Cancer Sentry

Project BMED-0133-JR-T

Problem / Question

We are answering the problem of a leading cause of death in countries around the world and among both genders, Lung Cancer.

Engineering Goal

- The AI will detect chances of lung cancer at an earlier stage by using symptom analysis , leading to improved patient outcomes and survival rates of lung cancer.
- We know that the AI is able predict if you have lung cancer or not with a high accuracy of over 90%, so this can be used to leverage people who are unsure about their symptoms to get medical assistance so the lung cancer can be caught early.

Variables

Controlled variables	Independent variable	Dependent variable
• Our controlled variable was how we predicted if you had lung cancer or not/our AI.	• The independent variable in our project was the symptoms.	• Our dependent variable was whether you have a high chance of lung cancer or low chance.

Background Research

We were looking for what language to use for this project, and we found a certain library in python that let us do this project very easily. Another thing we had to research was credible data, we found this credible data from a certified user on one of the largest machine learning databases in the world. We also had to find out the best practices for survey development so that we didn't have as much biases in our survey. Then we had to decide whether we wanted to make it for the general population or a certain demographic, but in the end we decided to make it for the general population.

Materials

Quantity (detailed list)	Materials (be specific)
Kaggle, 1	Dataset
Laptop, 3	Workspace
VScode, 1	IDE

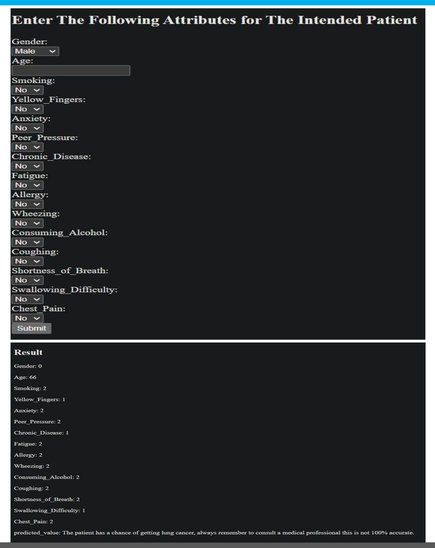
Procedure

1. Input user data into website
2. Click submit
3. Get result
4. Write down if accurate, false positive, false negative, true positive, or true negative.
5. Rinse and repeat.

Data / Observations

- The AI seems to have a bias with people older than the age of 45 when the user is male
- Drinking alcohol is another bias the AI tends to have
- The AI's real world accuracy is lower due to some symptoms being inputted wrong
- If inputted correctly the AI has a higher accuracy rate than predicted by our code. We sampled 20 patients and 19 of them were true positives and only one was a false negative.

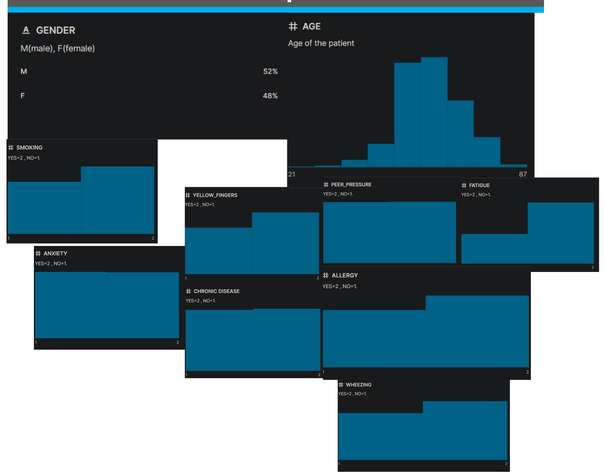
Photos



Charts

[Link to Spreadsheet]

Graphs



Results

- Tool to help user decide and get a formal screening for lung cancer
- Increases chances of early detection
- Increased awareness of lung cancer symptoms/causes

Conclusion

- We discovered that our AI had an accuracy of 90.32258064516129%
- The problem we tried to solve with this AI was catching lung cancer early and reducing death rates by doing that. The AI has a high accuracy that can do many surveys at once without declining in efficiency. The results made us happy that we made a tool to help people in dealing with lung cancer. We did achieve our goal and we are happy. Our project matters due to lung cancer being among the leading causes of death in the world, if we can help catch it early it will reduce death rates significantly. An applications of our findings is that it can be used by a person on the internet unsure if they have lung cancer or not prompting them to find medical help.

Works Cited

Bhat, M. A. (n.d.). Your machine learning and Data Science Community. Kaggle. https://www.kaggle.com/datasets/mysarahmadbhat/lung-cancer/

GitHub Copilot. (n.d.). program documentation. Retrieved 2023,.

Google. (n.d.). Google. https://bard.google.com/

Singhal, S. (n.d.). Mr. Sandeep Singhal. Round Rock.

Photo Credit

All photos were taken by use but the graphs were given by:

Bhat, M. A. (n.d.). Your machine learning and Data Science Community. Kaggle. https://www.kaggle.com/datasets/mysarahmadbhat/lung-cancer/

Project Board Rules

- A virtual project board must be uploaded prior to the deadline set for the fair.
- All ISEF Display and Safety Rules must be followed as well as any additional rules below.
- Students are allowed three 48” x 36” slides.
- The first slide should be modeled after a science fair board (see example on previous slide) and include all key information including Problem/Question, Hypothesis or Engineering Goal, Background Research, Materials, Procedure, Data, Results, and Conclusion.
- The Project # must be displayed under the Project Title on slide 1. This will be assigned in STEM Wizard after SRC is complete.
- The example project board on the previous slide may be used by students. Formatting to change colors, text box sizes, move panels, etc. is acceptable. We want this to be your board. Just make sure to follow the rules as to what needs to be included.
- The first slide must include a Photo Credit that gives credit for all photos, images, and graphics on the slides.
- The second slide may include any supporting information for the project such as additional photos, charts, and graphs.
- The third slide must include the Official SRC Abstract from STEM Wizard as well as Form 1C (Regulated Research Institutional/ Industrial Setting Form) and Form 7 (Continuation/ Research Progression Projects Form) if required for your project.
- Font on the boards must be 16pt or larger.
- If slides contain photographs with people other than the researcher, the researcher must have photo releases available upon request.
- The first two slides may NOT include an abstract. Only your official abstract should be included on slide 3.
- The slides may NOT include any animations or videos. However, you can add a link to a video. It is up to the judges on whether or not they view the video.
- The slides may NOT include any offensive or inappropriate images or photographs.
- The slides may NOT include any reference to an institution or mentor that supported the work or to any patents pending other than what is displayed on Form 1C on slide 3.
- The slides may NOT include any personal information such as email address, home address, phone number, or social media contacts.

Extra Slide

How will you conduct the experiment?

- We have a sample dataset of actual patients and the results of whether or they didn’t have lung cancer
- The dataset has multiple symptoms which could help determine chances of lung cancer.
- In machine learning there is an algorithm called logistic regression which can be applied to this dataset to create a machine learning model.
- After that we have created a simple UI to accept various symptoms and use the model to predict the chances of having lung cancer.

How did we make the experiment?

We have a sample dataset of actual patients and the results of whether or they didn’t have lung cancer

The dataset has multiple symptoms which could help determine chances of lung cancer.

In machine learning there is an algorithm called logistic regression which can be applied to this dataset to create a machine learning model.

After that we have created a simple UI to accept various symptoms and use the model to predict the chances of having lung cancer.

-

Project Forms

Instructions

- ALL Projects must display the Official SRC Abstract from STEM Wizard as well as Form 1C (Regulated Research Institutional/ Industrial Setting Form) and/or Form 7 (Continuation/ Research Progression Projects Form) if required for your project.
- In order to insert the documents on this slide, you will have to convert them to jpgs. You can use Adobe Acrobat, the Snip Tool, or any online conversion tool.
- After inserting the documents on this slide, make sure that the forms are still clear enough to be read by the judges.

Abstract

Abstract: Greater Austin Regional Science and Engineering Fair

Lung Cancer AI

Samarth Singhal, Nihal Takalkar, Swar Patel

James Garland Walsh, Round Rock, Texas, United States of America

Lung Cancer is a leading cause of cancerous deaths around the world. Early diagnosis and detection are important so that we can improve survival rates. AI has come out as a promising tool for lung cancer detection, in a way that a person who suspects that they have lung cancer at home can take a survey to see the likelihood of them having it. Our survey will tell them if it is likely or not, but still tell them to get medical help if they suspect they have lung cancer.

Category
Choose only one

- ☐ Animal Sciences (ANIM)
- ☐ Behavioral & Social Science (BEHA)
- ☐ Biochemistry (BCHM)
- ☐ Biomed & Health Science/Biomedical Engineering (BMED)
- ☐ Cellular and Molecular Biology (CELL)
- ☐ Chemistry (CHEM)
- ☐ Earth and Environmental Sciences (EAEV)
- ☐ Embedded Systems (EBED)
- ☐ Energy: Sustainable Materials and Design (EGSD)
- ☐ Engineering Technology: Statics and Dynamics (ETSD)
- ☐ Environmental Engineering (ENEV)
- ☐ Materials Science (MATS)
- ☐ Mathematics (MATH)
- ☐ Microbiology (MICRO)
- ☐ Physics and Astronomy (PHYS)
- ☐ Plant Sciences (PLNT)
- ☐ Systems Software (SOFT)
- ☐ Translational Medical Sciences (aka Disease Studies) (TMED)

1. As a part of this research project, the student directly handled, manipulated, or interacted with (check all that apply):
   ☐ human participants ☐ potentially hazardous biological agents
   ☐ vertebrate animals ☐ microorganisms ☐ rDNA ☐ tissue
2. This abstract describes only procedures performed by me/us, reflects my/our own independent research, and represents one year's work only.
   ☐ yes ☐ no
3. I/We worked or used equipment in a regulated research institution or industrial setting.
   ☐ yes ☑ no
4. This project is a continuation of previous research.
   ☐ yes ☑ no
5. My display board includes non-published photographs/visual depictions of humans (other than myself)
   ☐ yes ☑ no
6. I/We hereby certify that the abstract and responses to the above statements are correct and properly reflect my/our own work.
   ☑ yes ☐ no

GARSEF

Form 1C (If Required)

Regulated Research Institutional/Industrial Setting Form (1C)
This form must be completed AFTER experimentation by the adult supervising the student research conducted in a regulated research institution, industrial setting or any work site other than home, school or field.

Student's Name(s) _____

Title of Project _____

To be completed by the Supervising Adult in the Setting (NOT the student(s)) after experimentation: (Responses must be on the form as it is required to be displayed at student project; please do not print double-sided.)

The student(s) conducted research at my work site:

1. Did you or your proxy (e.g. graduate student, postdoc, employee) mentor or provide substantial guidance to the student researcher? ☐ Yes ☒ No
   a. If no, describe your and/or your institution's role with the student researcher and his/her project (e.g., supervised use of equipment on occasion, providing mentorship and sign below.
   b. If yes, complete questions 2-5.
2. Is the student's research project a subset of your ongoing research or work? ☐ Yes ☐ No
   Use questions 3, 4 and 5 to detail how the student project was similar and/or different from ongoing research or work at your site. If this project is under a grant and needs to be acknowledged, please list the grant statement here.
3. Describe the independence and creativity with which the student:
   a. developed the hypothesis or engineering goals for the research project
   b. designed the methodology for his/her research project
   c. analyzed and interpreted data

Regulated Research Institutional/Industrial Setting Form (1C) Continued

Student's Name(s) _____

(Continued on next page)

4. Detail the student's role in conducting the research (e.g. data collection, specific procedures performed). Differentiate what the student observed and what the student actually did.
5. Did the student(s) work on the project as part of a group? ☐ Yes ☐ No
   If yes, how many individuals were on the group and who were they (e.g. high school students, graduate students, faculty, professional researchers)?

I attest that the student has conducted the work as indicated above and that any required review and approval by institutional regulatory board (IRB/IACUC/IBC) has been obtained. Copies are attached if applicable. I further acknowledge that the student will be presenting this work publicly in competition and I have communicated with the student research regarding any requirements for my review and/or restrictions of what is publicized.

Supervising Adult's Printed Name | Signature | Title

Institution | Date Signed (must be after experimentation) (mm/dd/yy)

Address | Email/Phone

Form 7 (If Required)

Continuation/Research Progression Projects Form (7)
Required for projects that are a continuation/progression in the same field of study as a previous project. This form must be accompanied by the previous year's abstract and Research Plan/Project Summary.

Student's Name(s) _____

To be completed by Student Researcher: List all components of the current project that make it new and different from previous research. The information must be on the form; use an additional form for previous year and earlier projects.

Components	Current Research Project	Previous Research Project: Year: _____
1. Title		
2. Change in goal/ purpose/objective		
3. Changes in methodology		
4. Variable studied		
5. Additional changes		

Attached are:
☐ Abstract and Research Plan/Project Summary, Year _____

I hereby certify that the above information is correct and that the current year Abstract & Certification and project display board properly reflect work done only in the current year.

Student's Printed Name(s) | Signature | Date of Signature (mm/dd/yy)