

how it is intertwined within our military and national networks has been identified as critically important by all levels of our strategic guidance, yet DOD has no solutions currently fielded to address the issues. By incorporating smart and automated systems that apply a variety of learning models, we can improve the EMS visualization processes and better understand the nature of the information fueling these systems. The Defense Department can reduce the risks associated with capacity saturation by balancing between deep and big data solutions that enable us to understand and visualize the EMOE. The safety and combat effectiveness of the joint fighting force demand AI solutions that preserve the capacity to sense and make sense of an incredibly complex electromagnetic operating environment. Now is the time to lift the electromagnetic fog of war. JFQ

Notes

¹The *electromagnetic operating environment* (EMOE) is defined as “the background [electromagnetic] radiation and the friendly, neutral, and adversarial electromagnetic [activity] within the [electromagnetic area of influence] associated with a given operational area.” See Chairman of the Joint Chiefs of Staff Memorandum 3320.01C, *Joint Electromagnetic Spectrum Management Operations in the Electromagnetic Operational Environment* (Washington, DC: The Joint Staff, December 14, 2012), appendix D to enclosure C, C-D.1. The EMOE is a complex composite of the electromagnetic conditions, circumstances, and influences that affect the employment of capabilities and the decisions of the commander.

²Joint Publication 6-01, *Joint Electromagnetic Spectrum Management Operations* (Washington, DC: The Joint Staff, March 20, 2012), viii.

³Joint Doctrine Note (JDN) 3-16, *Joint Electromagnetic Spectrum Operations* (Washington, DC: The Joint Staff, October 20, 2016), I-1.

⁴Ibid., v.

⁵See Defense Information Systems Agency, “About DSO” [Defense Spectrum Organization], available at <<https://storefront.disa.mil/kinetic/disa/service-catalog#/forms/about-dso>>.

⁶JDN 3-16, C-1.

⁷Ibid., I-9.

⁸Ibid.

⁹Alexander Kott et al., *Visualizing the Tactical Ground Battlefield in the Year 2050: Work-*

Joint Publications (JPs) Under Revision (to be signed within 6 months)

JP 1-0, *Personnel Support*

JP 2-0, *Joint Intelligence*

JP 3-05, *Special Operations*

JP 3-26, *Combating Terrorism*

JP 3-40, *Countering WMD*

JP 5-0, *Joint Planning*

JP 6-0, *Joint Communications System*

JPs Revised (signed within last 6 months)

JP 1, *Doctrine for the Armed Forces of the United States*, vol. 1

JP 3-09, *Joint Fire Support*

JP 3-09.3, *Close Air Support*

JP 3-10, *Joint Security Operations*

JP 3-29, *Foreign Humanitarian Assistance*

JP 3-30, *Joint Air Operations*

JP 3-31, *Joint Land Operations*

JP 4-09, *Distribution Operations*

JP 4-10, *Operational Contract Support*

shop Report, ARL-SR-0327 (Adelphi, MD: U.S. Army Research Laboratory, June 2015), 22.

¹⁰Shukla Shubhendu and Jaiswal Vijay, “Applicability of Artificial Intelligence in Different Fields of Life,” *International Journal of Scientific Engineering and Research* 1, no. 1 (September 2013), available at <<https://pdfs.semanticscholar.org/2480/a71ef5e5a2b1f4a9217a0432c0c974c6c28c.pdf>>.

¹¹Darrell M. West and John R. Allen, *How Artificial Intelligence Is Transforming the World* (Washington, DC: The Brookings Institution, April 24, 2018), available at <www.brookings.edu/research/how-artificial-intelligence-is-transforming-the-world/>.

¹²Daniel Faggella, “What Is Machine Learning?” *Emerj*, February 19, 2019, available at <<https://emerj.com/ai-glossary-terms/what-is-machine-learning/>>.

¹³Sydney J. Freedberg, Jr., “Joint Artificial Intelligence Center Created Under DOD CIO,” *Breaking Defense*, June 29, 2018, available at <<https://breakingdefense.com/2018/06/joint-artificial-intelligence-center-created-under-dod-cio/>>.

¹⁴*Summary of the 2018 Department of Defense Artificial Intelligence Strategy: Harnessing AI to Advance Our Security and Prosperity* (Washington, DC: Department of Defense,

2018), available at <<https://media.defense.gov/2019/Feb/12/2002088963/-1/-1/1/summary-of-dod-ai-strategy.pdf>>.

¹⁵Radio Frequency Machine Learning Systems program, Defense Advanced Research Projects Agency-funded program solicitation, Duke University Web site, 2017, available at <<https://researchfunding.duke.edu/radio-frequency-machine-learning-systems-rfmls>>.

¹⁶Ibid.

¹⁷Adaptive Radar Countermeasures, BAE Systems Web site, 2017, available at <www.baesystems.com/en-us/product/adaptive-radar-countermeasures-arc>.

¹⁸Kott et al., *Visualizing the Tactical Ground Battlefield in the Year 2050*, I-2.

¹⁹This reflects the authors’ generalized definition of *big data* as applied to the context of this article only.

²⁰*The AIM Initiative: A Strategy for Augmenting Intelligence Using Machines* (Washington, DC: Director of National Intelligence, December 2018), 1, available at <www.dni.gov/files/ODNI/documents/AIM-Strategy.pdf>.

²¹This reflects the authors’ generalized definition of *deep data* as applied to the context of this article only.