

森林火灾探测器：用于森林火灾烟雾检测的扩展通道深度的细粒度特征学习

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摘要：【目的】野火是一个超越地域界限的紧迫的全球性问题。包括中国在内的许多地区都在努力应对野火威胁，管理有限的森林资源。鉴于森林火灾对生态平衡、社会福祉和经济稳定的重大影响，有效的森林火灾探测至关重要。针对目前林火检测模型中存在的噪声误分类和人工设计组件的问题，特别是在错综复杂的森林环境中识别细微和不易察觉的烟雾的能力有限。【方法】本文以 YOLOv8 为基础，提出了一种改进的林火烟雾检测模型。我们扩展了通道深度，以实现细粒度特征学习，并保留更多特征信息。同时，其中的轻量级卷积减少了模型的参数。【结果】该模型提高了对不同规模烟雾目标的检测精度，并超越了主流模型的精度。实验结果表明，改进后的模型性能优越，平均精度提高了 3.3%。【结论】该模型大大提高了检测能力，同时还优化了神经网络，使其更加轻便。这些进步使该模型有望成为早期林火烟雾检测的解决方案。

ForestFireDetector: Expanding Channel Depth for Fine-Grained Feature Learning in Forest Fire Smoke Detection

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Abstract: 【Objective】Wildfire is a pressing global issue that transcends geographical boundaries. Many areas, including China, are trying to cope with the threat of wildfires and manage limited forest resources. Effective forest fire detection is crucial, given its significant implications for ecological balance, social well-being and economic stability. In light of the problem of noise misclassification and manual design of components in the current forest fire detection model, particularly the limited capability to identify subtle and unnoticeable smoke within intricate forest environments. 【Method】This paper proposes an improved smoke detection model for forest fires utilizing YOLOv8 as its foundation. We expand the channel depth for fine-grain feature learning and retain more feature information. At the same time, the lightweight convolution in this reduces the parameters of the model. 【Result】This model enhances detection accuracy for smoke targets of varying scales and surpasses the accuracy of mainstream models. The outcomes of experiments demonstrate that the improved model exhibits superior

performance and the mean average precision is improved by 3.3%. **【Conclusion】**This model significantly enhances the detection ability, while also optimizing the neural network making it more lightweight. These advancements position the model as a promising solution for early-stage forest fire smoke detection.