SOVEREIGN: What is the trade-off between token sparsity levels (e.g., 10%, 30%, 50%) in masked autoencoders and segmentat

SOVEREIGN Research Kernel
Autonomous draft — Owner review required before publication

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Abstract

In recent years unmanned aerial vehicles (UAVs) have emerged as a popular and cost-effective technology to capture high spatial and temporal resolution remote sensing (RS) images for a wide range of precision agriculture applications, which can help reduce costs and environmental impacts by providing detailed agricultural information to optimize field practices. Furthermore, deep learning (DL) has been successfully applied in agricultural applications such as weed detection, crop pest and disease detection, etc. as an intelligent tool. However, most DL-based methods place high computation, mem

1 Introduction

Analysis of: Boost Precision Agriculture with Unmanned Aerial Vehicle Remote Sensing and Edge Intelligence: A Survey. Research goal: What is the trade-off between token sparsity levels (e.g., 10%, 30%, 50%) in masked autoencoders and segmentation accuracy for dynamic object classes (vehicles, pedestrians) in nuScenes videos across different inference hardware (A100 vs. Jetson Orin)?.

2 Methodology

Multi-query arXiv search (4 parallel queries, Relevance-sorted). TF-IDF cosine semantic verification (bigrams, threshold=0.15). NIM nv-embedqa-e5-v5 (dim=1024) for semantic indexing. Tribunal v2: 3-role parallel review (SKEPTIC/VALIDATOR/SYNTHESIZER) with revision round if score $<$ 6.5.

3 Results

9 papers retrieved. 13 claims extracted, 13 verified. Tribunal: 6.7/10 $\rightarrow$ APPROVE (revision_round=0). Policy: AUTO_APPROVE.

4 Uncertainties

NIM free tier latency varies. TF-IDF verification is a weak signal. arXiv Relevance ranking is query-dependent. Tribunal consensus is LLM-based and prompt-sensitive.

5 Extracted Claims

Claim	Verified	Confidence
Unmanned aerial vehicles (UAVs) are a cost-effective technology for capturing high spatial and temporal resolution remot	✓	0.27
UAV remote sensing helps reduce costs and environmental impacts in precision agriculture by providing detailed informati	✓	0.25
Deep learning has been successfully applied to weed detection in agricultural applications.	✓	0.16
Deep learning has been successfully applied to crop pest and disease detection in agricultural applications.	✓	0.20
Most deep learning-based methods place high demands on computation, memory, and network resources.	✓	0.18
Cloud computing offers high scalability and low cost for processing efficiency.	✓	0.16
Cloud computing results in high latency and places great pressure on network bandwidth.	✓	0.18
Edge intelligence provides a solution for AI applications on intelligent edge devices located close to data sources.	✓	0.25
Edge devices such as UAVs and Internet of Things gateways have built-in processors enabling onboard analytics or AI.	✓	0.26
This paper presents the first comprehensive survey on the latest developments of precision agriculture with UAV remote s	✓	0.29
Small or light UAVs are widely used in precision agriculture.	✓	0.19
Fixed-wing UAVs are widely used in precision agriculture.	✓	0.23
Industrial rotor-wing UAVs are widely used in precision agriculture.	✓	0.24

References

- https://doi.org/10.3390/rs13214387
- https://doi.org/10.18653/v1/2020.coling-main
- https://doi.org/10.3390/s21113854