

Real-Time Risk Evaluation System for Aviation Safety

Project Proposal(CS230)

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1 Introduction

Mid-air incidents and accidents are not unavoidable; and when a situation develops in flight, that is where a pilot earns his money by making quick decisions taking all relevant factors into account. The problem is, often pilots have only split seconds to make such decisions, often in the face of incomplete information. In a crisis, pilots have to decide between courses of actions that can potentially endanger lives(eg. disregard the emergency and continue to destination), versus courses that can cause enormous monetary loss(eg. divert to nearest airport) to airlines they fly for.

In light of this, the current work aims to develop a tool that can quickly quantify the "risk" of a developing situation in the air, and can guide pilots to take actions in light of historical data, i.e what pilots did before in similar situations and based on historical outcomes, perhaps suggest a best decision.

2 Dataset

The Aviation Safety Reporting System(ASRS) has over 100,000 reported and filed aviation incidents, with many datapoints for each incident (like crisis severity, pilot testimonies, numerical data on aircraft, suspected causes, action taken) which can be used as training data features(X) and results of the incidents (like level of risk, number of casualties etc) that can be used as training data outputs (Y).

3 Proposed Algorithm

The work will fall under the category of **Natural Language Processing**, since the dataset contains keywords that need to be identified, and paragraphs from which information needs to be gleaned. A proposed first model of the NN is as follows:

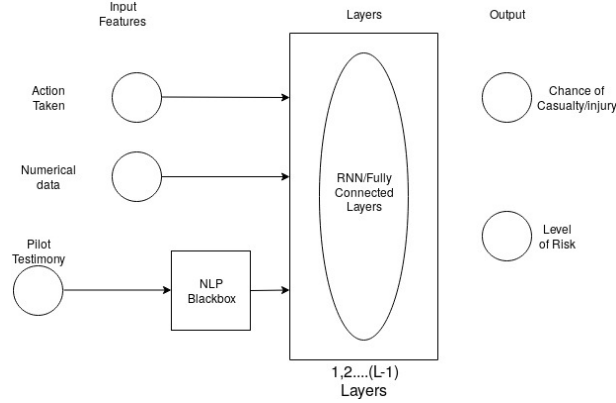


Fig. 1. Initial proposed architecture of network

4 Relevant Reading

Several ideas will be borrowed from the paper "Ensemble machine learning models for aviation incident risk prediction"[1], which uses a hybrid of SVMs and Deep Neural Networks to quantify the risk of a wide range of hazardous events. This is one of very few papers that exists on the topic.

5 Evaluation of Results

The goal is to develop a tool that predicts the risk of a current situation based on historical data. The efficiency of the tool will be judged based on a test set, drawn from the ASRS database itself. The test set will contain instances where there was both some and no injury/harm/casualty in the incident, and the idea is the network will correctly categorize the risk level of the situation and chance of injury to passengers.

6 References

- [1] Xiaoge Zhang, Sankaran Mahadevan,"Ensemble machine learning models for aviation incident risk prediction", Decision Support Systems,Volume 116, January 2019, Pages 48-63 [2]