# AI enhancements in medical imaging: A breakthrough in cancer diagnosis



Artificial intelligence (AI) is increasingly being recognised for its potential to enhance medical image analysis, particularly in the realm of oncology. A recent competition, known as AutoPET, has highlighted advances in this field, demonstrating how algorithms can efficiently identify and size tumour lesions through techniques such as positron emission tomography (PET) and computed tomography (CT). Researchers from the Karlsruhe Institute of Technology (KIT) were notably ranked fifth in this international competition, which saw participation from various teams worldwide.

Medical imaging plays a vital role in accurately diagnosing cancer, necessitating precise identification of tumour location, size, and type in order to inform appropriate treatment options. PET imaging utilises radionuclides to examine metabolic processes within the body, revealing that malignant tumours typically display a significantly higher metabolic rate compared to benign tissues. This is often assessed using fluorine-18-deoxyglucose (FDG), a radioactively labelled glucose molecule. Concurrently, CT scans involve the layered examination of the body through X-ray technology to accurately visualise anatomical structures and locate tumours.

The process of determining the dimensions of cancerous lesions can be laborious, as medical professionals often need to manually mark 2D slice images. Professor Rainer Stiefelhagen, who heads the Computer Vision for Human-Computer Interaction Lab at KIT, noted that “automated evaluation using an algorithm would save an enormous amount of time and improve the results.” He, along with doctoral student Zdravko Marinov, collaborated with Professor Jens Kleesiek and Lars Heiliger from the IKIM – Institute for Artificial Intelligence in Medicine in Essen. Their collective efforts in the 2022 AutoPET competition culminated in the achievement of fifth place out of 27 teams, comprising 359 participants.

Organised by Tübingen University Hospital and the LMU Hospital Munich, the AutoPET competition tasked participants with automatically segmenting metabolically active tumour lesions identified on whole-body PET/CT scans. Teams were provided with a comprehensive annotated PET/CT dataset for algorithm training, enabling them to refine their approaches. All submitted algorithms employed deep learning methods, a sophisticated variant of machine learning deploying multi-layered artificial neural networks to uncover intricate patterns within extensive datasets.

Research findings from the competition, recently featured in the journal Nature Machine Intelligence, indicate that a collaborative ensemble of the highest performing algorithms surpassed the capabilities of individual algorithms in detecting tumour lesions. As explained by Stiefelhagen, “the performance of the algorithms in image data evaluation partly depends indeed on the quantity and quality of the data, the algorithm design is another crucial factor, for example with regard to the decisions made in the post-processing of the predicted segmentation.”

Despite the progress made, further research is deemed necessary to enhance these algorithms, reinforcing their resilience against external variations and facilitating their integration into routine clinical practice. The ultimate objective is to fully automate the analysis of medical PET and CT images, paving the way for more efficient and accurate diagnostic procedures in oncology.

Source: [Noah Wire Services](https://www.noahwire.com)

## Bibliography

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