*Insurgent Artifacts* NSF #19982749

Project Year 2 (2019-2020)

Created by: Fiona Greenland

**Graduate Course Module**

**Title:** Technical and interpretive issues in remote sensing data for social problems

**Target Audience:** Graduate Students (+ advanced undergraduates)

**Course length:** 14 weeks (12 weeks’ classroom time plus 2 weeks for exams)

**Core scholarly fields:** Science and Technology Studies (STS); Data Science and Data Ethics; Sociology of Knowledge

**Pedagogical Approach**

This class is designed to make social sciences researchers better informed about the promise and pitfalls of incorporating satellite imagery into their work. With the rapid expansion of global satellite coverage, improved technologies, and increased availability of free, high-resolution images, there are now unprecedented opportunities to study human social relations through spatial and temporal analytical frames. While many of us immediately recognize the power of an image to capture the complexity of human societies, however, few of us understand how satellite images are made and why their production processes matter. We will delve into these and other technical issues, and learn about the application of satellite imagery in research and policy. No technical expertise is required for this course. Readings and assignments are calibrated for social sciences graduate students, and advanced undergraduates, who plan to use satellite imagery as part of mixed-methods research projects.

**Course Goals**

By the end of this course, students should be able to: (1) work with satellite imagery and understand the human and machine processes by which different types of satellite data are produced; (2) understand how to collect and analyze satellite data in a way that is replicable and reliable; (3) identify and make sound decisions about ethical issues concerning the application of satellite data to human populations; and (4) document and interpret satellite metadata.

**Equipment:** Laptop or desktop with high-speed internet to access high-resolution satellite imagery. Two books are required (may purchase or use library copy).

*Required texts:*

* Borra, S., Thanki, R., and Dey, N. (2019). *Satellite image Analysis: Clustering and Classification* (first edition). Springer. [Link here](https://www.springer.com/gp/book/9789811364235).
* Parks, L. (2005). *Cultures in Orbit. Satellites and the Televisual*. Duke: Duke University Press. [Link here](https://www.dukeupress.edu/cultures-in-orbit).

*Week 1: What is a satellite?*

* Borra et al. 2019 – Chapter 1
* Chuvieco, E and Huete, A. (2020). *Fundamentals of Satellite Remote Sensing: An Environmental Approach* (Third Edition). CRC Press. – Chapters 1-3

*Week 2: Types of satellites*

* Borra et al. 2019 – chapter 2

*Week 3: Case study: US satellite policy after 1992*

* Berman, G., de La Rosa, S., and Accone, T. (2018). “Ethical Considerations When Using Geospatial Technologies for Evidence Generation. UNICEF Office of Research – Innocenti Discussion Paper.” DP-2018-02. <https://www.unicef-irc.org/publications/pdf/DP%202018%2002.pdf>
* 2020 National Space Policy Directive. <https://www.space.commerce.gov/policy/national-space-policy/>
* Haller, L. and M. Sakazaki. “Commercial Space and United States National Security. *Commission to Assess United States National Security Space Management and Organization*.” <https://fas.org/spp/eprint/article06.html>
* H.R. 6133 – Land Remote Sensing Policy Act of 1992. <https://www.congress.gov/bill/102nd-congress/house-bill/6133>

*Week 4: Assessing quality in satellite science*

* Bollen, K., J.T. Cacioppo, R.M. Kaplan, J.A. Krosnick and J.L. Olds. (2015). “Social, Behavioral, and Economic Sciences Perspectives on Robust and Reliable Science.” *Report of the Subcommittee on Replicability in Science Advisory Committee to the National Science Foundation Directorate for Social, Behavioral, and Economic Sciences.* Report link [here](https://www.nsf.gov/sbe/AC_Materials/SBE_Robust_and_Reliable_Research_Report.pdf).
* Brouwer Burg, M. (2017). “It must be right, GIS told me so! Questioning the Infallibility of GIS as a methodological tool.” *Journal of Archaeological Science* 84: 115-120.
* Ioannidis, J.P.A. (2005). “Why most published research findings are false.” *PLoS Medicine* 2(8), e124.
* Leonelli, S. (2015). “What counts as scientific data? A relational framework.” *Philosophy of Science* 82(5): 810–821.
* Mayernik, M.S. (2019). “Metadata accounts: Achieving data and evidence in scientific research.” *Social Studies of Science* 49: 732-757.

*Weeks 5 & 6: Interpretive issues*

* Goodwin, C. (1996). “Professional Vision.” *American Anthropologist* 96: 606-633.
* Hacιgüzeller, P. (2012). “GIS, Critique, Representation and Beyond.” *Journal of Social Archaeology* 12(2): 245–63.
* Olson, C. (1960). “Elements of Photographic Interpretation Common to Several Sensors.” *Photogrammetric Engineering* 20(3): 433-454.
* Paglen, T. (2009) *Blank Spots on the Map: The Dark Geography of the Pentagon’s Secret World*. Dutton, New York.
  + + explore Trevor Paglen’s artistic work on surveillance imagery: <https://art21.org/artist/trevor-paglen/>
* Parks 2005: entire book (read by the end of the second week)
* Vertesi, J. (2015). *Seeing Like a Rover: How Robots, Teams and Images Craft Knowledge of Mars*. Chicago: University of Chicago Press. [excerpts]

*Weeks 7 & 8: Ethical issues*

* Aitken, Stuart C. and Mei-Po Kwan (2010). “GIS as Qualitative Research: Knowledge, Participatory Politics and Cartographies of Affect.” In Aitken, Stuart and Mei-Po Kwan (eds.), *GIS as Qualitative Research: Knowledge, Participatory Politics and Cartographies of Affect*, pp. 1-24. London: SAGE.
* Ananny, M. (2016). “Toward an Ethics of Algorithms: Convening, Observation, Probability, and Timeliness.” *Science, Technology, & Human Values* 41(1): 93–117.
* Burrows, Roger, and Nicholas Gane (2006). Geodemographics, Software and Class. *Sociology* 40 (5): 793–812.
* Robbins, Paul (2006). “Research is theft: Environmental inquiry in a postcolonial world.” In Valentine, Gill and Stuart Aitken (eds.), *Approaches to Human Geography: Philosophies, People, and Practices,*pp. 311-324. London: SAGE.

*Weeks 9 & 10: Case study:* *Remote sensing and satellites in war and peace studies*

* AAAS (American Association for the Advancement of Science). (2015). *Case Studies: Geospatial Technologies and Human Rights*. Washington, DC: American Association for the Advancement of Science (AAAS). <http://www.aaas.org/case-studies>.
* Avtar, R., A. Kouser, A. Kumar, D. Singh, P. Misra, A. Gupta, A.P. Yunus, P. Kumar, B.A. Johnson, R. Dasgupta, et al. (2021). “Remote Sensing for International Peace and Security: Its Role and Implications.” *Remote Sensing* 13: 439-468.
* Bjorgo, E. (2000). “Using Very High Spatial Resolution Multispectral Satellite Sensor Imagery to Monitor Refugee Camps.” *International Journal of Remote Sensing* 21 (3): 611–616. doi:10.1080/014311600210786.
* Campbell, D. (2001). “US Buys up All Satellite War Images.” *The Guardian*, October 17. <http://www.guardian.co.uk/world/2001/oct/17/physicalsciences.afghanistan>.
* Drake, J., and E. Ashcroft. (2013). “Eyes in the Sky: Remote Sensing in the Service of Human Rights.” *PhysicsToday*. <http://scitation.aip.org/content/aip/magazine/physicstoday/news/10.1063/PT.4.0072>.
* Witmer, F. (2015). “Remote sensing of violent conflict: eyes from above.” *International Journal of Remote Sensing*. 36: 2326-2352.

*Week 11: Case study:* *Satellites in conflict archaeology*

* Casana, J. (2015). “Satellite Imagery-Based Analysis of Archaeological Looting in Syria.” *Near Eastern Archaeology* 78(3): 142-52.
* Cunliffe, E. (2014). “Archaeological Site Damage in the Cycle of War and Peace: A Syrian Case Study.” *Journal of Eastern Mediterranean Archaeology & Heritage Studies*, 2(3): 229–247. <https://doi.org/10.5325/jeasmedarcherstu.2.3.0229>
* Quntar, S. A., Hanson, K., Daniels, B. I., & Wegener, C. (2015). “Responding to a Cultural Heritage Crisis: The Example of the Safeguarding the Heritage of Syria and Iraq Project.” *Near Eastern Archaeology*, 78(3): 154–160. <https://doi.org/10.5615/neareastarch.78.3.0154>

*Week 12: Case study: Experimental applications*

* Gillings, M. (2017). “Mapping Liminality: Critical Frameworks for the GIS-Based Modelling of Visibility.” *Journal of Archaeological Science*, Archaeological GIS Today: Persistent Challenges, Pushing Old Boundaries, and Exploring New Horizons, 84: 121–28.
* Jean, Neal, Marshall Burke, Michael Xie, W. Matthew Davis, David B. Lobell, and Stefano Ermon (2016). “Combining satellite imagery and machine learning to predict poverty.” *Science*353(6301): 790-794.
* Lawrence, C. (2020). “Heralds of global transparency: Remote sensing, nuclear fuel-cycle facilities, and the modularity of imagination.” *Social Studies of Science*50(4): 508-541.
* Yeh, C., Perez, A., Driscoll, A. et al. (2020). “Using publicly available satellite imagery and deep learning to understand economic well-being in Africa.” *Nat Commun* 11(2583). <https://doi.org/10.1038/s41467-020-16185-w>