

Colorado Science and Engineering Fair

2024 Team Project Abstract Form

Please print 2 copies of the completed form. Sign both copies, keep 1 for your notebook and submit 1 copy to your Regional Fair Director with your other paperwork.

Title of Project: G.L.O.W: A Novel Hybrid Neural Network Approach for Glioblastoma Localization Using Carcinogenic Oxidative Stress Biomarkers

Team Leader's Name: Julia Gao

Team Member 1: Om Vegesna

Team Member 2:

School and City: Fairview High School, Boulder

Sponsor's Name: Ella Tommer

Category: Biomedical & Health Sciences (BMED)

Division: Senior (9th - 12th grades)

Abstract (250 words or less):

Oxidative stress is a precursor to numerous malignant cancers, such as glioblastoma multiforme, the most dangerous brain cancer. However, precise identification of oxidative stress biomarkers remains incomplete. We originally sought to map the glycolysis enzyme and oxidative stress marker, glyceraldehyde-3-dehydrogenase (GAPDH), in the brain after simulated radiation effects.

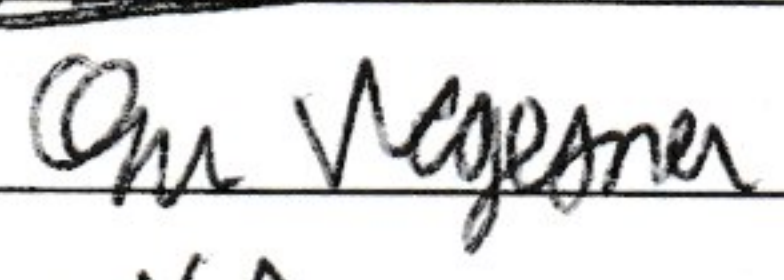
We obtained high Optical Density readings post-radiation which suggest rapid cell proliferation. In addition, GAPDH expression was 315% higher, indicating the cells had become cancerous. We then developed a hybrid neural network for glioblastoma localization using our identified carcinogenic oxidative stress biomarkers for early detection of tumors as small as 8 μm . With multi-modal imaging from QUEST MRIs, the model uses 3D rendering to identify tumor location, size, and growth rate. Our hybrid architecture processes 100 epochs of 64 batches efficiently and accounts for genomic data to uncover new pathways for development. Additionally, this novel approach of inferring cancer from oxidative stress allows us to detect invisible minuscule tumors, granting strong functionality for this new method of cancer diagnosis. Our model, the Glioblastoma Localization and Optimization Workbench (G.L.O.W.) is 96% accurate and consistent across all brain regions according to the Precision Report.

G.L.O.W. could be adapted for the whole body and be refined with clinical trials and integration of genomics. Our approach enables us to locate tumors with high accuracy for early treatment, all while being cost-effective and time-efficient. Our results are encouraging, potentially revolutionizing early cancer diagnosis and saving thousands of lives from cancer.

We hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. We also attest that the above properly reflects our own work.

Team Leader's Signature: 

Date: 02/28/2024

Team Member 1's Signature: 

Date: 02/28/2024

Team Member 2's Signature: N/A

Date: _____

In addition, all students must complete the ISEF Student Checklist (1A), Research Plan, Approval Form (1B), and Checklist for Adult Sponsor (1), and any other ISEF forms required for this type of project. See the International Rules and Guidelines for form requirements. Return COPIES of all of these forms to your Regional Fair Director with your Finalist Verification/Permission Form. A signed copy of this form must be included in your notebook.