Unsupervised Machine Learning for Analysis of 3D In-Vitro Assays Against Radioresistant and Chemoresistant Cancers

Pralhad Itani [1], Isaac Amoah[1], Lan Peyton, Jayce Hughes, Natasha Ratnapradipa, Charlotte Block, and Dr Andrew Ekpenyong[1]

[1]Department of Physics, Creighton University, Omaha, NE 68178, USA

About 25% of cancer patients receive chemotherapy and about 50% to 60% receive radiotherapy. Yet, several cancers are both chemo- and radioresistant, such as glioblastoma (GBM). This study aims to enhance treatment outcomes for cancers exhibiting high resistance to radiation and chemotherapy by utilizing MATLAB-based unsupervised machine learning to cluster and analyze cellular and organoid imaging data. We used Electric Cell-Substrate Impedance Sensing (ECIS) to monitor cellular activities, such as adhesion, proliferation, and migration, following chemotherapy and radiotherapy. Additionally, a cloud-based platform, Axion Omni provides millions of images over time. Unsupervised machine learning in MATLAB was employed to cluster morphological changes from imaging data, identifying patterns correlating with possible treatment efficacy. 3D data acquisition is on-going and machine learning results will be presented.