

2017 REU Student Amber Salome Finished Senior Thesis

Congratulations to our 2017 REU student Amber Salome finished her senior thesis based on her summer work!



Name: Amber Salome

School: Kalamazoo College

REU Project: Application of Machine Learning to Ischemic Stroke

REU Mentor: [Dr. Carroll](#)

Senior Thesis Advisor: [Dr. Michael Wollenberg](#)

Thesis Abstract:

Balloon Test Occlusion (BTO) is an elective, preoperative procedure to assess brain perfusion and function during an occlusion of the internal carotid artery (ICA). This allows physicians to determine if the patient can safely undergo subsequent surgical procedures that may temporarily or permanently block this artery. Current evaluation of BTO results involves (1) the manual assessment of kinetic features from X-ray digital subtraction angiography (DSA) and (2) perfusion features from single photon emission computed tomography (SPECT) in the middle cerebral artery (MCA) and anterior cerebral artery (ACA) watershed regions of the brain. Researchers in this study developed methods to computationally assess X-ray DSA imaging with minimal user input to calculate kinetic features, and determine perfusion values with the accuracy of manual X-ray DSA and SPECT assessment. Evaluated kinetic features include arterial arrival time (AAT), mean transit time (MTT), and peak contrast density (PCD). Additionally, values for perfusion pressure and cerebral blood flow (CBF) ratios were evaluated. Variability in AAT estimation was observed due to different standards in assessment of watershed regions of interest. Automated methods proved to accurately estimate the MTT from X-ray DSA. Most importantly, automated assessment of CBF ratios from X-ray DSA showed a strong correlation with SPECT perfusion values, and accurately predicted the perfusion based eligibility results of BTO assessment. Computational assessment of perfusion in X-ray DSA shows promise as a metric to evaluate eligibility for BTO in place of SPECT.