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Notice for the PhD Viva Voce Examination

Mr Kaushik Pratim Das (Registration Number: 1942054), PhD scholar at the School of Sciences, CHRIST (Deemed to be University), Bangalore will defend his PhD thesis at the public viva-voce examination on Tuesday, 20 February 2024 at 3.00 pm in Room No. 044, Ground Floor, R & D Block, CHRIST (Deemed to be University), Bengaluru - 560029.

Title of the Thesis	:	**Respiratory Motion Prediction of Lung Tumor Using Artificial Intelligence**
Discipline	:	**Computer Science**
External Examiner (Outside Karnataka)	:	**Dr Jayaraj P B** Associate Professor Department of Computer Science and Engineering National Institute of Technology Calicut, Kerala
External Examiner (Within Karnataka)	:	**Dr H S Guruprasad** Professor Department of Information Science and Engineering BMS College of Engineering Bengaluru, Karnataka
Supervisor	:	**Dr Chandra J** Professor Department of Computer Science School of Sciences CHRIST (Deemed to be University) Bengaluru - 560029 Karnataka

The members of the Research Advisory Committee of the Scholar, the faculty members of the Department and the School, interested experts and research scholars of all the branches of research are cordially invited to attend this open viva-voce examination.

Registrar

Place: Bengaluru

Date: 15 February 2024

ABSTRACT

Managing respiratory motion in radiotherapy for lung cancer presents a formidable and persistent challenge. The inherent dynamic movement triggered by respiration introduces a notable degree of uncertainty in target delineation, impacting the precision of image-guided radiotherapy. Overlooking the impact of respiratory motion can lead to the emergence of artifacts in images during image acquisition, resulting in inaccuracies in tissue delineation. Moreover, the motion between treatment fractions can induce blurriness in the dose distribution within the treatment process, thereby introducing geometric and dosimetric uncertainties. Additionally, inter-fraction motion can result in the displacement of the distribution of administered doses. Given these complexities, the precise prediction of tumor motion holds the utmost importance in elevating the quality of treatment administration and minimizing radiation exposure to healthy tissues neighboring the pertinent organ during radiotherapy. Moreover, lung cancer prognosis remains low, irrespective of the recent advancements in radiotherapy.

The strategy to expand treatment margins necessitates a trade-off, as it inevitably exposes larger volumes of healthy tissues to radiation. While there is a recognition that escalating radiation doses may yield improved results, administering higher radiation levels of normal tissues surrounding the area of interest increases the risk of radiation toxicity. In response to these multifaceted challenges, the proposed model centers on the real-time prediction of respiratory signals across varying time intervals while accounting for irregular breathing patterns for tumor delineation and the range of motion exhibited by the lung tumor. The model also facilitates the reconstruction of respiratory data into coherent breathing cycles, predicting excessive respiratory signals that surpass the acceptable range of motion. This approach curtails geometric uncertainties, refines treatment margins, enhances the precision of treatment delivery, and fosters favorable patient outcomes.

Keywords: Artificial Intelligence, Prediction, Radiotherapy, Lung Cancer, Image Fusion, Intra and Inter Fraction Motion, Respiratory Motion, Treatment Planning, Gated Radiotherapy

Publications:

1. **K. P. Das** and J. Chandra, "Nanoparticles and convergence of artificial intelligence for targeted drug delivery for cancer therapy: Current progress and challenges," Frontiers in Medical Technology
2. **K. P. Das** and C. J, "A survey on artificial intelligence for reducing the climate footprint in healthcare," Energy Nexus, vol. 9, p. 100167, Mar. 2023, doi: 10.1016/J.NEXUS.2022.100167.
3. **K. P. Das** and J. Chandra, "Imaging the Cure: Perspectives on Cancer Diagnosis (Research topic series)," Frontiers in Medical Technology (In-Progress).
4. **K. P. Das** and J. Chandra, "A Review on Preprocessing Techniques for Noise Reduction in PET-CT Images for Lung Cancer," Lecture Notes on Data Engineering and Communications Technologies. Springer Nature, 2022, pp. 455–475. doi: 10.1007/978-981-16-9113-3_34.
5. **K. P. Das** and C. J, "Multimodal Classification on PET/CT Image Fusion for Lung Cancer: A Comprehensive Survey," ECS Trans, vol. 107, no. 1, p. 3649, Apr. 2022, doi: 10.1149/10701.3649ecst.
6. **K. Pratim Das**, C. J, and D. Nachamai M, "A Review on Deep Learning Method for Lung Cancer Stage Classification Using PET-CT," in Applied Smart Health Care Informatics, John Wiley & Sons, Ltd, 2022, pp. 9–29. [Online]. doi: 10.1002/9781119743187.ch2
7. **K. Das** and C. J, "Efficient Segmentation Techniques for PET-CT Scan Image Analysis," presented at the 11th National Conference on Emerging Trends in IT, Christ University, ACM Student Chapter, 2020.