AI for Search and Rescue

A report of the CEng 2021 Summer Undergraduate Research Project

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Background
Search and Rescue is an area with emerging technologies designed to improve the efficiency with conducting a search operation in terms of surveying land with the use of unmanned aerial vehicles like drones or through the aid of software development methods like Artificial Intelligence to predict the likelihood of a rescue being located in a specific area. Currently, research is much more focused on the former. This summer research project's focus is on the latter; namely, providing rescuers with tools to improve their search by employing computer technology.

Progress
Being a new project with no previous work done, a lot of foundational work was required to allow for Machine Learning and Artificial Intelligence methods in the future. Much of the summer was spent on creating a fully digital version of the SAR (Search and Rescue) forms filled out by rescuers. With the current approach of using physical forms, there is a lack of functionality and proper organization and consolidation of data. The inability to arrange clues in terms of importance or relevance easily and to search for specific pieces of information swiftly caused the switch to an electronic alternative to be so imperative.

Initial migration of the SAR Forms to electronic versions was done through web-based form creators like Google Forms and JotForm. After early testing, problems with the pre-population of repeated fields across forms and limits in the number of forms allowed to be created and the number of submissions accepted caused a new outlook to be required for effective electronic equivalents of the paper-based SAR Forms.

A solution was found to both of these issues mentioned by creating a website for the front end (displaying the questions on each form with text-based and checkbox fields) along with a database to record responses and process the data. This was achieved by using Bootstrap 5 along with Google's Firebase database. This full customizability of this website allows for multiple fields to be pre-populated on all forms with shared fields, saving rescuers time from

having to repeat already known information. Along with this, the database is better organized to handle the large number of forms filled out and allows for specific data values to be searched for.

Future Goals

For the continuation of this project, the main goal should be the creation and utilization of probability equations that take advantage of previous entries in the SAR forms. These probability equation(s) will provide the foundation to build the artificial intelligence aspect of our project. Some smaller goals could include, expanding on the digitization of SAR forms, back-end for an application that rescuers could use in the field, and efficient methods of parsing through data in the database.

Although a probability and statistical analysis of the data gathered in the database is a crucial stepping point in the project, it is not necessarily the most immediate problem. For example, although we have digitized some of the SAR forms, there are more that need to be converted into a form and connected to the database. Another smaller goal that should be completed would be formulating how machine learning can connect to the data we have already received.