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AI in Warfare: A Race the U.S. Can’t Afford to Lose

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Testimony: Sean Gourley

U.S. Chamber of Commerce

AI Commission for Competitiveness, Inclusion, and Innovation

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Summary: AI is rapidly changing how wars are fought. Winners of the AI arms race will become the world's dominant military powers. Primer CEO Sean Gourley testified at the U.S. Chamber of Commerce AI Commission on July 21, 2022, about the global AI arms race — and what the U.S. and our allies need to do next. Below are his testimony notes.

Thank you Congressmen Ferguson and Delaney, members of the Commission.

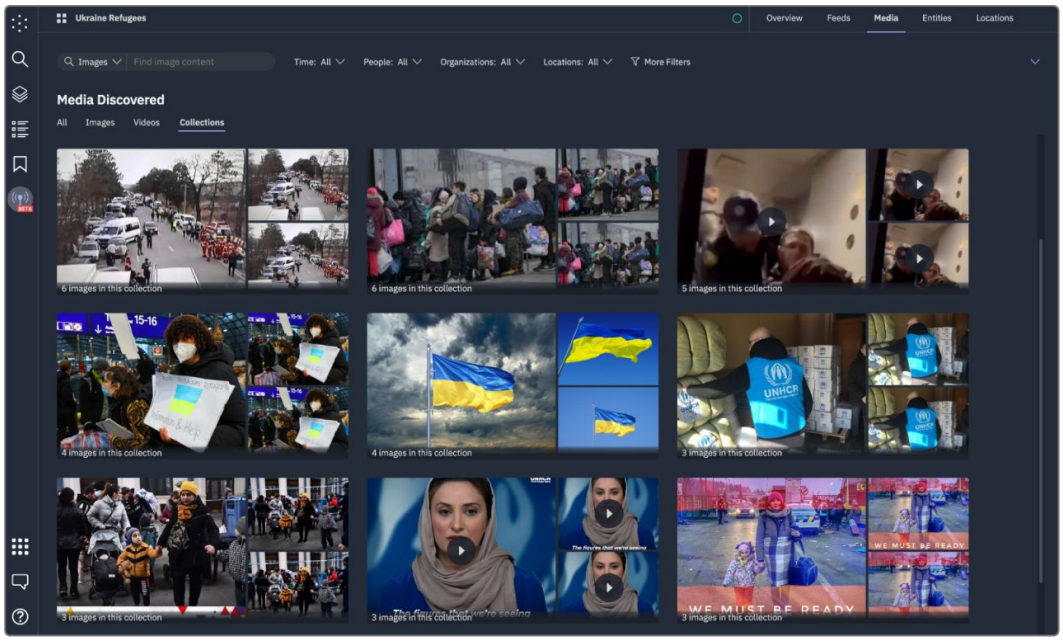
While there is a huge amount of discussion about the impact of AI on our society, the biggest impact that Artificial Intelligence (AI) will have in the next decade will be in warfare, where advanced AI will fundamentally change the way wars are fought. The impact of AI on warfare will be akin to that of nuclear weapons, where AI is a technology so powerful that the country that wields it will quickly defeat any opponent who does not.

> **"AI is a technology so powerful that the country that wields it will quickly defeat any opponent who does not."**
> ***-Primer CEO Sean Gourley***

Artificial intelligence represents what is known as the "third offset," a set of technological capabilities so advanced that it gives whoever wields them an advantage so large that the opponent without the technology is effectively ***defeated before a conflict even starts.***

The first offset was nuclear weapons, which ended the Second World War. The second offset was stealth weaponry and precision munitions, which resulted in the U.S. defeating the Iraq army — which at the time was the world's 6th most powerful army — in less than 72 hours during the First Gulf War. The third offset is artificial intelligence. And it will have as profound an impact on warfare as any of the previous two offsets combined.

This is not a hypothetical discussion about something that might happen in the future. Today, we are already seeing the impact of AI on the battlefield in Ukraine. From computer vision being used with commercial drones to identify camouflaged Russian vehicles, to AI that listens to radio communication and triangulates these with videos from social media to track Russian troop movement and intention in real time, through to AI being deployed in the information war to attempt to manipulate the narrative and win over the enemy population.



Advanced computer vision technology groups similar images together, allowing analysts to conduct visual searches, finding different perspectives of the same event. (Source: Primer Command)

These changes are happening rapidly. But Russia and Ukraine are not widely regarded as AI superpowers – it is China that we need to turn our attention to.

We need to acknowledge that we are currently in an AI arms race with China. The stakes are high, and the winner of this AI arms race will become the dominant military power in the world. It is a race that we cannot afford to lose.

The United States and its allies come into this arms race with a considerable set of advantages, but speed is going to determine the winner here — and China is moving fast.

To understand the AI arms race, we need to understand the components that underlie modern AI systems. Specifically, Algorithms, Computing Power, Human-Labeled Training Data, and the Deployment of AI.

Algorithms

Let's start with the first of these, the algorithms that underlie our most powerful neural networks. Here the U.S. has a clear advantage: The R&D capabilities of our universities and the research labs at the biggest technology companies in the U.S. are still ahead of the rest of the world. But that gap is closing fast.

Six years ago when we were starting Primer, of the research papers in AI that had a significant breakthrough or scientific impact in our field, there might have been 2% or 3% of those papers a month that were from Chinese research institutions. Today, in 2022, that number is closer to 20%. The advantage still lies with the U.S., but China is rapidly gaining ground.

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Computing Power

The second component of the AI arms race is computing power. When we are building cutting-edge AI, we need graphics processing units, or GPUs, to train our neural networks. U.S. and Taiwanese companies dominate the manufacturing of these components, and the best locally produced Chinese GPUs are still only equivalent to 2016-level technology from the likes of NVIDIA.

Here, China has an issue, as they are only able to internally produce less than one in 20 of the most advanced GPU chips inside their country. They don't have compute independence. And much like you wouldn't start a war without securing your fuel and energy supply lines, you won't start a war in the future without securing your advanced GPU supply. Of course, all of this changes if TSMC — who currently produces more than 90% of the most advanced chips in the world — is taken as part of an invasion of Taiwan, and TSMC supply and talent is secured for the People's Liberation Army. In the battle for AI dominance, Taiwan is a very important component.

Human-Labeled Training Data

The third component of the AI arms race is data. Specifically, human-labeled training data that is fed into the neural networks to allow the AI to learn. This labeling process is where subject matter experts teach machines what they know so that the machines can do things at a scale and speed that humans cannot achieve.

“All of the advantages in algorithms, compute, and labeling are of no real use to the warfighter until the AI is embedded within applications that solve mission-critical tasks”

-Primer CEO Sean Gourley

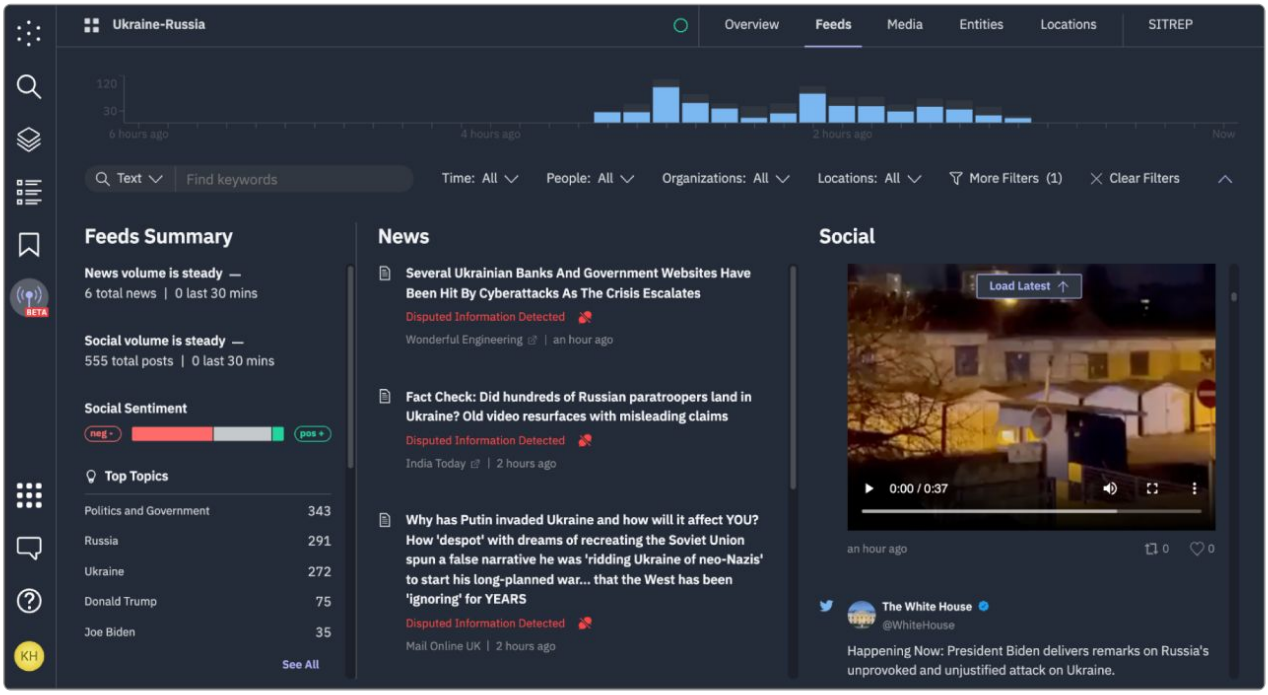
So that when a computer vision model knows how to distinguish between tanks and missile launchers from drone footage, it is because a set of human experts have literally sat down and labeled tens of thousands of images to teach the machine. This is what is known as supervised learning.

Having a huge amount of labeling capacity inside your country is crucial for the performance of AI in warfare. The ability to deploy this labeling capacity quickly during battle is even more important. We see China playing with adversarial technical capabilities to disguise tanks as construction vehicles to confuse potential computer vision algorithms. In labeling, the advantage goes to China, with the sheer volume of people in the 50 cent army that can be deployed to label data. They outrank the U.S. capability here easily.

Deployment of AI

The fourth component is the deployment of artificial intelligence. All of the advantages in algorithms, compute, and labeling are of no real use to the warfighter until the AI is embedded within applications that solve mission-critical tasks.

For too long, artificial intelligence has been pursued by the military as a kind of fairy dust that you sprinkle on top of outdated technology in the hopes that something magical will happen.



Disputed information detection AI enables analysts to quickly identify information that contains potential propaganda, disputes, or contradictory narratives. (Source: Primer Command)

Instead, artificial intelligence must sit at the heart of all new software applications, vehicles, and weaponry that the DoD is purchasing. We must build these solutions from the ground up with AI in mind.

All of this is well and good — we could have the best AI algorithms, the best GPUs, the best training data, and the best mission-critical applications – but we would still fail if we couldn't get these into the hands of our soldiers in time.

And ***this is where we are struggling***. Procurement cycles that have been designed with a 10-year development process for a new F35 fighter jet simply make no sense in the world of artificial intelligence where technology can become obsolete within six months.

If we have a three-year procurement cycle to build and deploy AI, then we open ourselves to the likelihood of being beaten by an opponent with inferior AI, but with a quicker path to get it into the hands of their war fighters.

The National Security Community faces challenges in the adoption of AI:

- Acquisition regulations are archaic, evolved to benefit the defense industry giants and make it difficult for smaller, newer companies to compete.

- Larger companies can survive the slow acquisition and funding cycles that can take three or more years to fund a new program. Smaller, newer companies are going out of business waiting for revenue from a government program.

- The deck is stacked for insiders. National security acquisitions usually involve byzantine bureaucratic processes, which introduce complexity that can overwhelm a small, inexperienced company. While the established contractors can navigate them with ease after many years of experience.

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- Small tech companies with world-class talented machine learning engineers could literally be solving anything. But, unfortunately, today they are told to avoid solving defense-related problems because, with good reason, it is viewed as a market where there is no meritocracy and the company with the best technology does not necessarily win the contract. This has to change.

On top of all this, there are further barriers that slow down the adoption of AI technology. For example, FedRAMP requirements are expanding. Where the federal government itself estimates it can take up to two years to achieve a FedRAMP certification at the average cost of $2.25mm, and a further $1mm a year (every year) to maintain it.

That's bad enough, but then we have the Authority to Operate (ATO) processes, which further slows the adoption of AI. Certification can take anywhere from six months (for less complex software on systems with lower classification) to several years (for more complex software on higher classified networks). To compound these issues, agencies don't honor each other's ATO certifications. When the Defense Intelligence Agency (DIA) grants ATO after ~ 12 month review, the CIA will not recognize DIA's ATO, and begins their own certification process — delaying time to deploying the AI.

All of this is not conducive to moving fast. It's conducive to ensuring the current large defense primes maintain their advantage — and this is not how you win an AI arms race.

"When it comes to the deployment of AI, it's fair to say that China has the advantage."
-Primer CEO Sean Gourley

China, on the other hand, has much closer connections between its defense and technology sectors, with CCP members sitting on the boards of all defense technology companies. As a result, it is moving much faster to deploy AI applications and weaponry in the expectation of leap-frogging our current U.S. military advantage. So when it comes to the deployment of AI, it's fair to say that China has the advantage.

To summarize: in the four key components of the AI arms race, the U.S. has the advantage in two (algorithms and computing power), while China has the advantage in the other two (data and labeling, and speed of deployment).

We have to change these odds.

Thank you for the opportunity to speak with this panel and I look forward to continuing the discussion on this important issue

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