Applying YOLOv8 to Fire Detection in Images

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***Abstract*—This undergraduate thesis investigates CNN-based fire detection using YOLOv8. Visual fire detection may support early warning when images contain recognizable flames or smoke. The student trains and evaluates a YOLOv8 detector on a fire-image dataset and reports box precision, recall, mAP50, and mAP50–95 curves. The manuscript reports mAP50 around 0.774 and mAP50–95 around 0.5 in its evaluation discussion. It also acknowledges a limited, imperfect dataset and mistakes on some real-world cases. The source does not establish general accuracy across independent camera environments, false-alarm rates under routine monitoring, or suitability for operational life-safety decisions. The contribution is a documented student study or prototype whose stated scope can guide further testing.**

***Index Terms*—YOLOv8, fire detection, CNN, computer vision**

I. Introduction

Visual fire detection may support early warning when images contain recognizable flames or smoke. This thesis investigates CNN-based fire detection using YOLOv8. It begins from a practical engineering need and explains the technologies and workflow chosen for the case. The objective is to document a student implementation or comparative investigation, together with the evidence available in the manuscript. Broader operational or economic effects require separate measurements and are not assumed from the existence of a prototype [1]. Earlier ICTU student work on related designs is included here for context [2], [3]. Related published studies provide context for the subject and methods [4], [5], [6], [7], [8], [9], [10]. These contextual works were selected for this English summary; they are not asserted to appear in the original thesis bibliography.

II. Methods

The student trains and evaluates a YOLOv8 detector on a fire-image dataset and reports box precision, recall, mAP50, and mAP50–95 curves. The source is summarized through its stated design, implementation material, examples, and conclusion. Features shown in the manuscript are distinguished from proposals for later development. This review does not add a new experiment, fill missing measurements with estimates, or treat a planned capability as an observed result. The source thesis remains the provenance for the reported work [1].

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III. Results

The manuscript reports mAP50 around 0.774 and mAP50–95 around 0.5 in its evaluation discussion. It also acknowledges a limited, imperfect dataset and mistakes on some real-world cases. The report's screens, configurations, examples, or measurements constitute the evidence for this summary. A capability described only as a design intention is not counted as a validated operational outcome. No additional performance, adoption, financial, or safety figure has been introduced here. The result is interpreted within the scope of the student's documented setup [1].

IV. Discussion

The source does not establish general accuracy across independent camera environments, false-alarm rates under routine monitoring, or suitability for operational life-safety decisions. Further work could improve dataset quality, test on independent scenes, and report sensitivity and false alarms under specified lighting and fire conditions. These limitations affect how the evidence should be read. The current manuscript can support understanding of the design and reported demonstration, while independent tests would be needed for stronger claims. Any later deployment should document its environment and separate observed outcomes from intended benefits [1].

V. Conclusion

The thesis documents CNN-based fire detection using YOLOv8. The manuscript reports mAP50 around 0.774 and mAP50–95 around 0.5 in its evaluation discussion. It also acknowledges a limited, imperfect dataset and mistakes on some real-world cases. The source does not establish general accuracy across independent camera environments, false-alarm rates under routine monitoring, or suitability for operational life-safety decisions. Further work could improve dataset quality, test on independent scenes, and report sensitivity and false alarms under specified lighting and fire conditions. Accordingly, the present contribution is a source-grounded account of the student work and its tested or illustrated scope. Claims about broader effectiveness should be assessed in later work using explicit evaluation conditions [1].

References

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