NYU | TANDON SCHOOL OF ENGINEERING

Integrated Design & Media

DM-GY 9201 B,
Digital Doubles

INSTRUCTOR INFORMATION

- Instructor: Jiwon Shin
- Office hours:
    - Thu 5 PM - 6 PM
    - Or by appointment via Zoom
- Instructor email: jiwon.shin@nyu.edu

COURSE INFORMATION

- **Course Number:** DM-GY 9201 B
- **Course Title:** Digital Doubles
- **Course Description**: In this course, students will examine how physical representations can be captured, processed, and altered in digital space. The course will provide students with fundamental knowledge of manipulating image and video data and introduce basic computer vision technologies used to process digital data of physical entities. At the end of the course, students will be expected to create a digital installation utilizing live video capture data. This course encourages students to experiment with computer vision and machine learning technologies to reflect on how our digital doubles can be represented in the digital space. A good foundation in at least one programming language is required.
- **Credits:** 1.5
- **Prerequisites:** A good foundation in at least one programming language is required
- **Meeting Times:**
    - Class: 10/23/2025 - 12/11/2025 Thu 6 PM - 8:50 PM
    - Final Project Showcase at the Navy Yard: 12/13/2025 Sat 3 PM - 6 PM
- **Location:** 370 Jay St, Room 308

COURSE OVERVIEW AND GOALS

This course explores the intersection of physical and digital representation through hands-on experience with computer vision, image processing, and real-time video manipulation. Students will develop technical skills in Python, OpenCV, and machine learning while critically examining the cultural, artistic, and ethical implications of digital surveillance and representation technologies. The course culminates in an original digital installation that demonstrates mastery of live video processing techniques and conceptual understanding of how our physical selves are translated into digital space.

UPON COMPLETION OF THIS COURSE, STUDENTS WILL BE ABLE TO:

- Implement advanced image and video processing techniques using Python and OpenCV for real-time applications
- Design and develop interactive digital installations that respond to live video input and user interaction
- Apply computer vision algorithms including face detection, object recognition, and pose estimation in creative contexts
- Critically analyze the ethical implications of surveillance technologies, algorithmic bias, and digital representation
- Integrate machine learning models with computer vision pipelines for generative and interactive applications
- Optimize real-time video processing systems for performance and user experience

COURSE REQUIREMENTS

CLASS PARTICIPATION

Active participation in hands-on labs, technical discussions, and critique sessions is essential. Students are expected to engage with both technical problem-solving and conceptual discussions about the implications of digital representation technologies.

WEEKLY LAB ASSIGNMENTS

Each week includes a hands-on lab component that builds technical skills progressively. Lab work involves implementing image/video processing techniques, experimenting with computer vision algorithms, and documenting the creative and technical process.

FINAL PROJECT PROPOSAL

Students will present a comprehensive proposal for their final digital installation, including technical specifications, conceptual framework, and implementation timeline. Proposals will be presented in Week 5 with peer and instructor feedback.

FINAL PROJECT

A working digital installation that utilizes live video capture and computer vision techniques. The project should demonstrate technical proficiency while engaging meaningfully with concepts of digital representation, identity, or surveillance. Documentation of code, process, and reflection is included as part of the final project assessment.

ASSIGNED READINGS

Readings are strategically selected to provide critical context for the technical work and encourage reflection on the cultural, ethical, and political implications of computer vision technologies. Students should complete readings before class and be prepared to discuss how the concepts relate to their technical practice.

GRADING OF ASSIGNMENTS

The grade for this course will be determined according to the following:

Assignments/Activities	% of Final Grade
Class Participation	30%
Weekly Lab Assignments	20%
Weekly Reading Responses	15%
Final Project Proposal	10%
Final Project & Documentation	25%

LETTER GRADES

Letter grades for the entire course will be assigned as follows:

Letter Grade	Points	Percent

A	1.50	92.5% and higher
A-	1.38	0.0 – 92.49%
B+	1.25	87.5% - 89.99%
B	1.13	82.5% - 87.49%
B-	1.00	80% - 82.49%
C+	0.87	77.5% - 79.99%
C	0.75	72.5% - 77.49%
C-	0.63	70% - 72.49%
D+	0.50	67.5% - 69.99%
D	0.38	62.5% - 67.49
D-	0.25	60% - 62.49%
F	.00	59.99% and lower

HOW TO ACCESS YOUR GRADES

Grades will be available through NYU Classes. Individual assignment feedback will be provided via email and consultation.

COURSE SCHEDULE

TOPICS AND ASSIGNMENTS

Week/Date	Topic	Reading	Assignment Due
Week 1, Oct 23	**Introduction & Image Processing Fundamentals** Course overview, Python + OpenCV setup, NumPy arrays, basic image manipulation	"Art in a Time of Surveillance" - *The Intercept*	
Week 2, Oct 30	**Advanced Image Processing & Video Fundamentals** Filtering techniques, convolution, video processing, motion detection, frame differencing	Hito Steyerl, "In Defense of the Poor Image" - *e-flux*	Reading Response 1, Lab 1: Basic image manipulation
Week 3, Nov 6	**Live Video Capture & Real-time Processing** Camera input, real-time pipelines, interactive effects, threading, pygame integration	Autumm Caines, "The Zoom Gaze" - *Real Life Magazine*	Reading Response 2, Lab 2: Video processing pipeline
Week 4, Nov 13	**Computer Vision - Detection & Feature Recognition** Face detection, object detection, pose estimation, feature matching, ML models in OpenCV	"This is how AI bias really happens—and why it's so hard to fix" - *MIT Technology Review*	Reading Response 3, Lab 3: Real-time interaction, Final project proposal

Week 5, Nov 20	**Advanced CV & ML, Final Project Proposals** Deep learning integration, style transfer, ethics discussion, proposal presentations	Kate Crawford, "Atlas of AI" Chapter 4: "Classification"	Reading Response 4, Lab 4: CV detection systems
Nov 27 – NO CLASS (Thanksgiving break)			
Week 6, Dec 4	**Final Project Development Workshop** Present the final project to the class for feedback		Reading Response 5
Week 7, Dec 11	**Set up at the Navy Yard**		
Week 7, Dec 13 **3 PM - 6 PM**	**Final Project Showcase at the Navy Yard**		
Week 8, Dec 18	**NO CLASS**		Final project & documentation

TESTS AND QUIZZES

No formal tests or quizzes - assessment is based on lab assignments, reading responses, and the final project.

COURSE MATERIALS

EXPECTATIONS FOR WORK OUTSIDE THE CLASSROOM

Students should expect to spend roughly 5 hours each week on supplemental work in this course. This may include reading assignments, writing, exam preparation, research, homework assignments, building, writing code, study time, unsupervised lab work, unsupervised group work, etc.

REQUIRED TEXTBOOKS & MATERIALS

- Computer with Python 3.8+ capability (laptop required for in-class work)
- Webcam (built-in or external USB camera for video capture work)

- Kate Crawford, "Atlas of AI: Power, Politics, and the Planetary Costs of Artificial Intelligence" (2021). Available at the NYU library
- “Art in a Time of Surveillance”, *The Intercept* (https://theintercept.com/2014/11/13/art-surveillance-explored-artists/)
- Hito Steyerl, “In Defense of the Poor Image”, *e-flux* (https://www.e-flux.com/journal/10/61362/in-defense-of-the-poor-image)
- Autumm Caines, "The Zoom Gaze”, *Real Life Magazine* (https://reallifemag.com/the-zoom-gaze/)
- “This is how AI bias really happens—and why it's so hard to fix”, *MIT Technology Review* (https://www.technologyreview.com/2019/02/04/137602/this-is-how-ai-bias-really-happensand-why-its-so-hard-to-fix/)

OPTIONAL TEXTBOOKS & MATERIALS

- External lighting or camera equipment for enhanced video capture (optional)

RESOURCES

- **Access your course materials**:
  - Google Drive (https://drive.google.com/drive/folders/1QBC_GxFM-6KoTL7bqZjC76_r6MVasSG8?usp=drive_link)
  - Class Website (https://js6450.github.io/Fall25_Digital_Doubles/)
- **Databases, journal articles, and more**: Dibner Library (library.nyu.edu)
- **Assistance with strengthening your writing**: NYU Writing Center (nyu.mywconline.com)
- **Obtain 24/7 technology assistance:** IT Service Desk (NYU IT) (nyu.edu/it/servicedesk)

COURSE POLICIES

ATTENDANCE AND TARDINESS

Given the intensive 7-week format and hands-on nature of this course, attendance is mandatory. Each class builds directly on previous work, and missing sessions will significantly impact your ability to succeed. If you must miss a class due to illness or emergency, contact the instructor immediately to discuss makeup work. More than one unexcused absence may result in course failure. Tardiness disrupts the collaborative lab environment - please arrive on time and ready to engage with technical work.

LATE ASSIGNMENT

Lab assignments are due at the beginning of the following class session. Late assignments will be penalized 10% per day late. Final project proposals and final projects must be submitted on

time - extensions will only be granted for documented emergencies. Given the technical nature of the work, it's essential to maintain the progressive building of skills throughout the course.

ACADEMIC HONESTY/PLAGIARISM

While collaboration and peer learning are encouraged in lab settings, all submitted work must represent your own understanding and implementation. When using code from online resources, tutorials, or AI assistance, you must document and cite these sources clearly. Simply copying and pasting code without understanding violates academic integrity. You are expected to be able to explain and modify any code you submit.

NYU School of Engineering Policies and Procedures on Academic Misconduct (from the School of Engineering Student Code of Conduct)

Introduction: The School of Engineering encourages academic excellence in an environment that promotes honesty, integrity, and fairness, and students at the School of Engineering are expected to exhibit those qualities in their academic work. It is through the process of submitting their own work and receiving honest feedback on that work that students may progress academically. Any act of academic dishonesty is seen as an attack upon the School and will not be tolerated. Furthermore, those who breach the School's rules on academic integrity will be sanctioned under this Policy. Students are responsible for familiarizing themselves with the School's Policy on Academic Misconduct.

Definition: Academic dishonesty may include misrepresentation, deception, dishonesty, or any act of falsification committed by a student to influence a grade or other academic evaluation. Academic dishonesty also includes intentionally damaging the academic work of others or assisting other students in acts of dishonesty. Common examples of academically dishonest behavior include, but are not limited to, the following:

- *Cheating*: intentionally using or attempting to use unauthorized notes, books, electronic media, or electronic communications in an exam; talking with fellow students or looking at another person's work during an exam; submitting work prepared in advance for an in-class examination; having someone take an exam for you or taking an exam for someone else; violating other rules governing the administration of examinations.
- *Fabrication*: including but not limited to, falsifying experimental data and/or citations.
- *Plagiarism*: intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise; failure to attribute direct quotations, paraphrases, or borrowed facts or information.
- *Unauthorized collaboration*: working together on work that was meant to be done individually.
- *Duplicating work*: presenting for grading the same work for more than one project or in more than one class, unless express and prior permission has been received from the course instructor(s) or research adviser involved.
- *Forgery*: altering any academic document, including, but not limited to, academic records, admissions materials, or medical excuses.

Access the entire School of Engineering Student Code of Conduct here: engineering.nyu.edu/academics/code-of-conduct

GENERATIVE TOOL USE IN THIS CLASS

Encouraged with Documentation: AI tools (ChatGPT, Copilot, etc.) are valuable resources for learning programming and debugging code. You are encouraged to use these tools to understand concepts, troubleshoot errors, and explore implementation approaches. However, you must document your use of AI assistance in your code comments and project documentation.

Learning Requirements: You must be able to explain and modify any code you submit, regardless of how it was generated. AI-generated code that you don't understand violates the learning objectives of the course. Use AI as a learning partner, not a replacement for understanding.

Documentation Requirements:

- Comment your code to show which sections used AI assistance
- Include prompts and AI responses in your project documentation when relevant
- Demonstrate your understanding by explaining the code in your own words

Document your process and use of generative AI when completing assignments using generative AI:

- Save copies of each step to create a record that can be shared with your instructors to facilitate conversations about your work. For example, keep copies of your previous drafts before and after interacting with generative AI.

Ensure that your final work is your own and is not simply copied and pasted from a generative AI tool:

- Your own style and voice should be evident.
- Simply rephrasing AI-generated content is not enough for it to be considered your own work! You must still apply your own critical and creative thinking to ensure learning.
- Foreground intellectual virtues and beware of cognitive biases from the Open Inquiry Toolkit.

Fact-check and cross-verify any information you use from generative AI:

- Note the limitations of generative AI, most notably that content generated by AI may be biased, made up, inaccurate, not up to date, etc.
- Apply critical thinking at all times! It is important to fact-check and cross-verify any information generative AI gives you.

- Using generative AI is not the same as using a search engine.

Think for yourself:

- Form your own perspectives and points of view. Do not rely solely on information generated by generative AI tools.

ACADEMIC ACCOMMODATIONS

If you are a student with a disability who is requesting accommodations, please contact New York University's Moses Center for Student Accessibility (CSA) at 212-998-4980 or mosescsa@nyu.edu. You must be registered with CSA to receive accommodations. Information about the Moses Center can be found at https://www.nyu.edu/csa. The Moses Center is located at 726 Broadway on the 2nd floor.

If you are experiencing an illness or any other situation that might affect your academic performance in a class, please email the Office of Advocacy, Compliance and Student Affairs: eng.studentadvocate@nyu.edu.

STATEMENT ON INCLUSION

The NYU Tandon School values an inclusive and equitable environment for all our students. I hope to foster a sense of community in this class and consider it a place where individuals of all backgrounds, beliefs, ethnicities, national origins, gender identities, sexual orientations, religious and political affiliations, and abilities will be treated with respect. It is my intent that all students' learning needs be addressed, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. If this standard is not being upheld, please feel free to speak with me.

RESOURCES FOR NON-CITIZEN STUDENTS

More than 40 percent of NYU students are international students. A smaller number are undocumented students, but many more come from mixed status families and communities. As a professor, I am committed to doing everything I can to ensure that every student, regardless of immigration status, is safe in this classroom. Following the recommendation of the NYU chapter of the AAUP, I encourage students to seek free legal support and other resources through NYU's Immigrant Defense Initiative. NYU IDI provides an extensive list of updates and resources. Students may also consult the "Know Your Rights" information provided by the New York Immigration Coalition.