Deep learning cardiac motion analysis for risk stratification of adverse cardiac event

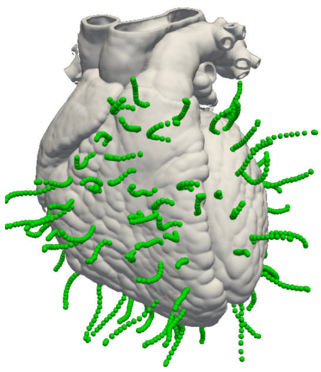
A tool for predicting risk profile in patients with pre-existing cardiac dysfunction with greater accuracy than the current gold standard.

Proposed use

This technology is suggested for use in multiple types of heart disease to predict time to adverse cardiac event.

Problem addressed

The standard method of analysing cardiac motion images captured by an MRI is to draw contours and calculate simple measures by hand. This fails to capture the complexity and scope of information that these images can provide, most specifically to determine early signs of cardiac diseases and time to adverse cardiac event.



Technology overview

The technology is a machine learning algorithm that is trained to find correspondence between heart motion and patient outcome, and which can efficiently predict risk profile and time to an adverse cardiac event.

Motion analysis is a technique used in computer vision to understand the behaviour of moving objects in sequences of images. It is possible to predict future events based on the current state of a moving 3D scene by learning correspondences between patterns of motion and subsequent outcomes. Imperial researchers used machine learning techniques to analyse the motion dynamics of the beating heart and created a network – 4Dsurvival – which predicts survival outcomes in patients with greater accuracy than clinical gold standard.

Benefits

- In a study of 302 patients, the accuracy of survival predictions for 4Dsurvival was 75%. This is significantly higher than the human benchmark of 59%

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Intellectual property information

The technology is protected by a UK priority patent application, number GB1816281.8

Link to published paper(s)

Bello, G.A., Dawes, T.J.W., Duan, J. et al. Deep-learning cardiac motion analysis for human survival prediction. Nat Mach Intell 1, 95–104 (2019). https://doi.org/10.1038/s42256-019-0019-2

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