

Revolutionizing Oral Cancer Screening: AI-Powered Digital Platforms for Early Detection

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Abstract

We present a comprehensive, innovative project aimed at enhancing oral cancer screening and public health through a digital platform named AIDOC (**A**rtificial **I**ntelligence system for **D**etecting **O**ral **C**ancer). This smartphone- and web-based system leverages integrative artificial intelligence (AI) to support both self-examinations by individuals and professional evaluations by dental practitioners. Users can submit oral images via the platform, where advanced AI models analyze them to detect potential oral lesions, including oral potentially malignant disorders (OPMDs) and oral squamous cell carcinoma (OSCC). The AI system is not only identifying lesion types but also precisely delineates their boundaries. Verified by specialist dentists, the platform provides timely recommendations, ensuring patients at risk receive early diagnosis and treatment before lesions progress to advanced cancer stages. This project addresses the urgent need for scalable, efficient oral cancer screening tools, especially for underserved rural and disadvantaged populations. Current manual practices are inefficient and fail to meet the increasing demand for screening. Our platform bridges this gap by enabling seamless transfer of patient information and images from remote locations to specialists, reducing the burden on public health workers. To meet these national and global needs, we have developed new machine learning algorithms that surpass existing methods in accuracy, efficiency, and comprehensiveness, and which adhere to stringent user experience and cybersecurity requirements. With its potential to significantly improve screening throughput and early detection rates, this project represents a critical advancement in telemedicine and oral health surveillance, aligning with public health policies to reduce the mortality and morbidity associated with oral cancer globally.

Keywords: Digital Platform, Artificial Intelligence, Oral Cancer, Image Segmentation

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Education History

[Doctorate]	2015	Department of Biomedical Engineering, Case Western Reserve University, USA
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Professional Background

2023-2024	Associate Professor in Computer Engineering, Chiang Mai University, Thailand
2018-2023	Assistant Professor in Computer Engineering, Chiang Mai University, Thailand
2015-2018	Lecturer in Computer Engineering, Chiang Mai University, Thailand



Selected Awards and Honors

1.	2022-2024	The Thailand Department of Health Research Grant Recipient
2.	2020-2021	The Murata Science Foundation Research Grant Recipient
3.	2018-2019	The Thailand Research Fund Grant Recipient
4.	2014	The SPIE Medical Imaging Best Poster Award
5.	2013	The World Molecular Imaging Congress Best Poster Award



Selected Publications

1. Wongsapai M., et al., "RISKOCA: A Smartphone-Based Digital Platform for Oral Cancer Self-Examination", Studies in Health Technology and Informatics, 2024, DOI: 10.3233/SHTI240369
2. Wuttisarnwattana P., et al., "Precise Identification of Oral Cancer Lesions Using Artificial Intelligence", Studies in Health Technology and Informatics, 2024, DOI: 10.3233/SHTI240601
3. Wuttisarnwattana P., et al., "Assessment of the therapeutic role of mesenchymal stromal cells in a mouse model of graft-versus-host disease using cryo-imaging", Scientific Reports, 2023, DOI: 10.1038/s41598-023-28478-3
4. Wuttisarnwattana P., et al., "Spleen Tissue Segmentation Algorithm for Cryo-Imaging Data", Journal of Digital Imaging, 2023, DOI: 10.1007/s10278-022-00736-2
5. Wuttisarnwattana P., et al., "Automatic Stem Cell Detection in Microscopic Whole Mouse Cryo-Imaging", IEEE Transactions on Medical Imaging, 2016, DOI: 10.1109/TMI.2015.2497285