

Siemens Competition

Math : Science : Technology

Regional Finalist

Name: Jenny Wang

High School: North Carolina School of Science and Mathematics

Mentor: Dr. Sylvain Bouix

Project Title: *Fully Automated Computational Brain Image Segmentation for Cross-Modality Analysis of Neurodegenerative Diseases*
(Bioengineering)

Biomedical image processing is becoming increasingly important for neuroscience research. Although MRI has been used extensively in clinical settings, histological images provide an informative, high resolution characterization of brain anatomy that can complement MRI data. To enable the cross-modality correlation analysis, we need to first identify the brain from the background in blockface images, which serve as the intermediary between the two modalities. Thus, this project focused on creating an automatic medical image segmentation technique, a challenging, but extremely critical computer vision procedure that will extract the 2D brain contour so that a 3D brain model can be built. We created a robust, fully automated image classification and segmentation technique that includes multi-colorspace processing and fuses together several segmentation approaches, including both pixel level processing and deformable contour models. Quantitative performance analysis validated the superior performance of our segmentation method, which had a misclassification rate of less than 1% and a high Dice Coefficient of 0.96. Overall, this robust tool allows for efficient and accurate modeling and analysis of the brain, which will help expedite the development of new techniques for the diagnosis and treatment of neurodegenerative diseases.