Siemens Competition
Math : Science : Technology
Regional Finalist

Names: Aileen Wang
High School: Aliso Niguel High School
Mentor: Dr. James Li
Project Title: *A Novel Cancer Diagnosis Framework Using Optimal Point Region Growing Segmentation and Pseudo-Zernike Moments*
(Mathematics)

Computer-aided diagnosis (CADx) has played important role for screening and early detection of cancers. The current CADx system usually needs several iterations for segmenting the lesion and requires the extraction of many features for classification. It also lacks a common framework. CADx algorithm for one type of cancers cannot be used for diagnosing another type of cancer. This project will focus on the development of a novel CADx common framework to simplify the diagnosis process and more efficiently and accurately diagnose different type of cancers in their early stages. The framework consists of automatic segmentation of a lesion using Optimal Point Region Growing Segmentation, reconstruction of the segmented lesion using Pseudo-Zernike moments, and Supported Vector Machine (SVM) classification of the lesion using the single feature, Root Mean Square (RMS) of Pseudo-Zernike moments. A comparative study among the various algorithms was performed on the selected mammographic images and dermoscopic images. The results demonstrated that the newly developed framework has over 86% average recognition rate, further improved the accuracy of Tahmasbi's CADx algorithm by 7.56%, and reduced the False Negative Rate (FNR) and False Positive Rate (FPR) by 7.24% and 3.48%, respectively. The new framework is generic and can be used for diagnosing different types of cancers.