Lesson Title / Topic

Detecting Diseases Using Machine Learning

Content Area(s)

Computer Science (Machine Learning)

Grade Level(s)

10 -12

MN Science Standards

Ecosystems: Interactions, Energy, and Dynamics

9L.2.2.1.2 Use a computational model to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.** (P: 5, CC: 5, CI: LS2)

Student Objectives

Upon completion of this lesson, the student will be able to:

- Explain what a machine learning model is
- Implement a machine learning model to detect diseases from images

Materials

- A computer with access to Google Colaboratory. Google Colab is accessible on an internet browser and only needs a Google account to function. (Keep in mind that each account has a limited amount of GPUs, so keep the datasets used in a smaller range, about 50 images).
- Any publicly available datasets containing images with diseases. Select a specific disease based on students' interests or course curriculum. Download the data as either XML files or images from the sites below:
    - https://kaggle.com
    - https://data.gov
    - https://data.census.gov/
    - https://datasetsearch.research.google.com/

- Background information on how to create a machine learning model and implement a dataset on Google Colab can be found here: https://techzizou.com/training-an-ssd-model-for-a-custom-object-using-tensorflow-2-x/

Time Required

60 - 90 min.

Procedures

1. Ensure that each student has a fully charged computer and access to Google Collaboratory.
2. Walk students through the basics of machine learning models and their purpose.
3. Have students identify a desired dataset and download the dataset.
4. Open Google Colaboratory and use the following sample code: https://github.com/Lakshika146/Cataract_Prediction_App/blob/main/cataractPrediction.ipynb
5. Have students experiment with model-building features, such as the number of max pooling, batch normalization, kernel size, and so on. Make sure the students note their findings.
6. Have students share their findings. Discuss ways to code such models to solve real-life problems. Example: Detection of diseases for people in impoverished locations with no access to medical care.

Additional Suggestion

Creating a machine learning model for the first time can be challenging and may take longer than intended. Give students lots of encouragement and positive feedback.

Credit

Lakshika Nanda Kumar Reddy, Math and Science Academy, Class of 2024, developed this lesson.