Abstract:

The use of fires in their current state, whether they be aerial or artillery, requires interfacing between human operators and both hardware and software systems. The presence of human error in this process results in increased delay times and possibly catastrophic mistakes. These risks are especially pertinent in counterfires, where speed and accuracy are essential. This research attempts to integrate artificial intelligence decision aids trained through machine learning to properly identify the source of enemy indirect fire and prioritize existing assets for use in counterfire

Background:

Field artillery soldiers, especially when operating in combat against a near-peer or peer threat, prioritize counterfire, which is determining the source location of enemy indirect artillery fire and using friendly assets to strike back. Counterfires have also been an area of development for the army, with special focus on confidence on firing without visual confirmation. To enable that goal, accurate data and precise decision making are essential.

The difficulty therein lies in two areas. First, is accuracy. Current technology used to detect enemy fires provides limited data in terms of shot origin, distance, speed, and a few other factors. This limited information is presented to a warrant officer who must make a determination of whether to counterfire or not, and what friendly asset to use. Unfortunately, this process is fraught with possibilities for error, for example quick-flying birds or just shooting a rifle have a possibility of creating a false positive, while false negatives are also possible when the radar misses a portion of a shell’s flight. The second difficulty is speed. Factoring together all the aforementioned considerations into a deduction is both difficult and time consuming for a human. Furthermore, warfare against near-peer and peer threats involves large-scale battalion on battalion fires, which not only increases the need for quick and precise counterfires, but also increases the data and decision burden on human operators. These problems could, however, be fixed by artificial intelligence decision aids working on this target acquisition and target matching.

Future Direction:

The goal of the project is to incorporate an artificial intelligence decision aid to streamline and improve the counterfires process.

The first step is the recognition or target acquisition of the enemy firing system. The proposed data necessary would be the shell flight and conditions data matched with a source weapon. This data could be combined with machine learning to create a program that is able to recognize the type of weapon firing, or lack thereof, when fed sensor or radio data. Other factors that can be taken into account are less tangible, such as the speed of relocation of enemy artillery being a result of them being tracked or towed.

The second step is to match these recognized targets with the correct weapon system. Considerations to be accounted for here are from the attack guidance matrix and involve threat level, range, and operational goals. The decision aid would consider these factors and provide a recommended friendly weapon system for counterfire.

Further expansion of this project could be into the realm of aerial drone swarms, which can be used both for radar/optical sensing data as well as carrying their own hellfire missiles. With these capabilities, they can be incorporated into the decision aid as both sensors and weapon systems that can be used for high-value or priority targets, while also reducing the risk on soldiers. From a decision aid standpoint, optical data and additional radar data are invaluable complements to the seemingly unreliable current methods. This addition allows for soldiers to not only more accurately identify enemies, but also more accurately prioritize targets.