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 (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 (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 (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
(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 work shop 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.
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
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
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
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