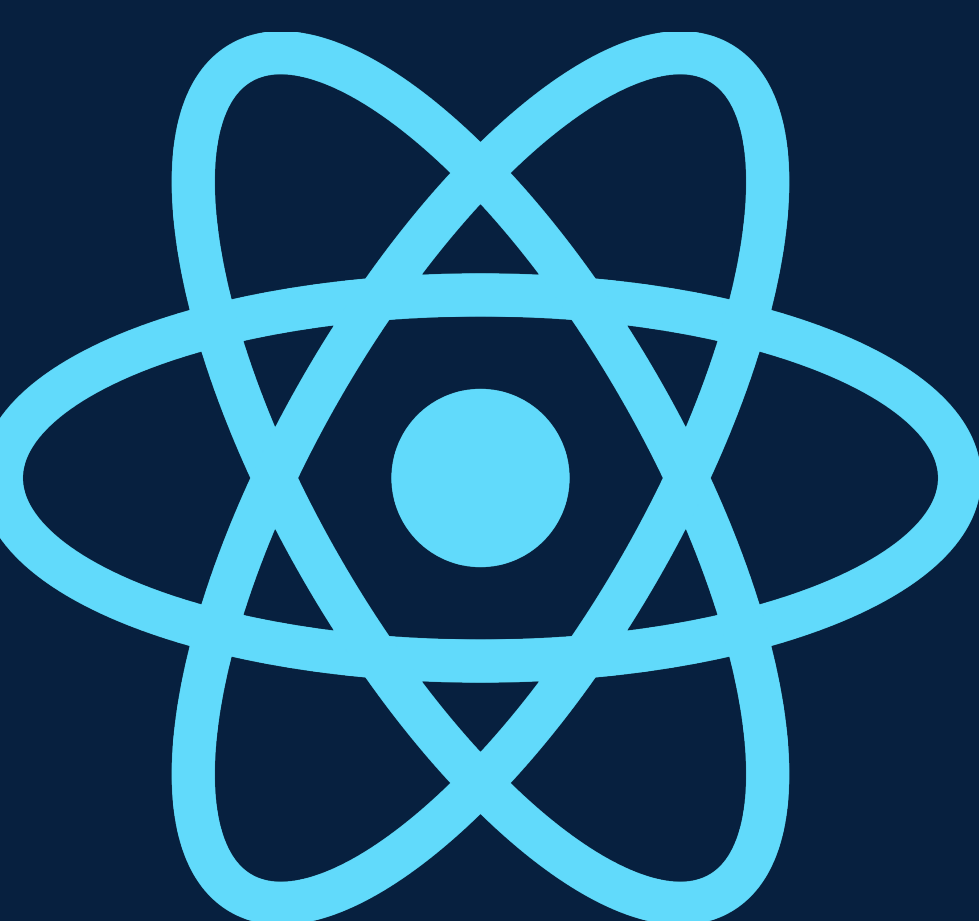


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Spring 2023 Capstone II Project

Computer Aided Diagnosis of Chest X-ray Images

Students: Robert Calistri

Mentor: Ananda Mondal, TA: Masrur Sobhan

Instructor/Faculty: Masoud Sadjadi, Florida International University

PROBLEM

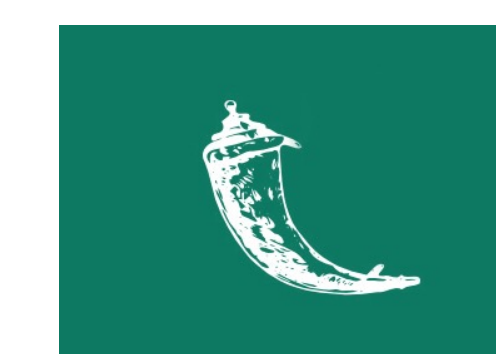
During the COVID-19 pandemic, the sheer volume of patients requiring testing created a large problem for the healthcare field. The turnaround time for diagnosing individuals with COVID was long and made it difficult to prevent the spread of the disease. From this experience, it became transparent that a more efficient diagnostic system could have prevented the scale of the pandemic, and saved lives. The program developed in this project aimed to solve this problem, by utilizing machine learning and artificial intelligence to create a virtual diagnostic system.

CURRENT SYSTEM

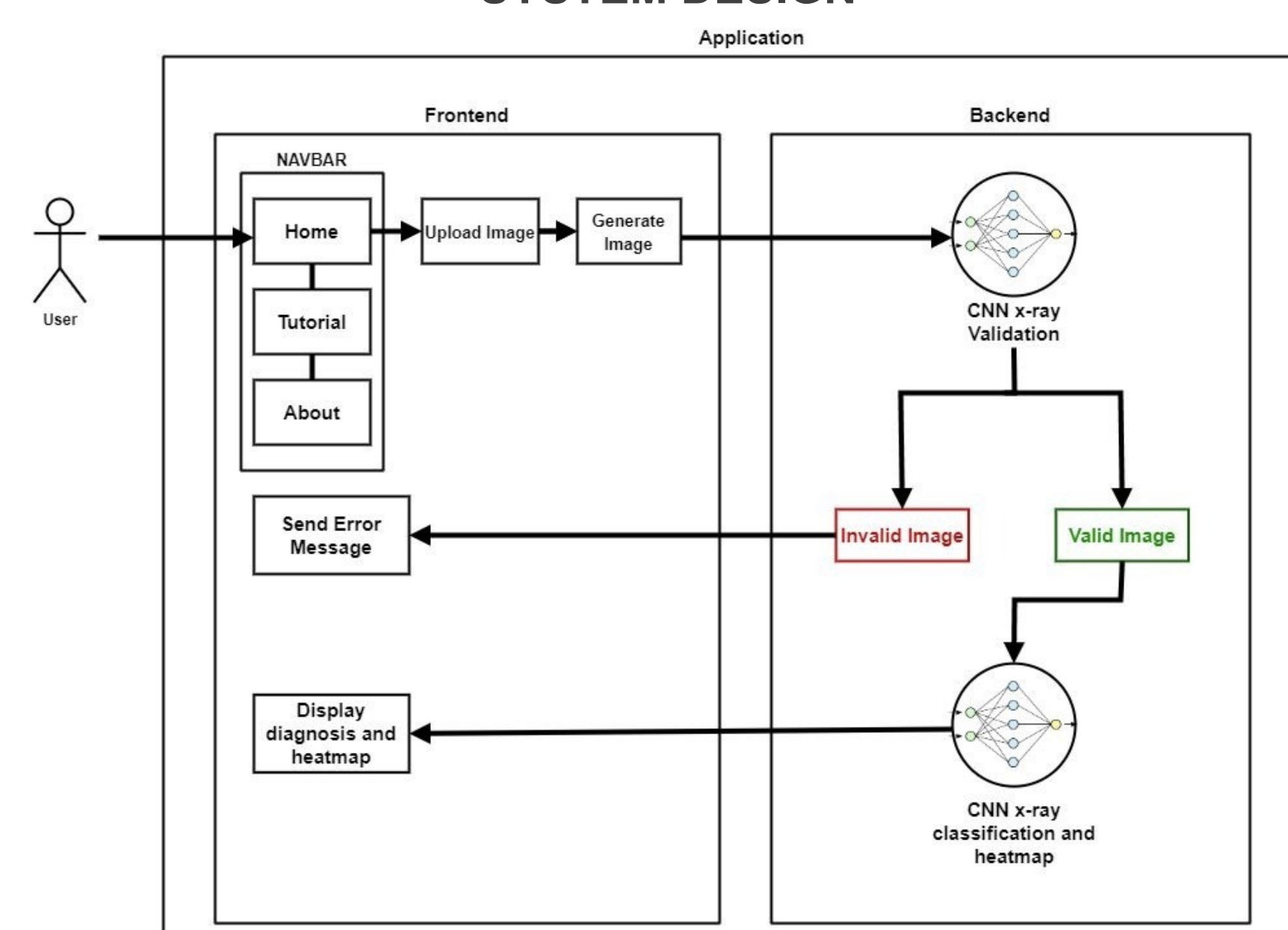
The pre-existing diagnostic tool was designed with efficiency in mind, using DenseNet-121, a powerful Convolutional Neural Network model type. The current system takes an x-ray image as input and processes the image using a model that was created by analyzing thousands of x-ray and non-x-ray images. The system then outputs a prediction of the diagnosis of the uploaded x-ray image, along with a heatmap of the image, showing the areas that helped the program make its prediction.

REQUIREMENTS

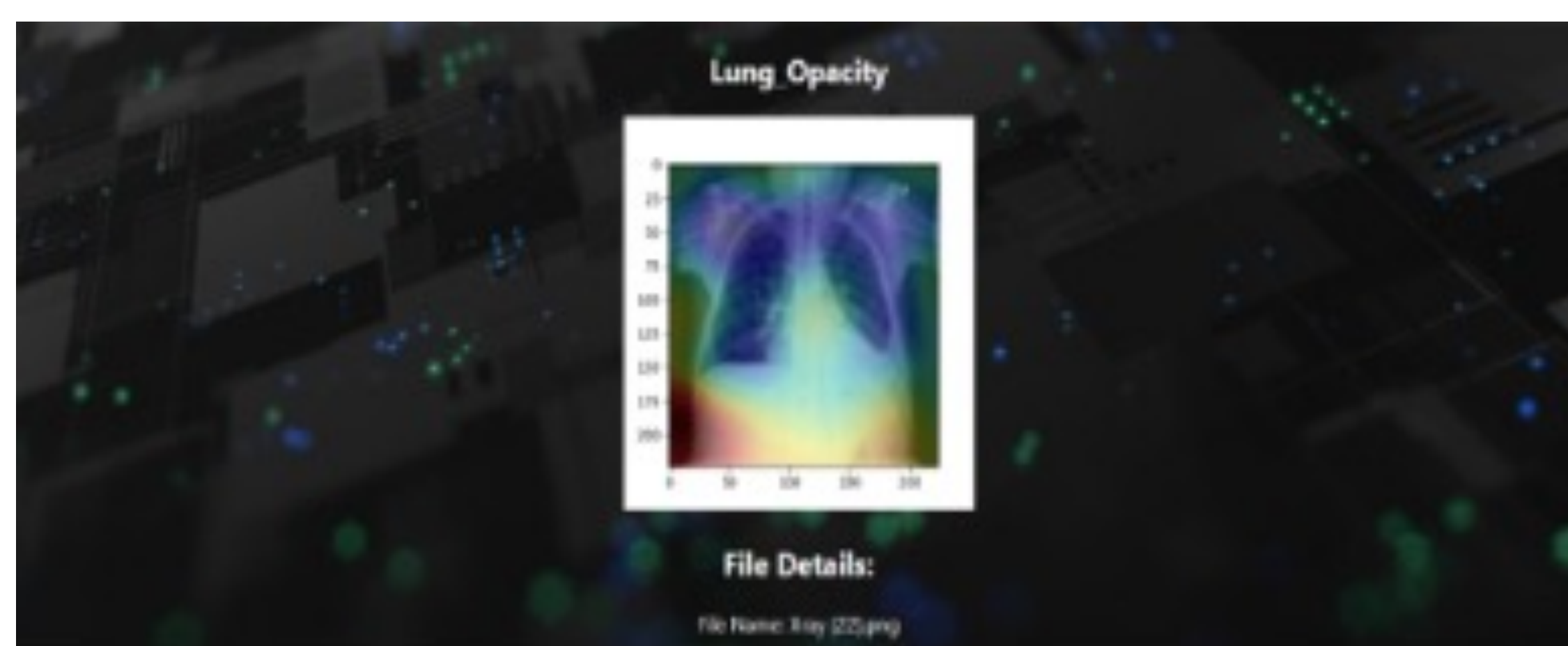
- Python 3.8+
- Numpy 1.19.2+
- Scipy 1.7.3+
- React 17.0.1+
- Tensorflow 2.12.0 +
- Keras 4.12+
- Yarn 1.0
- Flask 2.2.3+
- Github



SYSTEM DESIGN



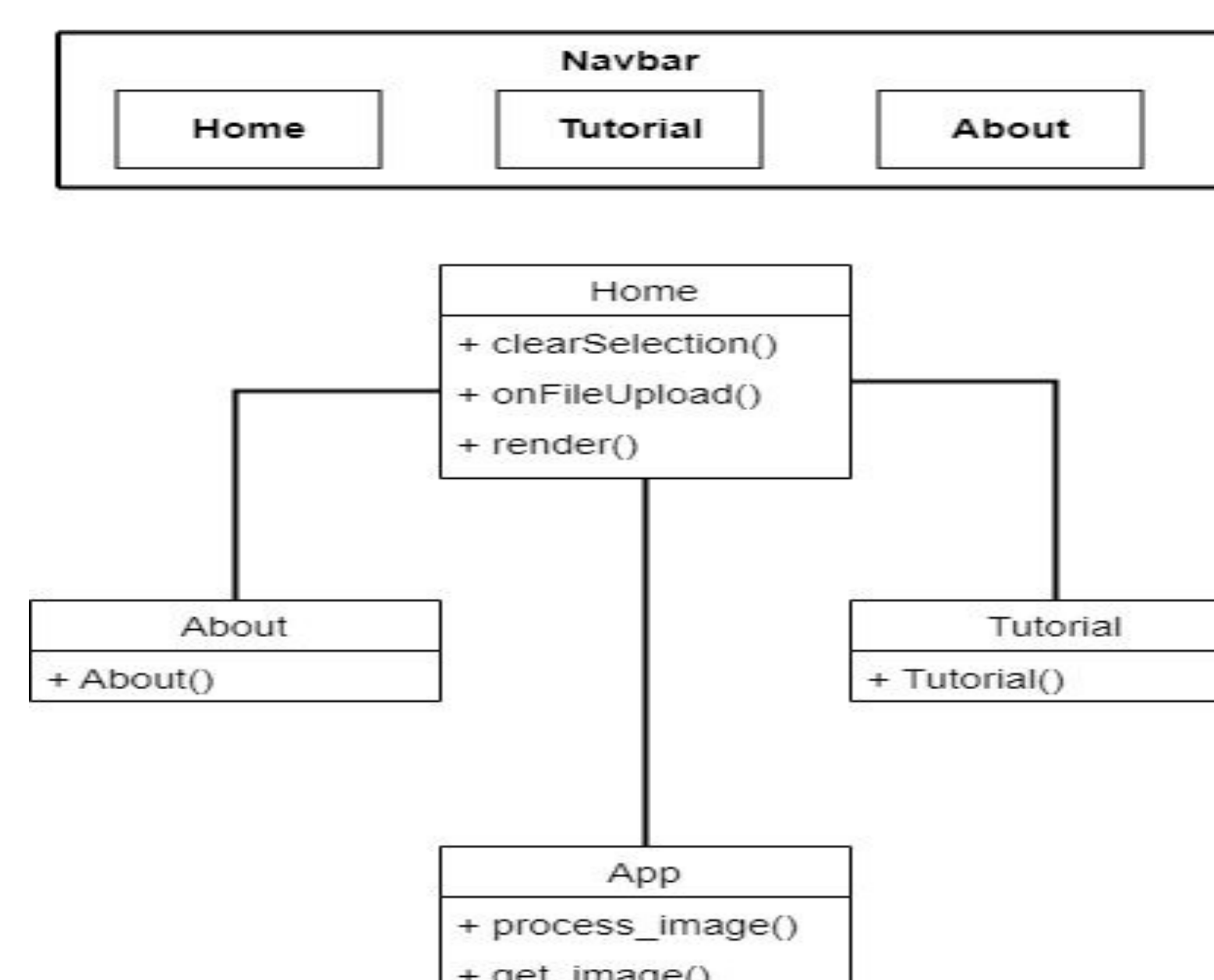
VERIFICATION



ACKNOWLEDGEMENT

The material presented in this poster is based upon the work supported by Ananda Mondal. We thank Ananda Mondal for his assistance and mentorship that we received throughout the senior design project.

OBJECT DESIGN



SUMMARY

The final deliverable for the project includes an additional CNN, an additional trained model for image validation, and improved front-end design files. This technology opens many options for health care professionals, as now they can make AI assisted predictions when diagnosing patients. This is important because with the help of AI, we can increase the accuracy of diagnostic testing in patients, in addition to decreasing the number of missed cases due to human error.

IMPLEMENTATION

During development, first a system design was created that utilized 2 neural networks. The first neural network was used for image validation. If the first neural network detected an x-ray image, then it would pass the image on to the next neural network for further processing. If the first neural network predicts a non-x-ray image, the front-end web application outputs an error, stating that an x-ray image must be uploaded in order to use the program. Furthermore, a new application webpage was designed and created to better display the newly added error message, and the previously implemented heatmap.

REFERENCES

- Visuña, L., Yang, D., Garcia-Blas, J. *et al.* Computer-aided diagnostic for classifying chest X-ray images using deep ensemble learning. *BMC Med Imaging* 22, 178 (2022). <https://doi.org/10.1186/s12880-022-00904-4>
- Raj, S. B., Computer Aided Diagnosis of Chest X-ray Images. Florida International University, Capston II. (2022)