**ADVANCING ORAL CANCER DETECTION THROUGH INTEGRATED CNN ARCHITECTURES AND BIO-INSPIRED FEATURE OPTIMIZATION TECHNIQUE**

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**Abstract**

**Background:**

Oral cancer, ranking as the eighth most prevalent cancer in India, poses a substantial public health challenge. Early detection plays a crucial role in improving patient outcomes, emphasizing the need for accurate and efficient diagnostic tools. This comprehensive research study delves into the multifaceted challenges surrounding oral cancer detection, employing a systematic literature review (SLR) methodology.

**Review:**

A systematic examination of research papers from esteemed online libraries, including IEEE, Springer Link, and ScienceDirect. By scrutinizing recent papers, the review not only synthesizes existing knowledge but also identifies gaps in the literature, paving the way for further research and innovation in oral cancer detection. The research contributes to a comprehensive understanding of the current landscape and potential improvements in addressing security concerns, class imbalance, and optimizing feature selection methods. The amalgamation of diverse findings enriches the discourse, contributing to ongoing advancements in oral cancer detection research. The study also explores effective feature selection techniques, establishing a robust foundation for their future practical application, particularly in commercial datasets.

**Findings:**

Analyzing 15 papers on oral cancer detection revealed the use of diverse image types, including histopathological, smartphone-based, CT-scan, computer-based medical, and binary images. Future research should integrate these sources for a comprehensive approach, balancing traditional and emerging modalities to enhance model adaptability and accuracy. Accuracy assessment across different image types showed average values: 93.75% for histopathological images, 85.76% for smartphone-based images, 96.5% for CT-scan images, 91.4% for computer-based medical images, and 87.07% for binary images. This guides future research to enhance accuracy, especially for smartphone-based images. The study highlights effective feature selection techniques like CNN/ISSA, PSOBER-DBN, and metaheuristic optimization methods, establishing a robust foundation for their future practical application, particularly in commercial datasets.

**Keywords:**

Class imbalance, Metaheuristic optimization techniques, Diagnostic tools, Commercial datasets, Histopathological images, Accuracy assessment

**References:**

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