Science Fair 2025-2026 Logbook

September 30, 2025:

To Do:

- ☐ Brainstorm Project Ideas
- ☐ Figure out Specific Categories of Interest

Today, I began brainstorming ideas for a science fair project that would be impactful and medically relevant. I also listed major categories that I would be interested in researching, coming up with medicine, health sciences, computer science, and engineering.

October 5, 2025:

To Do:

- ☐ Finalize General Idea
- ☐ View Past Projects for Reference

I continued brainstorming project ideas keeping my categories of interest in mind. To help and get inspiration, I looked at some past projects at CYSF that were in the same categories I wanted to research. In the end, I figured out that I wanted to do something related to lung cancer.

October 12, 2025:

To Do:

- ☐ Start Researching Lung Cancer
- ☐ Continue Narrowing Down Ideas

I started researching lung cancer and problems with diagnosing/treating it. One article I found explained that one of the reasons it was hard to treat was because while the lungs move to breathe, the tumour moves, making radiation therapy difficult and even inaccurate. I found this interesting, and started thinking about how to make my project related to this.

October 18, 2025:

To Do:

- ☐ Finalize Project Idea
- ☐ Fill Out First Half of “Basic Project Info” on CYSF

Today, I finalized my project idea, deciding that I would be innovating something with AI to help predict tumour movements in the lungs. With this general concept, I filled everything on the “Basic Project Info” except for the brief description.

October 25, 2025:

To Do:

- ☐ Finalize Full Research Question
- ☐ Plan Out Full Project

I finalized my research question: “Can a ConvLSTM-based system accurately predict lung tumor motion in order to improve radiation targeting compared to delayed targeting?” I also decided my project would use a ConvLSTM neural network to predict lung tumor motion using sequences of 4D CT scan images.

November 14, 2025:

To Do:

- ☐ Start Background Research By Finding 3 Relevant Sources
- ☐ Read and Annotate Sources
- ☐ Write Bullet Points on Main Ideas Learned

Today, I found three articles that discuss the main concept of my project: lung tumours and their movement. I read thoroughly through all three sources, and took notes on important points.

November 25, 2025:

To Do:

- ☐ Continue Background Research Through Finding 10 More Sources
- ☐ Note Big Concepts and Main Ideas

Today, I made drastic progress on my background research. I found ten more sources, including past projects on lung cancer and more information on the movement of lung cancer. I also had my mentor, Audrey, look over my research for depth and advice.

December 12, 2025:

To Do:

- ☐ Finalize Background Research With At Least 5 More Sources
- ☐ Annotate and Write Important Concepts

I finally finished the last portion of my background research with seven more sources. With all the links and websites, I was able to start the first half of my works cited page.

December 27, 2025:

To Do:

- ☐ Finish Basic Project Info
- ☐ Start Ethics Due Care 2A

Today, I finished the “brief description” portion of the Basic Project Info section, along with the fact I started my ethics form. Specifically, I finished off the purpose and description portion in detail. I need to finish the rest as soon as possible to start my innovation.

December 29, 2025:

To Do:

- ☐ Finish Ethics Form

To start my project as soon as possible, I needed to finish my ethics. I did exactly that today, completing the remaining portion of the ethics form. Now, I need to wait for approval before starting the first phase of my project.

January 3, 2026:

To Do:

- ☐ Acquire 4D CT scan dataset from The Cancer Imaging Archive
- ☐ Organize files by patient and phase

My final ethics form was finally approved, which started the first part of my project, which is the preprocessing section. Today, I downloaded a dataset containing 4D CT scans of 10 patients from The Cancer Imaging Archive. I organized each patient's data into the number of respiratory phases and slices, so that I could later identify the slices containing the tumor for preprocessing.

January 14, 2026:

To Do:

- ☐ Identify slices with largest tumor cross-section
- ☐ Crop images to 128x128 pixels

Today, I went through each patient's scan and located the slice with the largest tumor cross-section across every phase. I cropped these slices to a 128x128 pixel area to focus on the tumor and remove irrelevant background tissue.

January 28, 2026:

To Do:

- ☐ Construct input sequences for ConvLSTM
- ☐ Define target outputs

I structured the dataset so that the first nine phases of each patient became the input sequences (X) for the ConvLSTM. The 10th phase was defined as the target output (Y), representing the tumor's future position that the model would predict.

January 31, 2026:

To Do:

- ☐ Build ConvLSTM model in Python
- ☐ Specify filters and layers

Today, I set up and coded my entire ConvLSTM model in Python. I built 16 layers and implemented a ConvLSTM input and Conv2D output layer. With my model completed, I should be able to start testing and training it soon to obtain my data.

February 3, 2026:

To Do:

- ☐ Train model on first patient
- ☐ Visualize predicted tumor positions

I trained the model on patient 1 and tracked the loss over 50 epochs. I visualized the predicted tumor positions in green and actual positions in red. I also added the delayed position in blue. Overall, the test ran well and the predicted position became much closer than the delayed position, showing my model was effective.

February 15, 2025:

To Do:

- ☐ Train model on remaining patients
- ☐ Standardize preprocessing

I trained the ConvLSTM model on the other nine patients. Again, the model successfully predicted closer than the delayed position. However, there were two outliers in patient 4 and patient 10. I observed that this was because the tumour motion was less drastic for these two people.

February 16, 2026:

To Do:

- ☐ Compare predictions to delayed targeting control
- ☐ Compute MAE (Mean Absolute Error)

Using the information obtained the previous day, I calculated the mean absolute error for each patient. As a whole, the mean error for the predicted position was drastically less than that of the delayed position, which was very good news to show that my model was effective. From here, I need to make my data graphs and complete the visualization part.

February 18, 2026:

To Do:

- ☐ Generate overlay images for visualization
- ☐ Annotate tumor movement

Today, I created all my Mean Absolute Error graph in Matplotlib. I also saved the picture for visualization of my model.

February 20, 2026:

To Do:

- ☐ Organize results for presentation
- ☐ Finalize analysis visuals

I compiled all overlay images, error graphs, and phase diagrams for the trifold. I added annotations and legends to make the visuals clear and easy to interpret.

February 22, 2026:

To Do:

- ☐ Finish Problem, Method, and Analysis portion of the CYSF portal
- ☐ Start Planning Out My TriFold on Canva

Today, I mainly focused on my portal. I wrote the problem and method portion for the website, as well as the analysis. Additionally, I sectioned out my trifold and ended up putting my title at the top of the poster.

February 23, 2025:

To Do:

- ☐ Finish the Conclusion, Citations, Acknowledgement, and Declarations part of the portal.
- ☐ Plan out final design on Canva, utilizing colour scheme to print out as soon as possible at Staples

Again, I focused a huge chunk of time today to finalise my portal. Now, the only sections left are the presentation and logbook, which can be done as soon as my trifold is finished. On the note of trifolds, I finished the rough design of my trifold on Canva. I will get my mentor to look over this as soon as possible for feedback.

February 26, 2026:

To Do:

- ☐ Print Trifold
- ☐ Start Planning and Practicing Script

After getting approval from my mentor, I placed an order for a 48x36 sized poster at Staples. Pickup will be tomorrow, where I will start rehearsing. I also wrote the first portion of my script that I will start practicing as soon as possible.

February 27, 2026:

To Do:

- ☐ Finalize Logbook and Citations
- ☐ Finalize CYSF Presentation and Attachments
- ☐ Finish Script and Start Rehearsing

Today, I finalized many of the major necessities for my project. I completely finished my portal, as well as my script. I read over my script three times, but I definitely need to practice more before the presentation.

February 28, 2026:

To Do:

- ☐ Time full presentation
- ☐ Final adjustments

I ran through the full 5–10 minute presentation multiple times to ensure it flows naturally and covers technical details, results, and real-life implications. I made minor adjustments to the wording and slides to improve clarity.

March 1, 2026:

To Do:

- ☐ Final Script Rehearsal
- ☐ Prepare for judges' questions

I finalized the trifold layout, ensuring all sections were complete and visually appealing. I practiced answers for questions about datasets, AI model performance, and clinical impact.