

DIGITAL PRESERVATION

CINE-GT 1807

Tuesdays, 5:30 – 9:30 PM

721 Broadway, Room 652

<https://www.digiprez.co>

Instructor

Nicole Martin

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office hours: by appointment

ABSTRACT

This course explores the use of digital files and infrastructure as preservation media, and will investigate current theories and practices for the preservation of both digitized and born digital materials. The history of digital technology, computing, and preservation initiatives undertaken by the national, international, regional, and cooperative organizations will be explored. Students will learn about digital preservation environments, technological systems, and the policies and procedures integrated into repositories ensure compliance with digital preservation standards. Students will gain practical skills identifying, analyzing, handling, and assessing risk for works as a whole, their component parts, and associated software and metadata. As advocates for the field of digital preservation in general, students will learn to appreciate the difference between information technology and information systems, and the necessity of their expertise. Through a combination of lectures, discussion, demonstrations, hands-on activities and lab exercises, students will develop an increased understanding of digital technology and digital preservation.

OBJECTIVES

1. Explore the history of digital technology, computing, and digital preservation initiatives
2. Understand the computing environment in which digital objects or collections were created, and the optimal environment in which they will be preserved
3. Identify and characterize digital objects and become familiar with format specifications and associated metadata;
4. Understand and articulate the requirements, responsibilities, and functions of digital preservation environments;
5. Through lab exercises, demonstrate an understanding of command line tools used for preservation and preservation techniques;
6. Understand basic digital standards, protocols, and technologies including operating systems (UNIX/Linux/macOS/Windows), network sharing protocols (AFP, NFS, SMB), networks (HTTPS, SFTP) file systems (Mac OSX, FAT32, EXFAT, ext), and storage architectures (SAN, NAS, DAS);
7. Understand strategies for digital preservation management.

EXPECTATIONS

Students are expected to do required readings each week in order to be prepared for class exercises and discussions. Readings assigned for the week should be read in advance of the class session. Students are expected to bring laptop computers on lab days designated in the course syllabus.

Attendance at all classes is expected; more than one unexcused absence will affect grading. Grades will be based on a combination of class preparedness and participation (25%); and assignments (45% for the final project, and 30% for assignment 1). Class sessions will include a mix of lecture, discussion, demonstrations, and group or individual exercises. Your participation in these in class activities is a required part of your grade. Many in-class exercises and homework assignments will require a computer. Student laptops will be required most weeks for in-class exercises, so please plan on bringing your laptop to class. If you can't bring a laptop, you can work with others, or possibly borrow one from the department. Please inform the instructor if you

regularly cannot bring a laptop so that arrangements can be made.

Part of your participation grade may include volunteering to research and present briefly on specific topics addressed throughout the semester.

ASSIGNMENTS & STUDENT WORK

Students will complete two assignments for this course: an interview with an archivist or practitioner who works in the field of digital preservation, and an individual final project to be negotiated with the professor. Students are required to submit a proposal of their final project for approval, and encouraged to submit a draft in advance of the final project deadline. Assignments will be submitted electronically in the PDF file format via email to the instructor at nmartin@nyu.edu. Feedback will be provided within three weeks after the (on-time) assignment is submitted. The first assignment and student works containing sensitive or proprietary information will be archived by the Moving Image Archiving and Preservation program department, marked as confidential, and never published. Works that do not contain sensitive information will be considered for publication on the MIAP website.

SKILLS

- Introductory bash scripting
- File identification (mediainfo, exiftool, DROID)
- Data storage, formatting and analysis
- Safe file transfer
- Fixity checks for files and collections
- Basic web archiving using Archive-IT and Web Recorder
- Read/Write data to LTO tape using LTFS
- Data packaging and disk imaging

TEXTS

There are no physical text sources for this class, and all required readings are accessible online. If you have any issues accessing readings, please contact Nicole ASAP.

NYU/TISH POLICIES

Tisch Policy on Academic Integrity

The core of the educational experience at the Tisch School of the Arts is the creation of original work by students for the critical review of faculty members. Any attempt to evade that essential transaction through plagiarism or cheating is educationally self-defeating and a grave violation of Tisch's community standards. Plagiarism is presenting someone else's original work as if it were your own; cheating is an attempt to deceive a faculty member into believing that your mastery of a subject or discipline is greater than it really is. Penalties for violations of Tisch's Academic Integrity Policy may range from being required to redo an assignment to dismissal from the School. For more information on the policy--including academic integrity resources, investigation procedures, and penalties--please refer to the [Policies and Procedures Handbook](https://tisch.nyu.edu/student-affairs/important-resources/tisch-policies-and-handbooks) (tisch.nyu.edu/student-affairs/important-resources/tisch-policies-and-handbooks) on the website of the Tisch Office of Student Affairs.

Health & Wellness Resources

Your health and safety are a priority at NYU. If you experience any health or mental health issues during this course, we encourage you to utilize the support services of the 24/7 NYU Wellness Exchange 212-443-9999. Also, all students who may require an academic accommodation due to a qualified disability, physical or mental, please register with the Moses Center 212-998-4980. Please let your instructor know if you need help connecting to these resources. Students may also contact MIAP Director Juana Suárez (juana@nyu.edu) and/or Associate Director Scott Statland (scott.statland@nyu.edu) for help connecting to resources.

Sexual Misconduct, Relationship Violence, and Stalking Policy & Reporting Procedures

NYU seeks to maintain a safe learning, living, and working environment. To that end, sexual misconduct, including sexual or gender-based harassment, sexual assault, and sexual exploitation, are prohibited. Relationship violence, stalking, and retaliation against an individual for making a good faith report of sexual misconduct are also prohibited. These prohibited forms of conduct are emotionally and physically traumatic and a violation of one's rights. They are unlawful, undermine the character and purpose of NYU, and will not be tolerated. A student or employee determined by NYU to have committed an act of prohibited conduct is subject to

disciplinary action, up to and including separation from NYU. Students are encouraged to consult the online [Sexual Misconduct, Relationship Violence, and Stalking Resource Guide for Students](https://nyu.edu/about/policies-guidelines-compliance/policies-and-guidelines/sexual-misconduct--relationship-violence--and-stalking-resource-.html) (nyu.edu/about/policies-guidelines-compliance/policies-and-guidelines/sexual-misconduct--relationship-violence--and-stalking-resource-.html) for detailed information about on-campus and community support services, resources, and reporting procedures. Students are also welcome to report any concerns to MIAP Director Juana Suárez (juana@nyu.edu) and/or Associate Director Scott Statland (scott.statland@nyu.edu).

Non-Discrimination and Anti-Harassment Policy & Reporting Procedures

NYU is committed to equal treatment and opportunity for its students and to maintaining an environment that is free of bias, prejudice, discrimination, and harassment. Prohibited discrimination includes adverse treatment of any student based on race, gender and/or gender identity or expression, color, religion, age, national origin, ethnicity, disability, veteran or military status, sexual orientation, marital status, or citizenship status, rather than on the basis of his/her individual merit. Prohibited harassment is unwelcome verbal or physical conduct based on race, gender and/or gender identity or expression, color, religion, age, national origin, ethnicity, disability, veteran or military status, sexual orientation, marital status, or citizenship status. Prohibited discrimination and harassment undermine the character and purpose of NYU and may violate the law. They will not be tolerated. NYU strongly encourages members of the University Community who have been victims of prohibited discrimination or prohibited harassment to report the conduct. MIAP students may make such reports to MIAP Director Juana Suárez (juana@nyu.edu) and/or Associate Director Scott Statland (scott.statland@nyu.edu), or directly to Marc Wais, Senior Vice President for Student Affairs. Students should refer to the University's [Non-Discrimination and Anti-Harassment Policy and Complaint Procedures](https://nyu.edu/about/policies-guidelines-compliance/policies-and-guidelines/non-discrimination-and-anti-harassment-policy-and-complaint-proc.html) (nyu.edu/about/policies-guidelines-compliance/policies-and-guidelines/non-discrimination-and-anti-harassment-policy-and-complaint-proc.html) for detailed information about on-campus and community support services, resources, and reporting procedures.

NYU Guidelines for Compliance with the Family Educational Rights and Privacy Act (FERPA)

The Family Educational Rights and Privacy Act of 1974 (FERPA) was enacted to protect the privacy of students' education records, to establish the rights of students to inspect and review their education records, and to provide students with an opportunity to have inaccurate or misleading information in their education records corrected. In general, personally identifiable information from a student's education records, including grades, may not be shared without a student's written consent. However, such consent is not needed for disclosure of such

information between school officials with legitimate educational interests, which includes any University employee acting within the scope of their University employment. See [here](http://nyu.edu/about/policies-guidelines-compliance/policies-and-guidelines/FERPA.html) (nyu.edu/about/policies-guidelines-compliance/policies-and-guidelines/FERPA.html) for full policy guidelines.

NYU Academic Support Services

NYU offers a wide range of academic support services to help students with research, writing, study skills, learning disability accommodation, and more. Here is a brief summary:

NYU Libraries

Main Site: library.nyu.edu; Ask A Librarian: library.nyu.edu/ask

70 Washington Square S, New York, NY 10012

Staff at NYU Libraries has prepared a guide

(<http://guides.nyu.edu/c.php?g=276579&p=1844806>) covering services and resources of particular relevance to graduate students. These include research services and guides by topic area, subject specialists, library classes, individual consultations, data services, and more. There's also a range of study spaces, collaborative work spaces, and media rooms at Bobst, the library's main branch.

The Writing Center

nyu.mywconline.com

411 Lafayette, 4th Floor, 212-998-8860, writingcenter@nyu.edu

The Writing Center is open to all NYU students. There, students can meet with a faculty writing consultant or a senior peer tutor at any stage of the writing process, about any piece of writing (except exams). Appointments can be scheduled online. Students for whom English is a second language can get additional help with their writing through a monthly workshop series scheduled by the Writing Center (cas.nyu.edu/content/nyu-as/cas/ewp/writing-resources/rise-workshops.html).

The University Learning Center (ULC)

nyu.edu/ulc; Academic Resource Center (18 Washington Pl, 212-998-8085) or University Hall (110 East 14th St, 212-998-9047)

Peer Writing Support: All students may request peer support on their writing during drop-in tutoring hours for "Writing the Essay / General Writing" at the University Learning Center (ULC), which has two locations noted above. Students for whom English is a second language may wish to utilize drop-in tutoring geared towards international student writers (see schedule for "International Writing Workshop").

Academic Skills Workshops: The ULC's Lunchtime Learning Series: Academic Skills Workshops focus on building general skills to help students succeed at NYU. Skills covered can help with work in a variety of courses. Workshops are kept small and discuss topics include proofreading, close reading to develop a thesis, study strategies, and more. All Lunchtime Learning Series workshops are run by Peer Academic Coaches.

Moses Center for Students with Disabilities

nyu.edu/students/communities-and-groups/students-with-disabilities.html

726 Broadway, 3rd Floor, 212-998-4980, mosescsd@nyu.edu

All students who may require an academic accommodation due to a qualified disability, physical or mental, are encouraged to register with the Moses Center. The Moses Center's mission is to facilitate equal access to programs and services for students with disabilities and to foster independent decision making skills necessary for personal and academic success. The Moses Center determines qualified disability status and assists students in obtaining appropriate accommodations and services. To obtain a reasonable accommodation, students must register with the Moses Center (visit the Moses Center website for instructions).

SYLLABUS

01 :: Introduction to Digital Preservation

September 4, Tue 5:30-9:30P

Topics

Introduction to digital technology and preservation

Exercise: Digital technology timeline

Readings

ALA Freedom to Read Statement & Bill of Rights

Clark & Steadman: Alan Turing's Legacy (WIRED)

Digitizing Contemporary Art: Bit Preservation & Logical Preservation

Martin: What is a Digital File?

Recommended/Reference

DP Workshop Digital Technology and Preservation Timeline

02 :: Foundations of Digital Technology and Preservation Practice

September 11, Tue 5:30-9:30P

Topics

Introduction: Goals, syllabus, assignments, course overview

Brief history of digital technology & computing 1930-1995

Basic digital preservation principles

Lab *Bring Laptops to Class*

Introduction to the bash shell and command line structure

Follow along exercise: Navigate file systems with the command line, create files, create folders, list files and directories (pwd, cd, mkdir, touch, ls, etc.)

Individual exercise: Create your own directory structures and files based on a theme of your choice. Create an inventory report with "ls".

Readings

Rosenthal: Requirements for Digital Preservation Systems

Digital Preservation Management Workshop: Sections 1–3 (note: alternate link is here)

Besser: Moving from Digital Collections to Interoperable Libraries

Reference

1996 Task Force on Archiving of Digital Information

Reference Model for an Open Archival Information System (The Magenta Book)

03 :: Operating Systems and Computing Environments

September 18, Tue 5:30-9:30P

Topics

How computers work: Part 2, Software

Computing foundations and digital preservation: UNIX and GNU/Linux

Free Software Movement and Open Source Software

Lab *Bring Laptops to Class*

Demo: nano

Follow along exercise: Write a bash script using nano

Individual exercise: Write your own bash shell script using ATOM (GUI) with a prepared script to perform a batch process (ffmpeg, disk usage, df, etc.)

Readings

Finley: Linux Took Over the Web. Now, It's Taking Over the World (WIRED)

Kelty: Two Bits: The Cultural Significance of Free Software (Chapter 3 only) – alternate download [here](#)

Lyons: Introduction to Using the Command Line

UNIX tutorial 1 & 2

Recommended Reading

Raymond: The Cathedral and the Bazaar

04 :: History of Digital Preservation Efforts, Intro to OAIS Model

September 25, Tue 5:30-9:30P

CONDUCT PRACTITIONER INTERVIEWS

Topics

Discussion of Assignment #1

History of digital preservation efforts and initiatives

OAIS reference model, history, and context

Lab *Bring Laptops to Class*

Command line scavenger hunt

Follow along exercise: Write a bash shell script using ATOM text editor

Readings

Lavoie: Meeting the Challenges of Digital Preservation: The OAIS Reference Model

Lavoie: The Open Archival System Introductory Guide (sections 1 – 5)

Lyons: Introduction to Using the Command Line

Reference

Reference Model for an Open Archival Information System (The Magenta Book)

05 :: NDSA Levels of Preservation, Digital Format Identification

October 2, Tue 5:30-9:30P

Topics

NDSA Levels of Preservation

File identification and format sustainability

Characteristics and Specifications of digital files

Lab *Bring Laptops to Class*

Follow-along exercise: File analysis using JHOVE, DROID, Mediainfo and Exiftool

Team Exercise: Comparing results from mediainfo, exiftool, and DROID. Research file sustainability with:

Sustainability of Digital Formats – Planning for Library of Congress Collections

Readings

NDSA Levels of Preservation

Peltzman: Expanding NDSA Levels of Preservation

Lacinak: Primer on Codecs

Jackson: Formats Over Time, UK Libraries

Recommended/Reference

Rosenthal: Formats Through Time, DHSR Blog

Library of Congress: Sustainability of Digital Formats (Introduction, Sustainability)

06 :: Data Integrity, Fixity, & Transfer

October 9, Tue 5:30-9:30P

Topics

Safe file transfer and maintaining data integrity

Fixity and checksums for preservation of audiovisual digital objects

Lab - Bring Laptops to Class

Follow along exercise: File transfer (cp, mv, rsync)

Follow along exercise: Fixity and checksums (md5, sha1, hashdeep, framemd5)

Readings

Baily: Protect Your Data (The Signal)

Rice: Reconsidering Checksums

Havemeyer-King: Trojan Dots and DIY Solutions (NDSR Blog)

Recommended

Checking Your Digital Content: An NDSA Publication

07 :: Data Storage: Architecture & File Systems

October 16, Tue 5:30-9:30P

DUE: A1 IN-CLASS PRESENTATIONS

Topics

Digital File Systems and Storage Media

Servers and Storage Architecture

Lab *NO LAPTOP NEEDED*

Legacy digital storage formats: Old Media Lab

Readings

Google – Pinheiro, Weber, Barroso: Failure Trends in a Large Disk Drive Population

Glicksman: Storage Architectures and Network

2017 NDSA Storage Survey & Report

Recommended/Reference

Backblaze – Klein: What Can 49,056 Hard Drives Tell Us?

Lab *NO LAPTOP NEEDED*

Legacy digital storage formats continuation: Old Media Lab

Readings

Summers: Web as a Preservation Medium (Medium)

Fino-Radin: Rhizome Preservation

08 :: Midterm Presentations

October 23, Tue 5:30-9:30P

DUE: A1 PAPERS, FRIDAY 10/26 6PM

09 :: Intro to Web Archiving

October 23, Tue 5:30-9:30P

Topics

Introduction to the Internet and World Wide Web, Web Architecture and Preservation

Web Preservation and the Internet Archive

Lab - Bring Laptops to Class

Rhizome Webrecorder demo

Create WARC files using wget command

Readings

Lasar: 25 Years of Hypercard (Ars Technica)

Berners-Lee: WorldWideWeb Executive Summary

McKeehan: Symmetrical Web Archiving with Webrecorder (NDSR Blog)

Archivelt: Five Challenges of Web Archiving

Recommended/Reference

Archiving Social Media Sites

Glossary of Web Archiving Terms

10 :: Preservation Metadata

October 30, Tue 5:30-9:30P

DUE: A2 PAPER/PROJECT PROPOSAL

Topics

Introduction to preservation metadata

PREMIS, METS, and XML

Lab

No lab – Students will give Assignment #1 presentations

Readings

Caplan: Understanding PREMIS

Amaral: METS for Transferable Metadata

Recommended/Reference

PREMIS Data Dictionary

Lavoie, Gardener: Preservation Metadata

11 :: Digital Repository Design & Microservices

November 13, Tue 5:30-9:30P

Topics

Microservices for digital preservation and repositories

Readings

Handel: Data Migration, Digital Asset Management and Microservices at CUNY TV

Spalenka: Some Assembly Required: Micro-services and Digital Preservation

Cramer & Kott: Designing and Implementing Second Generation Digital Preservation Services (Stanford University)

Lab - Bring Laptops to Class

Follow-along exercise: Create file system reports and reconcile backups using **ls**, **diff** and **FileMerge**

12 :: Digital Repositories: Sustainability, Policy and Trust

November 20, Tue 5:30-9:30P

Topics

Guest Speaker: Seth Anderson - TRAC and the TRAC Checklist

Sustainability and policy for digital preservation environments

LOCKSS and CLOCKSS

Lab

Tour of Homebrew

Nano text editor demo and exercise

Readings

TRAC Checklist (read pages 1–8, skim/review remainder of document)

Rosenthal: TRAC Audit, Lessons Learned (DSHR Blog)

What is LOCKSS? and LOCKSS Preservation Principles

The CLOCKSS Archive and What is the Difference Between LOCKSS and CLOCKSS?

Center for Research Libraries: Certification Report on CLOCKSS

Lavoie: The fifth blackbird

13 :: AMIA

November 27, Tue

No Class

Students in Portland for Association of Moving Image Archivists Conference

14 :: Digital Preservation Packaging + LTO Tape

December 4, Tue 5:30-9:30P

DUE: A2 IN-CLASS PRESENTATIONS

Topics

Digital Preservation Packaging & the Bagit Specification

LTO Tape: Formats, indexes and LTFS

Lab

Create "bags" and reports with Bagit command line software

Video demo: LTO tape recovery from BRU and LTFS

Readings

Bagit: A Video Introduction

Gates: Using Bagit – The Patch Bay

Kim, Ross: Digital Forensics Formats: Seeking a Digital Preservation Storage Container Format

Clipper Notes: LTO tape advantages over disk

Recommended/Reference

Rosenthal: The Medium Term Prospects for Long Term Storage

Pease, Amir, et al: The Linear Tape File System

Lazorchak: Digital Forensics and Digital Preservation: An Interview with Kam Woods of BitCurator

Educopia Institute: BagIt Usage Instructions

Internet Draft: BagIt File Packaging Format Specifications for the Internet Engineering Task Force (IETF)

15 :: Final Project Presentations

December 11, Tue 5:30-9:30P

DUE: A2 FINAL, FRIDAY, 12/14

Final Papers Due

December 14, Fri 6p

DUE – Email: FRIDAY, December 14th, 6pm

Last day of Fall 2018 classes

Friday, December 14, 2018