



CALIFORNIA STATE SCIENCE FAIR 2016 PROJECT SUMMARY

Name(s) Anish R. Neervannan	Project Number 36782
Project Title Modeling Deep Learning Neural Net Based Image Recognition to Classify Melanoma Better than a Trained Professional	
Abstract Objectives/Goals The purpose of this experiment was to determine if the latest artificial intelligence (deep learning neural net) image recognition algorithms had reached a level of sophistication to create a melanoma classification model (deep learning classifier) that could distinguish melanoma from other forms of skin cancer (non-melanoma) more accurately than a trained professional's classification mental model (human classifier). Methods/Materials Materials included a Windows laptop, 800 images of melanoma and non-melanoma scans collected from Lloyd-Derm, and Metamind's generic deep learning based image recognition algorithm. 640 images were used to train the computer algorithm and the remaining 160 images were used to determine the accuracy of the training. A subset of these 160 images was to a human classifier (an oncologist, a trained professional) for her to classify. Results After the deep learning classifier was trained to identify melanoma, its accuracy was compared to that of a human classifier with a controlled test sample. It was found that deep learning classifier had an accuracy of 85% and the human classifier had an accuracy of 68%. Conclusions/Discussion The deep learning classifier achieved a higher accuracy than the human classifier by a significant margin. Every year, skin cancer affects 5.4 million people in the US and costs \$8.1 billion in treatment as the diagnosis of the disease costs up to \$10000. The survival rate reduces from 94% to 15% when detected later. Detecting melanoma using the deep learning classifier is more accurate and quicker, thus positively impacting both the survival rate and the overall cost of diagnosis.	
Summary Statement Using a generic deep learning based image recognition algorithm, I created a classifier to distinguish melanoma from other forms of skin cancer with a higher accuracy than a trained oncologist.	
Help Received Dr. Swarajya Lakshmi Vemuri from Kaiser Permanente classified the medical images with her experience as an oncologist. Metamind's generic deep learning algorithm and images from Lloyd-Derm, DermNet NZ, and DermIS were used in this project.	