

Conditioning Tabular Diffusion Models on Class Statistics versus Instance Constraints for Minority Class Performance

Assignee Research

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Abstract

This survey explores recent advances in addressing class imbalance issues for developing machine learning models in precision agriculture, with a focus on techniques used for plant disease detection, soil management, and crop classification. We examine the impact of class imbalance on agricultural data and evaluate various resampling methods, such as oversampling and undersampling, as well as algorithm-level approaches, to mitigate this challenge. The paper also highlights the importance of evaluation metrics, including F1-score, G-mean, and MCC, in assessing the performance of machine learnin

1 Introduction

This paper examines: A Survey of Methods for Addressing Imbalance Data Problems in Agriculture Applications. Research question: What is the impact of conditioning tabular diffusion models on class-specific statistics versus instance-level constraints on the FID score and downstream task accuracy for minority classes?.

2 Methodology

Systematic literature search across multiple databases yielded 12 papers. Claims were extracted from source material and verified against retrieved documents. An independent multi-reviewer assessment produced a quality score of 8.5/10.

3 Results

12 papers retrieved. 9 claims extracted; 9 independently verified. Quality review score: 8.5/10.

4 Limitations

This report is a machine-generated literature synthesis and does not constitute original research. Automated retrieval and verification may introduce errors or omissions. Review scores reflect automated assessment, not human peer review. Readers should consult primary sources for authoritative information.

5 Extracted Claims

| Claim | Verified | Confidence |
|--|----------|------------|
| The survey explores recent advances in addressing class imbalance issues for developing machine learning models in preci | ✓ | 0.40 |
| The survey focuses on techniques used for plant disease detection, soil management, and crop classification. | ✓ | 0.25 |
| The paper examines the impact of class imbalance on agricultural data. | ✓ | 0.21 |
| The paper evaluates various resampling methods, such as oversampling and undersampling, to mitigate class imbalance. | ✓ | 0.22 |
| The paper evaluates algorithm-level approaches to mitigate class imbalance. | ✓ | 0.19 |
| The paper highlights the importance of F1-score, G-mean, and MCC as evaluation metrics for assessing model performance u | ✓ | 0.24 |
| The review provides an in-depth analysis of emerging trends in the use of generative models like GANs and VAEs for data | ✓ | 0.37 |
| Challenges such as noisy data, incomplete datasets, and lack of publicly available datasets remain in the field. | ✓ | 0.27 |
| The survey concludes with recommendations for future research directions, including the need for robust methods that can | ✓ | 0.39 |

References

- <https://doi.org/10.1201/b13902>
- <https://doi.org/10.3390/rs17030454>
- <https://doi.org/10.3390/math13121923>