Algorithm to Predict ISIL Movements

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By: HDIAC Staff

Recently in eastern Afghanistan, an elder tribesman told an American Special Forces commander that U.S. precision weapon strikes against Taliban insurgents in his country were like "magic." He saw attacks striking the exact spot where terrorist fighters were sleeping, taking them out without even damaging the house next door. "Bring on more of the magic" the tribesman told the commander. [1] Now, researchers at Arizona State University (ASU) want to upgrade American military capabilities from magic to psychic.

ASU's Paulo Shakarian, director of the Cyber-Socio Intelligent Systems Lab which is part of the School of Computing, Informatics and Decision Systems Engineering in the Ira A. Fulton School of Engineering developed an artificial intelligence (AI) algorithm he claims learned how to predict how Islamic State in Iraq and the Levant (ISIL) forces will react when faced with various tactical situations. [1] This information could be used by American or Iraqi governments, or other coalition member commanders to contain ISIL and reduce its footprint in Syria and Iraq.

Shakarian utilized real-world intelligence on ISIL to test his equation, forming a database of 2,200 recorded incidents of hostile activity. ISIL continues to conduct complex military maneuvers spanning a multi-nation area of the Middle East in spite of the air campaign led by the United States against them. [1] ISIL's ability to constantly switch between conventional warfare, insurgency tactics and terrorist campaigns allows it to keep opponents off balance, but Shakarian claims his algorithm will help military planners mount more effective attacks against the rogue group in the future.

"What we looked for was, are there relationships amongst the actions the Islamic State does that leads to significant increases in activity?" Shakarian said. "When the violence increases that much, we want to understand why that is. We wanted to get

A U.S. Air Force F-15E Strike Eagle pops a flare while departing after refueling with a USAF KC-10 Extender aircraft over Southwest Asia in support of Operation Inherent Resolve, Aug. 30, 2015. (U.S. Air Force photo by Staff Sgt. Sandra Welch)

insight into what led them to conduct certain military tactics." [1]

By recognizing these patterns, high command personnel can relay orders to ground commanders in a timelier manner and thwart the efforts of ISIL.

Shakarian, a West Point graduate, is no stranger to combat in the Middle East, having served two tours of duty during the Iraq war with the U.S. Army's First Armored Division. [2] He began to notice patterns of attack by insurgent forces during his time in Baghdad, which helped inspire the creation of his algorithm.

"The key thing that differentiates our approach is we look at relationships" he said. "One thing we found is that when there was a spike in armed attacks-essentially conventional military operations-it was preceded by indirect fire (artillery and mortar fire). This is nothing new in warfare: get the other guy's head down, bottle them up and then attack with infantry."

The algorithm also found that car bombs

in Baghdad preceded attacks against cities in and around northern Iraq. These attacks compelled the Iraqi's to keep the majority of their forces in the capital to increase security within the city rather than dispatching them to the outlying areas to repel ISIL attacks.

"Now there's less forces for the Islamic State to deal with when they go to one of these northern cities like Baiji or Balad," Shakarian said. "We found that in this case since Balad had something major going on, if there was infantry operations in Balad, if there was indirect fire in Baiji, then there would be a spike in car-bomb activity. … This was occurring 100 percent of the time, this relationship. … If they want to see a significant increase in infantry, we're going to see car bombs 100 percent of the time. So we're mixing terrorism and military activity together to keep the (Iraqi) army off base." [1]

The science of algorithms is growing rapidly, giving researchers the ability to predict human behavior with unprecedented accuracy. A team of British researchers recently unveiled a

set of equations using cell phone data that claims to be able to not only catalog movements but actually predict where an individual will travel within a 24 hour period within a 20 meter area. This program was constructed by Mirco Musolesi, Manio Domenico, and Antonio Lima at the University of Birmingham and won first place in the Nokia Mobile Data Challenge. [3] Even with these radical advances in technology, however, some experts are warning against the use of such algorithms as a stand-alone defense against terrorist attacks.

According to Jamie Bartlett, director of the Centre for the Analysis of Social Media at the Demos Institute, there is a sense of "techno-utopianism" in the air which has created a false sense of confidence in the power of modern computing technology. He claims that the extensive use of algorithms by businesses and social media providers has created an "unrealistic expectation that either the intelligence agencies or Facebook or Twitter can produce some snazzy technology, some clever algorithm, which can predict radical intent and prevent it." [4]

Bartlett says the problem with this assumption is that the sheer volume of social media activity often overwhelms such algorithms and makes it impossible for intelligence and military officials to separate significant threat activity from benign chatter.

"Part of my job at Demos involves building algorithms that can guess intent from language use, the sort of thing is called natural language processing. This involves teaching computer systems to automatically recognize words and the meaning behind them. It's hard, imprecise work. There are 12 billion private messages sent every day on Facebook, from its 1.3 billion users. People use those words for a hundred different reasons, mostly nothing to do with terrorist machinations. Even trying to build a clever algorithm to look for certain clusters of words and specific semantic patterns based on would be a nightmare. People say extreme, offensive, threatening stuff online all the time: a tiny slither really mean it and only a fraction of those might go on to actually do anything about it." [4]

"To be perfectly honest," Bartlett continued, "if Twitter and Facebook decided to monitor their platforms and pass on suspicious language use to intelligence agencies, the workload of intelligence agencies would be so heavy that they would probably ask those organizations to leave them alone." [4]

Even so, it is obvious to some that the massive increase in data collection in recent years will influence how future wars and counter-terrorism efforts will be carried out. Daniel Rothenberg, professor of practice in the School of Politics and Global Studies and co-director of the Center on the Future of War at ASU, said there has been a substantial shift in how war and conflict are managed in regards to information.

[5] He said the future of warfare will include huge amounts of data being collected and correlated in real time and that algorithms such as the one created by Shakarian could play a vital role in such a system.

"That's how a lot of operations are going to proceed," said Rothenberg, who is also a Lincoln Fellow for Ethics and International Human Rights Law, and executive director of the Center for Law and Global Affairs in the Sandra Day O'Connor College of Law. "What is kind of radical is the power of analytics. … We don't even know where it's going because this is so new." [5]

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