**IMAGING MASS SPECTROMETRY IN DETECTING TUMOR HETEROGENEITY**

|  |  |
| --- | --- |
| Project Summary  Intratumor heterogeneity is a key factor in tumor progression, affecting patient outcomes and treatment. Tumor subpopulations can be histologically indistinguishable but still have molecular phenotypes that drive tumor progression and determine disease out-come.  The identification of the proteins that cause tumor heterogeneity is of utmost importance for understanding cancer development and the management of cancer patients.  Mass spectrometry-based proteomics is applied following isolation of the proteins from cell lysates or tissue samples by biochemical fractionation or affinity selection leading to better cancer diagnosis and treatment. | Fund   1. Amazon account to access data and deal with it 2. PC with high GPU to apply deep learning and image processing on data or Any laptop with high GPU too 3. Work station (RAM, Hard Disk, Processor … etc.) |
| Materials and Methods  Tumor-specific signatures obtained by protein matrix-assisted laser desorption MSI analysis of primary tumors of gastric cancer (n = 63) and breast cancer (n = 32) were nonlinearly mapped to a 3D space using t-SNE. Using the perceptually linear L\*a\*b color map to color each pixel according to its position in the t-SNE space. To segment the image into a discrete number of clusters, bisecting k-means and edge- correlation algorithms were applied. The resulting clusters, or tumor subpopulations, were then statistically compared with the patients’ clinical data (survival for gastric cancer and lymph node metastasis for breast cancer) to identify the subpopulations statistically associated with patient phenotype. LOPO pixel-based and patient-based classifiers were built to cross-validate the identification of tumor subpopulations and patient outcomes. | Methods Diagram |
| Team Members   |  |  | | --- | --- | | Ibrahim ElSayed  Mostafa Yehia  Donia AbdElSalam  Renad Taher  Mariem Ahmed | [Hemasayed600@gmail.com](mailto:Hemasayed600@gmail.com)  [Mustafayehia4@gmail.com](mailto:Mustafayehia4@gmail.com)  [Donia.199887@gmail.com](mailto:Donia.199887@gmail.com)  [Renad.taher12@gmail.com](mailto:Renad.taher12@gmail.com)  [Mariem.ahmed.1608@gmail.com](mailto:Mariem.ahmed.1608@gmail.com) | | Expertise   * Improving Deep Neural Network (Coursera)  Neural Network (Coursera)  * Sequence Models (Coursera)  * Introduction to Data Visualization with ggplot2 (Datacamp)  * CNN (Coursera)  * Machine Learning (Andrew - Coursera)  Computer Vision Basics (Coursera)  * Machine Learning with Python (Coursera)  Machine Learning Foundations: A Case Study Approach (Coursera)  * Front-End Web UI Frameworks and Tools: Bootstrap 4 (Coursera)  * Embedded Systems |