Introduction to Digital Archaeology

Fall 2024
MW 3:30-5:00 PM

Jason T. Herrmann
Museum 191
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Classroom: Museum 190

Overview

Students in this course will be exposed to the broad spectrum of digital approaches in archaeology with an emphasis on data collection and fieldwork, through a survey of current literature and applied learning opportunities that focus on African American mortuary landscapes of greater Philadelphia. As an Academically Based Community Service (ABCS) course, course material will draw upon real data collected in cooperation with cemetery companies, historic preservation advocacy groups, and members of the African Methodist Episcopal Church to reconstruct the past built and natural landscapes, untangle site taphonomy, and assess our results for each site. Our results will be examined within the broader constellation of threatened and lost African American burial grounds and our interpretations will be shared with community stakeholders using digital storytelling techniques. This course can count toward the minor in Digital Humanities, minor in Archaeological Science and the Graduate Certificate in Archaeological Science.

Students in this course will:

1. Digitize, manage, and interpret historic maps and cemetery records in a geographic information system (GIS).
2. Explore digital field recording systems.
3. Conduct topographic and aerial surveys using Global Navigation Satellite Systems (GNSS) and Unmanned Aircraft Systems (UAS/UAVs).
4. Participate in a geophysical survey of the near subsurface.
5. Create 3D representations of monuments, structures, and landscapes using photogrammetry and scanning.

Upon completion of this course, students should:
1) Possess a broad understanding of the array of digital methods that are available for collecting, managing, analyzing, and disseminating archaeological data.
2) Be able to design a research project that uses one or more digital methods.
3) Assess the outcome of a digital archaeology project.
4) Communicate the results of research via digital media.
5) Be familiar with current debates in digital archaeology.

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6) Be aware of the impact that digital methods have on anthropological and archaeological thought and practice.

Course Delivery:

There will be three general types of class meetings: lecture and discussion sessions in which we will cover assigned readings, meetings in the field where we apply one or more of the technologies at our disposal, and 'work-along" sessions where we use a digital tool together as a group either on our devices or in the computer lab.

There will also be field excursions in which the students can gain experience collecting data in the field with 3D scanners, non-metric cameras, terrestrial surveying equipment, and geophysical instruments. Some of the field excursions will be during the class period and take place at the Woodlands Cemetery, local to the Penn Campus. Other field excursions will visit one of the three field sites west of Philadelphia on weekends, and transportation will be offered. Individual transportation costs could be reimbursed if the student's schedule will not fit the transportation schedule.

Much of the course content will be served through Canvas. We will use external software for data distribution and processing (e.g. Box, QGIS, ArcGIS Online, etc.). It may be the case that we will use software that requires local installation on a computer. It is therefore important to have access to a reasonably new laptop or desktop for coursework. Where possible, preference will be given to free and open source software (FOSS).

Possible Field Sites

Our active fieldwork will take place at two sites, Lindley Hill Cemetery and Washington Square in Philadelphia.

Lindley Hill Cemetery (Partners: Rev Ivy Berry & Sister Angela Rice)

Washington Square (Partners NPS & City of Philadelphia).

We will also use data from three other field sites where we have worked in past semesters. They are: Mt Zion AME Cemetery, adjacent to the Mt Zion AME Church in Devon, Tredryffin Township, PA, Ebenezer Cemetery in East Whiteland Township, PA (property owned by Mt Zion AME in Devon), and Eden Cemetery in Collingdale, PA. These cemeteries are notable for being the final resting places for a significant number of US Colored Troops (USCTs), African American veterans of the American Civil War.

Eden Cemetery (Partner: Sheila Jones) in Collingdale (https://www.edencemetery.org/) is the largest African American Cemetery in the Philadelphia area and the home to many of the interments that were displaced by urban expansion in South and West Philadelphia in the 19th and 20th centuries. The origin and population of Eden Cemetery provides a unique opportunity

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for students to practice using a Geographic Information System (GIS) to relocate the original cemeteries that hosted the people interred at Eden, and to explore techniques for visualizing movement and networks with geographic data. Eden Cemetery is also relatively open, so it presents a safe space for training in capturing aerial images with a UAS (uncrewed aircraft system). Aerial images will be used for creating three-dimensional models of the landscape and for creating image mosaics for mapping surface features.

Mt Zion AME, Devon (Partners: Bertha Jackmon & Rev. April Martin) is the oldest continuously operating African American church on the Main Line, and the adjacent cemetery is home to 21 USCTs. This small cemetery was originally planned to be surveyed during Spring of 2020, but student fieldwork had to be canceled owing to the shutdown from COVID-19. The prospect of promising results remains after some initial surveys in January of this year using CAAM equipment, and these results need to be augmented with GPR and EM surveys. Mt Zion AME in Devon is seeking recognition by the National Register, and the results of the students' work during this class will reinforce the application text.

Weekend Fieldwork:

As mentioned above, field excursions in which we will visit one of the three field sites will be Saturday trips. These trips are optional, but highly recommended for students who want to gain experience in archaeological fieldwork. Transportation will be offered. Individual transportation costs could be reimbursed if the student's schedule will not fit the class transportation schedule.

Evaluation:

	Contribution	Description
Participation	10%	Introductory assignment, attendance, your contribution to class discussion, and involvement in class exercises will count toward your participation grade.
Practica	60%	Each stage of the course project will involve one or more skills that will be honed through practica. These assignments, written by the instructor, will serve as a combination instruction set and worksheet, and walk students through collecting, processing, and interpreting a particular type of data related to the overall course project. Practica will be completed in part during work-alongs and partly on the student's own time outside of class. Skills learned in practica can be applied to your own research material to be presented in the final projects.
Interim Exam	10%	An asynchronous exam will assess students' retention of key concepts covered in the first half of the course.
Final Project	20%	A final project can be one of several things: ● A report of work undertaken that expands upon one or more practica at the field sites or your own research ● An analysis and presentation of digital archaeology data collected by the student in the field at one or more of the field sites and relating to the ABCS goals of the course. ● An analysis and presentation of digital archaeology data collected by the student in the field for their thesis/dissertation research.

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		Undergraduate and Graduate Students: ● A polished public-facing storymap, poster, or article manuscript. The report should demonstrate familiarity with more than two digital skills (e.g., mapping, display of 3d data, analysis, etc.) and the goals of the fieldwork. Graduate Students: ● Additional 3000+ word paper placing this research into theoretical context or explaining its archaeological significance.

Course Materials and Plan

All readings will be available on the class Canvas site. All assignments will be turned in through the Canvas website. Do you use Zotero? See these references and more (https://www.zotero.org/jherrma)! Request to join the group on Zotero.

Academic Integrity

Collaborative learning and cooperation is encouraged in this course. The completion of the assignments themselves, however, must be done by each student on their own in order to best internalize the techniques. Practica and papers will be assessed using Turnitin prior to grading. It is your responsibility to be familiar with the University's Code of Academic Integrity, which can be found at this link:
http://provost.upenn.edu/policies/pennbook/2013/02/13/code-of-academic-integrity

Student Disabilities Services

The University of Pennsylvania provides reasonable accommodations to students with disabilities who have self-identified and been approved by the office of Student Disabilities Services (SDS). Please make an appointment to meet with me as soon as possible in order to discuss your accommodations and your needs. If you have not yet contacted SDS, and would like to request accommodations or have questions, you can make an appointment by calling SDS at 215-573-9235. The office is located in the Weingarten Learning Resources Center at Stouffer Commons 3702 Spruce Street, Suite 300. All services are confidential.

List of Readings

Module 1 Organizing Digital Data

Bevan, Andrew. 2015. "The Data Deluge." Antiquity 89 (348): 1473–84.
https://doi.org/10.15184/aqy.2015.102

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Archaeological Data Service. 2013. Caring for Digital Data in Archaeology. ADS Series. Oxford: Oxbow Books. https://guides.archaeologydataservice.ac.uk/g2gpwiki/ (Under Project Lifecycle, sections: Planning for the creation of digital data, Project Documentation and Project Metadata.)

Averett, Erin Walcek, Derek Counts, and Jody Gordon. 2017. "Mobilizing the Past for a Digital Future: The Potential of Digital Archaeology," January. https://hcommons.org/deposits/item/hc:12289/. Or https://thedigitalpress.org/mobilizing-the-past-for-a-digital-future/ Chapters 1, 2

"What Is XML and Why Should Humanists Care? An Even Gentler Introduction to XML." n.d. Accessed August 24, 2021. http://dh.obdurodon.org/what-is-xml.xhtml.

Ryan, Nick. 2004. "Databases." Internet Archaeology, no. 15. https://intarch.ac.uk/journal/issue15/8/index.html

Lacy, Robyn Sarah. 2018. "Public Engagement through Burial Landscapes: Cupids and Ferryland, Newfoundland." AP: Online Journal in Public Archaeology 8 (2): 55–78. https://doi.org/10.23914/ap.v8i2.146.

Labrador, Angela M. 2012. "Ontologies of the Future and Interfaces for All: Archaeological Databases for the Twenty-First Century." Archaeologies 8 (3): 236–49. https://doi.org/10.1007/s11759-012-9203-2.

Module 2 GIS and GNSS

Historic England. 2015. Where on Earth Are We? The Role of Global Navigation Satellite Systems (GNSS) in Archaeological Field Survey. 2nd ed. Swindon: English Heritage. https://historicengland.org.uk/images-books/publications/where-on-earth-gnss-archaeological-field-survey/heag047-where-on-earth-are-we/.

Dibble, Harold L. 1987. "Measurement of Artifact Provenience with an Electronic Theodolite." Journal of Field Archaeology 14 (2): 229–54. https://doi.org/10.2307/530143.

Hill, Austin Chad, Fred Limp, Jesse Casana, Elise Jakoby Laugier, and Malcolm Williamson. 2019. "A New Era in Spatial Data Recording: Low-Cost GNSS." Advances in Archaeological Practice 7 (2): 169–77. https://doi.org/10.1017/aap.2018.50.

Limp, William (Fred), and Adam Barnes. 2014. "Solving the Grid-to-Ground Problem When Using High Precision GNSS in Archaeological Mapping." Advances in Archaeological Practice 2 (2): 138–43. https://doi.org/10.7183/2326-3768.2.2.138.

Kvamme, Kenneth L. 1999. "Recent Directions and Developments in Geographical Information Systems." Journal of Archaeological Research 7 (2): 153–201.

McCoy, Mark D., and Thegn N. Ladefoged. 2009. "New Developments in the Use of Spatial Technology in Archaeology." Journal of Archaeological Research 17 (3): 263–95. https://doi.org/10.1007/s10814-009-9030-1.

Verhagen, Philip. 2018. "Spatial Analysis in Archaeology: Moving into New Territories." In Digital Geoarchaeology: New Techniques for Interdisciplinary Human-Environmental Research, edited by Christoph Siart, Markus Forbriger, and Olaf Bubenzer, 11–25. Natural Science in Archaeology. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-25316-9_2.

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Gupta, Neha. 2013. "What Do Spatial Approaches to the History of Archaeology Tell Us? Insights from Post-Colonial India." Complutum 24 (2): 189–201. https://doi.org/10.5209/rev_CMPL.2013.v24.n2.43379.

Hacıgüzeller, Piraye. 2012. "GIS, Critique, Representation and Beyond." Journal of Social Archaeology 12 (2): 245–63. https://doi.org/10.1177/1469605312439139.

Landeschi, Giacomo. 2019. "Rethinking GIS, Three-Dimensionality and Space Perception in Archaeology." World Archaeology 51 (1): 17–32. https://doi.org/10.1080/00438243.2018.1463171.

Module 3 GIS and Remote Sensing

Conolly, James. 2020. "Spatial Interpolation." In *Archaeological Spatial Analysis: A Methodological Guide*, edited by Mark Gillings, Piraye Hacıgüzeller, and Gary Lock, 118–34. London: Routledge. https://doi.org/10.4324/9781351243858. (available via https://franklin.library.upenn.edu/catalog/FRANKLIN_9977657173803681).

Kvamme, Kenneth L. 2003. "Geophysical Surveys as Landscape Archaeology." American Antiquity, 435–57. https://doi.org/10.2307/3557103.

Thompson, Victor D., Philip J. Arnold, Thomas J. Pluckhahn, and Amber M. Vanderwarker. 2011. "Situating Remote Sensing in Anthropological Archaeology." Archaeological Prospection 18 (3): 195–213. https://doi.org/10.1002/arp.400.

Kvamme, Kenneth L. 2006. "Magnetometry: Nature's Gift to Archaeology." In Remote Sensing in Archaeology: An Explicitly North American Perspective, edited by Jay K. Johnson, 205–34. University Alabama Press.

Campana, Stefano. 2017. "Emptyscapes: Filling an 'Empty' Mediterranean Landscape at Rusellae, Italy." *Antiquity* 91 (359): 1223–40. https://doi.org/10.15184/aqy.2017.139.

Somers, Lewis. 2006. "Resistivity Survey." In Remote Sensing in Archaeology: An Explicitly North American Perspective, edited by Jay K. Johnson, 109–29. University Alabama Press.

Kvamme, Kenneth L. 2006. "Data Processing and Interpretation." In Remote Sensing in Archaeology: An Explicitly North American Perspective, edited by Jay K. Johnson, 236–50. University Alabama Press.

Wadsworth, William T. D., Kisha Supernant, Ave Dersch, and the Chipewyan Prairie First Nation. 2021. "Integrating Remote Sensing and Indigenous Archaeology to Locate Unmarked Graves: A Case Study from Northern Alberta, Canada." Advances in Archaeological Practice 9 (3): 202–14. https://doi.org/10.1017/aap.2021.9.

Chase, Arlen F., Diane Z. Chase, John F. Weishampel, Jason B. Drake, Ramesh L. Shrestha, K. Clint Slatton, Jaime J. Awe, and William E. Carter. 2011. "Airborne LiDAR, Archaeology, and the Ancient Maya Landscape at Caracol, Belize." Journal of Archaeological Science 38 (2): 387–98. https://doi.org/10.1016/j.jas.2010.09.018.

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Harmon, James M., Mark P. Leone, Stephen D. Prince, and Marcia Snyder. 2006. "LiDAR for Archaeological Landscape Analysis: A Case Study of Two Eighteenth-Century Maryland Plantation Sites." American Antiquity 71 (4): 649–70. https://doi.org/10.2307/40035883.

Module 4: 3D Modeling and Virtualization

Opitz, Rachel, and W. Fred Limp. 2015. "Recent Developments in High-Density Survey and Measurement (HDSM) for Archaeology: Implications for Practice and Theory." Annual Review of Anthropology 44 (1)

Sapirstein, Philip, and Sarah Murray. 2017. "Establishing Best Practices for Photogrammetric Recording During Archaeological Fieldwork." Journal of Field Archaeology 42 (4): 337–50. https://doi.org/10.1080/00934690.2017.1338513.

Campana, Stefano. 2017. "Drones in Archaeology. State-of-the-Art and Future Perspectives." *Archaeological Prospection*, January, n/a-n/a. https://doi.org/10.1002/arp.1569.

Matthew, Matthew Douglass, Whittaker Schroder, Jonathan Reeves, and David R. Braun. 2020. "The Digital Revolution to Come: Photogrammetry in Archaeological Practice." American Antiquity 85 (4): 737–60. https://doi.org/10.1017/aaq.2020.59.

Dell'Unto, Nicolo. 2020. "The Analytical Role of 3D Realistic Computer Graphics." In Archaeological Spatial Analysis: A Methodological Guide, edited by Mark Gillings, Piraye Hacıgüzeller, and Gary Lock, 444–59. London: Routledge. https://doi.org/10.4324/9781351243858.

Richards-Rissetto, Heather, and Jennifer von Schwerin. 2017. "A Catch 22 of 3D Data Sustainability: Lessons in 3D Archaeological Data Management & Accessibility." Digital Applications in Archaeology and Cultural Heritage, The Past now showing in 3D: case studies in 3D archaeology, 6 (September): 38–48. https://doi.org/10.1016/j.daach.2017.04.005.

Liang, Jiafang. 2021. "Mixing Worlds: Current Trends in Integrating the Past and Present through Augmented and Mixed Reality." Advances in Archaeological Practice 9 (3): 250–56. https://doi.org/10.1017/aap.2021.16.

Ch'ng, Eugene. 2009. "Experiential Archaeology: Is Virtual Time Travel Possible?" Journal of Cultural Heritage 10 (4): 458–70. https://doi.org/10.1016/j.culher.2009.02.001.

Ellenberger, Kate. 2017. "Virtual and Augmented Reality in Public Archaeology Teaching -." Advances in Archaeological Practice 5 (3): 305–9. https://doi.org/10.1017/aap.2017.20.

DOHR project:

https://jitp.commons.gc.cuny.edu/relational-presence-designing-vr-based-virtual-learning-enviro
nments-for-oral-history-based-restorative-pedagogy/

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(Optional) Living Museum:
https://jitp.commons.gc.cuny.edu/blending-disciplines-for-a-blended-reality-virtual-guides-for-a-living-history-museum/

From Connected Learning, Wooden Bead exhibit:
https://clalliance.org/blog/can-vr-used-learning/

VR in Museums:
https://canvas.upenn.edu/courses/1611820/files/folder/Readings?preview=102979480

Module 5: Communication and Ethics

Earley-Spadoni, Tiffany. 2017. "Spatial History, Deep Mapping and Digital Storytelling: Archaeology's Future Imagined through an Engagement with the Digital Humanities." Journal of Archaeological Science, Archaeological GIS Today: Persistent Challenges, Pushing Old Boundaries, and Exploring New Horizons, 84 (August): 95–102.

González-Tennant, Edward. 2010. Virtual Archaeology and Digital Storytelling: A Report from Rosewood, Florida. The African Diaspora Archaeology Network, September 2010 Newsletter.

Richardson, Lorna-Jane. 2018. "Ethical Challenges in Digital Public Archaeology." Journal of Computer Applications in Archaeology 1 (1): 64–73. https://doi.org/10.5334/jcaa.13.

Davis, Dylan S., Danielle Buffa, Tanambelo Rasolondrainy, Ebony Creswell, Chiamaka Anyanwu, Abiola Ibirogba, Clare Randolph, et al. 2021. "The Aerial Panopticon and the Ethics of Archaeological Remote Sensing in Sacred Cultural Spaces." *Archaeological Prospection* 28 (3): 305–20. https://doi.org/10.1002/arp.1819.

Chase, Adrian S. Z., Diane Chase, and Arlen Chase. 2020. "Ethics, New Colonialism, and Lidar Data: A Decade of Lidar in Maya Archaeology." Journal of Computer Applications in Archaeology 3 (1): 51–62. https://doi.org/10.5334/jcaa.43.

Caraher - "Slow Archaeology: Technology, Efficiency, and Archaeological Work"

Huggett, Jeremy. 2015. "A Manifesto for an Introspective Digital Archaeology." Open Archaeology 1 (1). https://doi.org/10.1515/opar-2015-0002.

Huggett, Jeremy. 2017 The Apparatus of Digital Archaeology, Internet Archaeology 44.