

Case Study 3 Rubric – Wildfire Detection with CNNs

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General Description

Submit to Canvas a PDF of your written portion and a link to your GitHub repository.

This case study is your opportunity to demonstrate your ability to apply deep learning to a real-world image classification task using wildfire imagery. You will take on the role of an environmental data scientist responsible for developing a binary classifier to detect active wildfire zones.

Why am I doing this?

This study allows you to show your conceptual understanding and technical abilities in machine learning. Through hands-on modeling, you will explore how a CNN can be trained to classify environmental data and reflect on model performance, accuracy, and future improvements. The assignment emphasizes reproducibility, evaluation, and communication of results.

What am I going to do?

You will build a CNN model using Keras and TensorFlow to classify wildfire images as either “fire” or “no fire.” You will then evaluate your model’s performance and explain the results using a short written report. All relevant code, data, and output should be stored in your GitHub repository.

You will submit:

- **Written portion PDF** – includes analysis, reflection, and references
- **GitHub repository** – includes code and all supporting materials
- **Reference list** – on a separate page of the PDF using IEEE style

How will I know I have succeeded?

You will meet expectations when you follow the criteria in the rubric below:

Category	Details
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Formatting	<ul style="list-style-type: none"> • Submit all materials in the formats outlined below: <ul style="list-style-type: none"> ○ Written Portion: Submit as a PDF ○ GitHub Repository: Include code, images, model outputs ○ References: List IEEE-style citations at the end
Written Portion	<ul style="list-style-type: none"> • Summarize the goal and motivation of the case study <ul style="list-style-type: none"> ○ What is the problem and why does it matter? • Outline your analysis plan <ul style="list-style-type: none"> ○ Include a flowchart or diagram outlining the steps of your CNN modeling process (e.g., Data Cleaning → Preprocessing → Model Training → Evaluation) • Report results <ul style="list-style-type: none"> ○ Discuss your final model performance (accuracy, precision, recall, F1-score) ○ Comment on the significance of the results in terms of real-world application
Reflection	<ul style="list-style-type: none"> • Discuss challenges you faced during the project <ul style="list-style-type: none"> ○ What issues arose in model training, tuning, or evaluation? ○ What did you learn while solving these issues? • Discuss what you would do differently in a future project
Code	<ul style="list-style-type: none"> • Include the fully functioning Jupyter Notebook or Python script <ul style="list-style-type: none"> ○ Must contain: <ul style="list-style-type: none"> ■ Image preprocessing and augmentation ■ CNN model construction using Keras ■ Training/validation/test split ■ Model training and evaluation ■ Visualization of loss and accuracy curves ■ Confusion matrix of results ○ Code should be modular and clearly commented
References	<ul style="list-style-type: none"> • Include at least 2–3 external sources to support your methodology and analysis <ul style="list-style-type: none"> ○ Example: Blog posts on CNNs, Keras documentation, or academic articles (Use IEEE format)