-friendly GUIs from scratch to handle image and video inputs for model predictions.
4. Experience with GitHub: I now understand how to manage repositories, commits, and version control professionally.
5. Independent Research Skills: Strengthened my ability to study independently, troubleshoot errors, and build knowledge from scratch.
6. Portfolio Development: These completed projects will become part of my portfolio for future internships and placements.

The impact of this internship will extend beyond this one month, as the skills I've gained will continue to benefit me in future academic projects and professional endeavors.

9.CONCLUSION

To summarize, this internship with Null Class was a turning point in my learning journey. It was more than just task completion — it was a full-cycle learning experience that taught me how to research, plan, implement, test, document, and submit machine learning projects.

The challenges I faced pushed me to develop strong problem-solving skills and technical independence. I now feel more confident in building AI models, understanding their inner workings, designing user interfaces, and maintaining project repositories.

This hands-on experience has added substantial value to my resume and personal development. I am grateful for the opportunity and excited to apply this knowledge in future roles and research opportunities in the field of AI.

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