Science Fair Project

2024 - 2025

Emaan Khosa & Gurshaan Singh

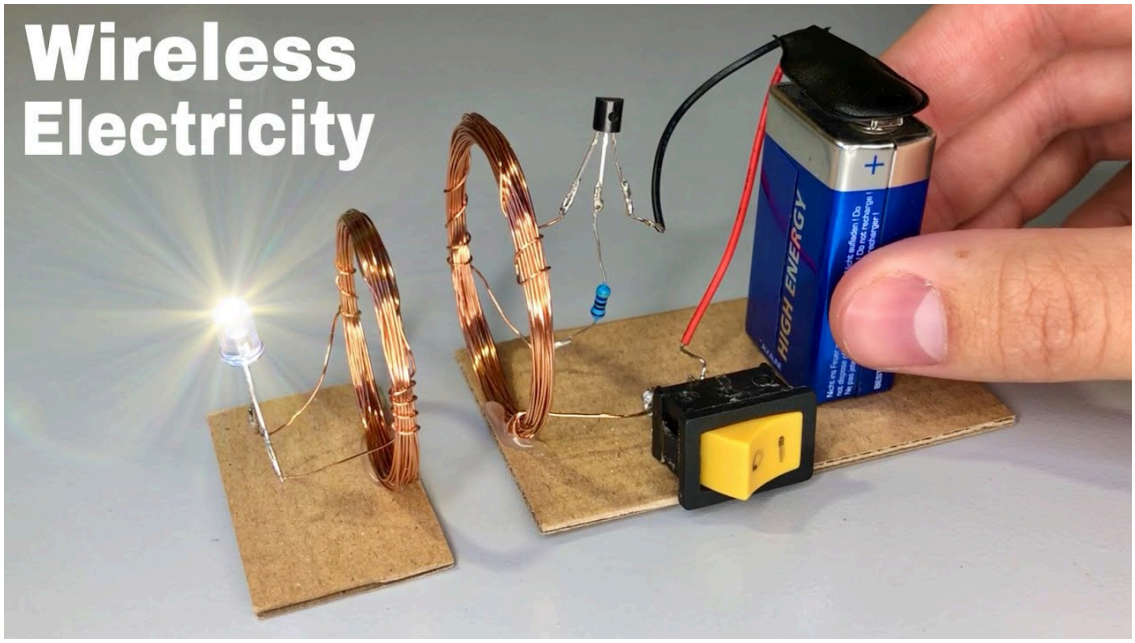
Gobind Sarvar School Calgary

Timeline

End of December 2024 - January 8, 2025:

During this period, we researched potential project ideas for our science fair project. Some ideas we were interested in included Artificial Intelligence in health, particularly using machine learning to predict thyroid cancer recurrence, Password Security and Hacking or Wireless Energy Transfer.

We specifically focused on building a wireless energy transfer system that was able to light an LED.



After discussions with our science teacher on January 8, we decided to pursue using machine learning to predict thyroid cancer recurrence. We chose this topic due to its relevance in both AI advancements and the healthcare field as well as it being a contemporary topic in society.

January 8 - January 24, 2025:

We dedicated this time to heavy research analysis and learning about thyroid cancer, focusing on how machine learning could be applied to predict its recurrence. We conducted the experiment using a shared Python environment on Google Colab, which helped us collaborate remotely. Throughout this process, we sought continuous feedback from our science teacher. A challenge we faced was communication, as one of our team members traveled to India. Despite this, we kept sharing ideas and updates online.

Timeline of our Topics to Research (tentative)

- ☐ **What is Thyroid Cancer? (Jan. 8, 2025)**
- ☐ **What is Thyroid Cancer Caused By? (Jan. 8, 2025)**
- ☐ **Does Thyroid Cancer Spread Quickly? (Jan. 9, 2025)**
- ☐ **What are the Thyroid Cancer Stages? (Jan. 10, 2025)**
- ☐ **What's the Thyroid Cancer Survival Rate? (Jan. 11, 2025)**
- ☐ **Thyroid Cancer Recurrence: Why does Thyroid Cancer Return? (Jan. 12, 2025)**
- ☐ **Role of Diet and Lifestyle in Thyroid Health: (Jan. 12, 2025)**
- ☐ **What is Artificial Intelligence? (Jan. 13, 2025)**
- ☐ **What is Machine Learning? (Jan. 14, 2025)**
- ☐ **Managing Recurrence (Jan. 15, 2025)**
- ☐ **Applications of Machine Learning in Cancer Diagnosis (Jan. 16, 2025)**
- ☐ **Pros and Cons of Machine Learning (Jan. 17, 2025)**
- ☐ **How does Machine Learning Work? (Jan. 18, 2025)**
- ☐ **Types of Machine Learning (Jan. 19, 2025)**
- ☐ **What are some Factors that may Increase the Risk of Thyroid Cancer Recurrence? (Jan. 20, 2025)**
- ☐ **How might the use of Machine Learning Models like Random Forests Improve the Personalization of Follow-Up care for Thyroid Cancer Patients? (Jan. 21, 2025)**
- ☐ **What are some Drawbacks of using Decision Trees, and how do Random Forests Address these Issues? (Jan. 22, 2025)**
- ☐ **Why might it be Beneficial to Focus on the Top Three Factors for Predicting Thyroid Cancer Recurrence instead of using all Available Tests? (Jan. 23, 2025)**
- ☐ **What are Potential Ethical Considerations when using Machine Learning in Healthcare? (Jan. 24, 2025)**

Near the end of January, we also began our experimental method and analysis. Our machine learning model worked through the use of random forest classifiers that used a pre-processed set of patient records data with numerous features to predict the recurrence of their cancer. The recurrence we realized was based on a number of factors. Through constant manipulation of our code, we were finally able to decipher the main contributing factors for thyroid cancer recurrence. Among these factors were the following:

- Response rate to effective treatment

- Nodes
- Adenopathy
- Smaller factors: age and gender differences.

We used the matplotlib function to generate these results and display them in a tabular format, as shown on our trifold.

January 24 - February 1, 2025:

In these final days, we focused on proofreading and editing our presentation, making last-minute adjustments. In addition to our feedback from our science teacher, I also received direct revision and feedback from my sister. We also received our trifold and began preparing the final details for our display. Additionally, we started rehearsing for our presentation, ensuring we were prepared to cover the key topics effectively.