

Task 1.1 – Case Study of AI Solution

1. What is the Domain and Specific Application you have selected?

The Domain that I have chosen is the Defence Sector. The application within this domain that I have chosen to discuss is target identification and classification.

2. Why is it important to have AI solutions in this domain?

Military applications within AI will be at the very forefront of the projection of military power over the next decade. Through large scale conflicts throughout history militaries have often been at the leading edge of research and implementation of new technologies. Notable examples identified by Tucker (2015, p. 244, 264, 285) include:

- Nuclear fission in the development and deployment of nuclear weapons,
- RADAR, and
- Jet aircraft.

Artificial Intelligence and Machine Learning will be no different as the field matures and more and more states identify the impact that these technologies can have on modern conflict.

A brief look at the data of civilian casualties in the Ukrainian conflict shows that as at 06 March 2023 21,793 civilian casualties have been recorded. This includes some 972 children who have been injured or killed (UN, 2023). These figures are staggering, though unfortunately not uncommon in modern conflict. Rapid and accurate identification of targets through the use of AI vision can hopefully assist militaries in reducing civilian casualties.

3. What is the difference between traditional applications and AI based applications in this domain?

Traditional target identification is carried out in a multitude of ways including human only identification and software based interrogation methods.

Human only identification is commonly carried out through the applying of a Rules of Engagement (RoE) or Orders for Opening Fire (OfOF) cards. This carries significant area for error in human judgement due to myriad factors including sight accuracy, stress, non-uniformed combatants and more.

Software based identification methods include interrogating an aircraft with Identification Friend or Foe (IFF) or ships with Automatic Identification System (AIS) to determine the flight or shipping data of a craft. Combat Systems onboard naval vessels can classify a target based on its RADAR cross section, flight path, speed, angle of attack and other factors. The most notable failing of these systems is the shooting down of Iran Air Flight 655, leading to the killing of 290 civilian persons (Lendon, 2020).

Artificial Intelligence based applications within this domain are rapidly evolving however one Australian based company, Athena, is pursuing AI vision models that can identify targets based on their uniform, stance, weapon status and movement patterns.

4. What are the Challenges and Strengths of AI in that domain?

Strengths

Speed, Power, Efficiency and Intelligence

A key strength of AI in the Defence domain is the speed with which complex target identification can be carried out. A commander or soldier on the ground required to identify a target must do so rapidly and accurately as the results of misidentification can lead to allied casualties or even civilian casualties. The efficiency of an AI solution to process huge amounts of data would be integral as a human will exceed their ability to assess the classification of large groups of people fairly rapidly.

Capability to Achieve Business Goals

Militaries operating in an armed conflict are bound under treaties and conventions including the Geneva Conventions, the Hague Convention and the Law of Armed Conflict to provide protections to non-combatants and 'hors-de-combat' personnel (such as those who have laid down their arms, have become incapacitated or have surrendered). The impact of armed conflict on a person can affect their ability to think rationally and ensure the adherence to these international laws. Artificial intelligence targeting may provide a solution to these human limitations.

Non-Specific and Unexpected Situations

The Australian Defence Force (ADF) in particular often operates in a non-kinetic environment such as peace keeping and Humanitarian and Disaster Relief Operations. The ability to rapidly identify humans within an earthquake or tsunami can allow teams to make their way swiftly to the people that require assistance, leading to more rescues and reducing the risk to the first responders when moving around a disaster zone. AI Vision can augment the business delivery of the ADF across a wide gamut of operations due to the scalability and flexibility of AI.

Challenges

Compute Power

In these early years of AI compute power is a leading limitation running algorithms. The infrastructure and hardware required to power these systems would be difficult to manoeuvre on a logistical standpoint for militaries. They would also present as high value targets and lead to electronic warfare opportunities when transferring data across networks in a battle space.

Knowledgeable data science, specialists or teams

Australian industry and technology can often lag behind larger states due to the limited resources and professionals in a field. Artificial intelligence is no outlier here. Large states are able to develop very sophisticated models and apply large amounts of resources to ensure the best people are working on these problems.

Ethical Concerns

Potentially the most important part of this entire case study is the ethical considerations attached to 'human-out-of-the-loop' systems. It was shown in the shooting of Iran Air Flight 655 (Lendon, 2020) and recently with a report from the UN on the use of AI targeting systems engaging Haftar Affiliated Forces during a retreat (UN, 2021) that there are enormous implications on human rights in this domain. Almost equally important to the design and development of these systems is the analysis and legislative measures surrounding them (Koch, 2022).

References

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