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Deep learning approaches for cardiovascular image analysis for improved patient care

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Cardiovascular diseases are the primary cause of mortality on a global scale, and researchers throughout the globe are actively seeking ways to prevent fatalities. Prior to the emergence of deep learning, conventional machine learning approaches, such as model-based techniques such as active shape and appearance models and atlas- based methods, have shown effective performance in cardiac image segmentation. Nevertheless, these methods often need substantial feature engineering or previous information in order to get acceptable levels of accuracy. On the other hand, algorithms based on deep learning (DL) are adept in autonomously identifying complex characteristics from data to perform tasks such as object identification and segmentation. These characteristics are acquired directly from data utilizing a versatile learning technique and in a seamless manner from start to finish. DL-based methods may be readily applied to several additional image analysis applications. DL-based segmentation algorithms have gained prominence in research because of their superior performance compared to state-of-the-art approaches, due to better computer technology and increasing availability of training data. This article presents a detailed examination of several versions of U-Net and models based on transformers. We demonstrate that deep learning applied to echocardiography can detect local cardiac structures, estimate cardiac function, and predict systemic phenotypes that alter cardiovascular risk but are not easily discernible to human interpretation using variants of U-Net and a transformer-based model on a CAMUS dataset. In addition, a web application was created by incorporating the suggested model into the Python Flask web development framework.

Biography

Keerthiveena Balraj earned her Ph.D. degree from Anna University, in 2021 and has 7+ years of research experience in the field of medical image analysis. Presently, she is a postdoctoral researcher and coordinator of the data analytics division at the Centre of Excellence in Biopharmaceutical Technology, IITD. She manages research and development efforts in mobile health for heart failure, pancreatic cancer, brain tumor identification, Multivariate data analytics and video-based cardiac function monitoring.