Creating a Haptic 4D Model along with Machine Learning Analysis by Developing a Non-invasive Pressure Mapping Method to Screen Genital Skin Cancer

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Cancer is Curable, But only when it is detected in its early stages. When focusing on genital skin cancer matters become worse since factors like privacy, comforts, social hurdles and restrictions play a key role in postponing cancer detection in genital regions. Biopsy is an invasive method to accurately screen cancer, but when conducted in genital region causes pain, infection, numbness etc. Hence, our engineering goal is to screen suspicious skin lesions non invasively providing detailed analysis doctors virtually, reducing the number of times patients experience an invasion of their privacy, giving them control of the screening process, respecting their privacy and promoting early detection We developed a machine learning model, executed and deployed as a mobile app. The image of the lesion is processed and fed into our pre-trained AlexNet Deep Convolutional Neural Network (DCNN) - trained and tested with 18000 images by transfer learning and data augmentation - yielding a percentage probability report of the lesion being classified as Malignant, benign or premalignant. If malignant, further classifying them within the 5 main skin cancers. For further analysis, the patient uses a liquid gel putty pack and applies it on the lesion, which delocalizes the gel. Using gradient localization methods we map gel density against pressure to create a 3D support's file which is convoluted with the 3D STL file generated by the lesion's top image to produce a single 3D flexible printing file, when printed by the doctor gives a flexible haptic model which provides accurate tactile feedback.

Awards Won:
Fourth Award of $500