

ANAR 121: Cyber-Archaeology and World Digital Cultural Heritage

Winter 2023

Location/Hours: CSE B210, TU/TH 12:30-1:50pm

Instructor: Dr. Neil Smith

Email: ngsmith@ucsd.edu

Office Hours: Tu/Thu 10:00-11:00am in CSEB210 (or by appointment)

Zoom link: <https://ucsd.zoom.us/my/drngsmith>

Required Textbooks

Levy T., and I. Jones, eds. 2018. *Cyber-Archaeology and Grand Narratives*. One World Archaeology. Springer, Cham. [CGN]

Select chapters for readings will be available on Canvas. Physical copies of the book are available in Geisel Library or can be purchased from UCSD Bookstore or Amazon.

Averett, E., J. Walcek, M. Gordon, and D. B. Counts, eds. 2016. *Mobilizing the Past for a Digital Future: The Potential of Digital Archaeology*. Grand Forks, ND: The Digital Press at the University of North Dakota. [MTP]

Available as a free PDF from <https://thedigitalpress.org/mobilizing-the-past-for-a-digital-future/>.

Additional required readings are available on Canvas.

Course Description

This course will introduce the various computational tools and digital methodologies used in the field of Cyber-Archaeology. Cyber-Archaeology can be defined as the employment of digital and computational methods within an immersive and collaborative environment to study the complex systems of past human behavior, culture and society through empirical data recovered from archaeological excavation, survey and conservation. Cyber-Archaeology provides a means to digitally preserve archaeology and cultural heritage and make it available to a larger audience. Rather than focusing on a specific region or time period, it provides tools that broadly transform the entire domain of archaeology and cultural heritage studies. Most importantly it is driven by the true needs of archaeologists who seek to embrace well designed computational tools to advance research in ways not perceived as possible in the past. This course includes lectures, digital labs, external reading, and a final project.

Prerequisites

Upper division standing.

Canvas

<http://canvas.ucsd.edu>

The course Canvas page contains a copy of the syllabus, electronic course readings, lecture slides, lab, and grades. For information on using Canvas, see: <https://edtech.ucsd.edu/students/index.html>

Office Hours

I will be available to help with lab assignments and your research projects during office hours in Sequoia 142. If you need to meet privately please schedule in advance a private Zoom based office meeting. All office hours including private will be recorded. However, only public office hours will be posted on CANVAS. Please use this link to log in during office hours: <https://ucsd.zoom.us/my/drngsmith>

Submissions

All submissions from quizzes, reading notes, lab assignments and Final Research Project will go through CANVAS. **When uploading documents or taking quizzes it is your responsibility to make sure the website successfully accepts them.** If you face any technical difficulties, please email me and I will forward any issues I cannot resolve to UCSD IT support. All quizzes and submissions need to be completed **before March 24th Midnight** or they will not be counted towards your final grade.

Grading System

9 Weekly Reading Notes: **10%**

5 In Lecture Quizzes: **10%**

7 Lab Assignments: **40%**

Final Research Project: 40%

Weekly Reading Notes

The readings for each class session are listed below the date and title of that session in the schedule. It is your responsibility to complete the readings for each session and take notes. The readings will go into greater depth on the topics discussed in the lectures of that week. The readings will also help you in identifying the research topic you will present in the final project. You can also use the readings as references in your presentation. You receive 100% score for submitting your weekly reading notes to CANVAS. How you structure your notes and the level of detail is up to your discretion. However, it should be clear that they are notes on the readings for that week.

Retention Quizzes

Five short quizzes will be presented throughout the quarter after lecture. The purpose of the quiz is to help reinforce your retention of what was learned and encourage course attendance. The answers will be obvious if you attend/watch the lecture and you can always go back to the lecture to find the answers. Your score across all 5 quizzes makes up 10% of your final grade.

Lab Assignments

Each week there will be a lab component geared towards training you on a new Cyber-archaeology digital skill set. I will have a live digital walk-through tutorial of the lab. The labs will be in class digital tutorials that you can work through with the instructor. When you complete the lab, you will submit a screenshot of your completed tutorial to Canvas. You receive 100% score for submitting the completed lab assignment. All labs need to be submitted before March 24th, but I highly recommend you complete them on a weekly basis as I will not discuss previous weeks' lab assignments in office hours. You must, however, **always complete your own work**. Any evidence that you have copied answers directly from another person will result in loss of credit for **both people**.

Final Research Project

A major goal of this class is for you to walk away with a high proficiency in one of the topics or digital skills in Cyber-Archaeology. Your Final Research Project is an opportunity for you to dig deeper into one of the topics/skills in the course and educate the other students and myself on what you learned.

During the lectures, I will highlight different topics related to that week's work and give direction on how you can pursue the subject. On CANVAS I will upload a topic list to help you identify a topic.

You will have 5 weeks to select your topic. There will be no Midterm but you will be expected to submit a 1 paragraph thesis topic for your final project by **February 10th** to CANVAS which will represent **5%** of the Final Research Project's grade.

I will provide on CANVAS greater detail and instruction on how to research and present your topic for the Final Project.

You will have two options to choose from for your project.

A. Research Paper

You will write a research paper (~10-12 pages, 2-5 figures) on one of the Cyber-archaeology pillar topics from the course.

B. Unreal Engine Demo Project

Using the skills learned in the class lab tutorials, you will create an Unreal Engine project that contributes to one of the Cyber-archaeology pillars discussed throughout the class. This can be a visualization of new data, blueprint/c++ tool, virtual tour, or new VR/AR interaction/experience. It is encouraged to build off of the CyberArchWarehouse project that you will learn to use.

There will be no final exam in the class, instead on Week 10 students will present their research project to the class. Each student will be given 10 minutes to present their work to the class. You will be expected to have prepared 8-10 slides. If you are not able to attend the in-person class, present on a Zoom meeting or face technical difficulties, you may submit a recorded version of your presentation before your assigned day to present.

Breakdown of Final Research Project Grading:

5% Submission of Topic Thesis by Midterm (February 10th)

55% Final Project

10% Digital Slides (8-10 slides)

30% Recorded/Live Presentation of Research (10 minutes)

Students with Disabilities

Students requesting accommodations for this course due to a disability must provide a current Authorization for Accommodation (AFA) letter (paper or electronic) issued by the Office for Students with Disabilities (<http://osd.ucsd.edu/>). Students are required to discuss accommodation arrangements with their instructor (i.e. me) and Garrett Soriano, the Department of Anthropology's OSD liaison, in advance of any exams or assignments. Students authorized to receive reasonable accommodations should discuss their needs with me during office hours to ensure confidentiality. For additional information, contact

the Office for Students with Disabilities: (858) 534-4382; email: osd@ucsd.edu; website: <http://osd.ucsd.edu>.

Emergency Preparedness

Please review the Campus Emergency Preparedness website for information on campus emergency procedures: <http://blink.ucsd.edu/go/emergencyplanning>

Academic Integrity

Plagiarism and cheating are very serious offenses, with serious negative consequences for your academic career. Plagiarism includes both quoting someone without giving a citation and also using someone else's ideas without citing them. It is your responsibility to be familiar with and abide by UCSD's Policy on Integrity of Scholarship, as well as your rights and responsibilities according to the UCSD Student Conduct Code. In this course, you are expected to present your own original words and ideas in labs, notes and the final project. You are welcome and encouraged to discuss course material with your classmates, but you may not present other students' answers as your own. For your project, any words or ideas you adopt from another sources (whether verbatim or paraphrased) must be properly credited through citation. If you have any questions about plagiarism or how to properly cite sources, don't hesitate to ask me.

For additional information, see <https://academicintegrity.ucsd.edu/faq/index.html>

Course Schedule

Part 1: Acquisition

Week 1 (January 9-13)

Lecture 1: What is Cyber-Archaeology?

Lecture 2: Introduction to Acquisition and Digital Field Recording

Reading: [MTP] Introduction, pp. 1-30; [CGN] Chapter 1 pp. 1-19; [MTP] 1.3 pp. 77-110

Lab: No lab this week

Week 2 (January 16-20)

Lecture 3: Photogrammetry, Remote Sensing & Drones in Archaeology

Lecture 4: Tutorial 1: Your first hour in UE5

Reading: [MTP] 2.2 pp. 237-250; [MTP] 2.3 pp. 251-278

Smith, N.G., L. Passone, S. Al-Said, M. Al-Farhan, and T. E. Levy. 2014. "Drones in Archaeology: Integrated Data Capture, Processing, and Dissemination in the Al-Ula Valley, Saudi Arabia," *Near Eastern Archaeology* 77(3): 176-181.

Watch: https://www.ted.com/talks/sarah_parcak_help_discover_ancient_ruins_before_it_s_too_late

Optional Reading:

Levy, T.E., M.L. Vincent, M. Howland, F. Kuester, and N.G. Smith. 2014. "The Art of Implementing SfM for Reconstruction of Archaeological Sites in Greece: Preliminary Applications of Cyber-Archaeological Recording at Corinth," *Mediterranean Archaeology and Archaeometry* 14 (4):125-133.

Lab: UE5 Part1: Your first hour in UE5

Week 3 (Jan 23-27)

Lecture 5: Laser Scanning and Acquisition below the Top Soil and beyond the visible spectrum

Lecture 6: Tutorial 2: Reality Capture and working with Drone Data

Reading: [CGN] Chapter 5 pp. 67-90;

Berggren, Å, N. Dell'unto, M. Forte, S. Haddow, I. Hodder, J. Issavi, and J. Taylor. 2015. "Revisiting Reflexive Archaeology at Çatalhöyük: Integrating Digital and 3D Technologies at the Trowel's Edge," *Antiquity* 89(344): 433-448.

Mccarthy, J., and J. Benjamin. 2014. "Multi-Image Photogrammetry for Underwater Archaeological Site Recording: An Accessible, Diver-Based Approach," *Journal of Maritime Archaeology* 9 (1): 95-114.

Lab: SfM Part1: Reality Capture and working with Drone Data

Part 2: Curation

Week 4 (Jan 30-Feb 3)

Lecture 7: Digital Curation Databases and the Problem of Standardization

Lecture 8: Tutorial 3: Creating Virtual Archaeological Experiences in UE5 using CyberArchWarehouse

Reading: [MTP] 1.7, pp. 201-220

Savage, S. H., and T. E. Levy. 2014. "DAAHL – The Digital Archaeological Atlas of the Holy Land: A Model for Mediterranean and World Archaeology." *Near Eastern Archaeology* 77 (3):243-247.

Kansa, Eric C., and S.W. Kansa. 2013. "We All Know That a 14 Is a Sheep: Data Publication and Professionalism in Archaeological Communication," *Journal of Eastern Mediterranean Archaeology and Heritage Studies* 1(1): 88–97.

Optional Reading:

Forte, M. 2014. "3D Archaeology: New Perspectives and Challenges—The Example of Çatalhöyük," *Journal of Eastern Mediterranean Archaeology & Heritage Studies* 2(1): 1-29.

Lab: UE5 Part2: Creating Virtual Archaeological Experiences in UE5 using CyberArchWarehouse

Week 5 (Feb 6-10)

Lecture 9: From GIS to 4Dimensional curation and HBIM

Lecture 10: Tutorial 4: Intro to GIS

Reading:

Hritz, Carrie. 2014. "Contributions of GIS and Satellite-based Remote Sensing to Landscape Archaeology in the Middle East." *Journal of Archaeological Research* 22(3): 229-276.

Smith N., M. Howland, and T. Levy. 2015. "Digital Archaeology Field Recording in the 4th Dimension: ArchField C++ a 4D GIS for Digital Field Work," In *Proceedings of Digital Heritage International Congress (DigitalHeritage) 2015, September 28-October 2, 2015*.

López, F.J., P.M. Leronés, J. Llamas, J. Gómez-García-Bermejo, and E. Zalama. 2018. "A Review of Heritage Building Information Modeling (H-BIM)," *Multimodal Technologies Interact* 2018, 2, 21.

Lab: GIS Part 1: GIS Intro Tutorial

Part 3: Analysis

Week 6 (Feb 13-17)

Lecture 11: Digital Reconstructions, Analysis and the Metaverse

Lecture 12: Tutorial 5: Dealing with Real Archaeological Spatial Databases

Reading:

Younesa, G., R. Kahilb, M. Jalladc, D. Asmara, I. Elhajja, G. Turkiyyahb, and H. Al-Harithyc. 2017. "Virtual and Augmented Reality for Rich Interaction with Cultural Heritage Sites: A Case Study from the Roman Theater at Byblos. Digital Applications," in *Archaeology And Cultural Heritage* 5:1-9.

Forte, M. 2011. "Cyber-archaeology: Notes on the simulation of the past," *Virtual Archaeology Review*, 2(4), 7-18.

Smith, N.G., K. Knabb, C. DeFanti, P. Weber, J.P. Schulze, A. Prudhomme, F. Kuester, F., T.E. Levy, T.A. DeFanti. 2013. "ArtifactVis2: Managing real-time archaeological data in immersive 3D environments," in *Proceedings of Digital Heritage International Congress (DigitalHeritage) 2013, October 28-November 1*, 363-370.

Sanders, D. 2014. "Virtual Heritage Researching and Visualizing the Past in 3D," *Journal of Eastern Mediterranean Archaeology and Heritage Studies* 2(1):30-47.

Lab: GIS Part 2: Dealing with Real Archaeological Spatial Databases

Week 7 (Feb 20-24)

Lecture 13: Modeling, Simulation, Experimentation and Storytelling

Lecture 14: Tutorial 6: Creating your own datasets using Photogrammetry

Reading:

Roux, V., B. Bril, and A. Karasik. 2018. "Weak Ties and Expertise: Crossing Technological Boundaries," *Journal of Archaeological Method and Theory* 10.1007;

Romanowska, I., S. Crabtree, B. Davies, and K. Harris. 2019. "Agent-based Modeling for Archaeologists. A step-by-step guide for using agent-based modeling in archaeological research (Part I of III)." *Advances in Archaeological Practice* 7 (2).

Davies, Benjamin, Iza Romanowska, Kathryn Harris, Stefani Crabtree. 2019. "Combining Geographic Information Systems and Agent-Based Models in Archaeology: A step-by-step guide for using agent-based modeling in archaeological research (Part II of III)," *Advances in Archaeological Practice* 7 (2).

Optional Reading:

Gubrium, A. 2009. "Digital Storytelling as a Method for Engaged Scholarship in Anthropology," *Practicing Anthropology* 31(4): 5-9.

Lab: SfM Part2: Creating your own datasets using Photogrammetry

Week 8 (Feb 27-March 3)

Lecture 15: Crowd Sourcing, AI (Machine Learning) and Experiential Archaeology

Lecture 16: Tutorial 7: Cesium and Spatial Analysis inside UE5

Reading: [CGN] Chapter 6 pp. 91-110; [MTP] Section 3.3, pp. 373-397;

Grosman, L., A. Karasik, O. Harush, U. Smilansky. 2014. "Archaeology in Three Dimensions - Computer-Based Methods in Archaeological Research," *The Journal of Eastern Mediterranean Archaeology and Heritage Studies* 2: 48-64.

Granger, R. E. Bowen, B. Tofel, and S. Parcak. 2017. "Algorithmic Identification of Looted Archaeological Sites from Space," *Frontiers in ICT* 4.

Optional Reading:

Smith, Neil G., Avshalom Karasik, Tejaswini Narayanan, Eric Olson, Uzy Smilansky, Thomas E. Levy. 2012. "The Pottery Informatics Query Database: A new method for mathematic and quantitative based analyses of large regional ceramic assemblage datasets," *Journal of Archaeological Method and Theory* 23.

Kansa, E. C., and S.W. Kansa. 2011. "Toward a do-it-yourself cyberinfrastructure: Open data, incentives, and reducing costs and complexities of data sharing," in E. C. Kansa, S. W. Kansa, & E. Watrall, eds., *Archaeology 2.0: New approaches to communication and collaboration*, 57-91. Los Angeles: Cotsen Institute of Archaeology Press.

Ch'ng, Eugene. 2009. "Experiential archaeology: Is virtual time travel possible?" *Journal of Cultural Heritage* 10: 458-470.

Lab: UE5 Part 3: Cesium and Spatial Analysis inside UE5

Part 4: Dissemination

Week 9 (March 6-10)

Lecture 17: The Southern Levant as a Case Study in Cyber-Archaeology

Lecture 18: Tour of Qi Institute CAVE and Design Lab

Reading: [MTP] Section 4.2, pp. 443-474, [MTP] Sections 5.1-5.2, pp. 475-520

Optional Reading:

Forte, M. 2016. "Cyber archaeology: 3D sensing and digital embodiment," in M. Forte & S. Campana eds., *Digital methods and remote sensing in archaeology: Archaeology in the age of sensing*, 271–289. Cham: Springer.

Levy, T. E., N. G. Smith, M. Najjar, T. DeFanti, A. Lin, and F. Kuester. 2012. *Cyber-archaeology in the holy land: The future of the past*. Washington, DC: Biblical Archaeology Society.

Lab: No lab, use this time to work on your Final Research Project

Week 10 (March 13-17)

Lecture 17: Presentations

Lecture 18: Presentations

Reading: No Reading, Prepare for Presentations and Final Research Paper

Lab: No lab, use this time to work on your Final Research Project

Final Research Project due March 23rd (Thursday of Finals week by Midnight)