SCHOOL OF ARCHITECTURE UNIVERSITY OF FLORIDA

MACHINE LEARNING FOR ARCHITECTS

COURSE NUMBER:	ARC 6XXX
TERM:	Fall 2025
NUMBER OF CREDIT HOURS:	3
CLASS LOCATION:	AH-215
CLASS MEETING TIMES:	*Tuesday, Periods 4-6 – 1:40 PM – 5:40 PM*
EMAIL:	*ksaldanaochoa@ufl.edu or Canvas*
INSTRUCTOR:	Dr. Karla Saldana Ochoa
PHONE:	+1 352 294 1453
OFFICE HOURS:	ARC 262 - *Tuesday at 9:00 by appointment*
COURSE WEBSITE:	http://elearning.ufl.edu

COURSE DESCRIPTION:

The built environment's planning, design, and construction are on the verge of a fundamental transformation. A key element of this transformation is a radical shift in paradigm from planning and design representations of unconnected data to practices with an overwhelming amount of information-rich data. Artificial intelligence (AI), particularly machine learning (ML), designers with new models and methods engage in these data-heavy processes to synthesize meaningful information for all areas of their practice. This course provides architecture students with an opportunity to learn about the application of AI in their discipline.

COURSE OBJECTIVES AND GOALS

- Understand how AI technologies can inform the planning, design, and construction of the built environment.
- Apply existing AI models in architecture
- Build a simple Machine Learning model.
- Understand the current limitations of machine learning technologies.

INSTRUCTIONAL METHODS

The class meets one time a week for lecture hours.

COURSE SCHEDULE:

Week	Disciplines	Contact hours	Applications in DCP	Classes	Assignments
Week 01	AI/ML	3	-	**Introduction to AI (SLO2)**. Lecture on Machine Learning, Neural Networks, Deep Learning, Back propagation, and examples of application in the Built Environment Practice	-
Week 02 - 03	Data Collection,	6	-	**Collecting Data (SLO2)**. Lecture on crawlers, scrapers, API keys. Run python code to **use** crawlers and API keys to systematically collect images and text from web databases based on **specific context and application**.	**A1 (SLO3)**: Collect Data from existing websites using the materials taught in class and preprocess the collected data. Do text mining on the collected text. **15 points**
Week 04 - 05	Visualization, & Coding	6	-	**Data Visualization (SLO2)**. Lecture on feature vectors and data visualization methods. Run python code to **apply** data procession **techniques**: Text mining: Word Frequency and Word Embeddings. Images: RGB encoding and Edge Detection	
Week 06 - 07	Self-Organizing Maps	6	Unsupervised learning for data exploration	**Unsupervised learning algorithms**, learn how they work and train then to perform clustering on the data collected and previous pre-processed	**A2 (SLO3)**: **Apply** Computer vision algorithms. Run notebook and Q1: create clusters. Q2. Calcify and Segment objects on collected images. **15 points**
Week 08-09	Computer vision	6		**Computer vision (SLO2)**. Lecture on CNNs overview and theory. Explanation of Image analysis**.** Run python Code to **apply** CNNs for Object Detection and Image Segmentation on images. Introduction to **Hugging Face**	
Week 09	Generative Models	6	Generative design	**Generative Algorithms (SLO2)**. Lecture on Generative algorithms, overview, and theory. Explanation of GANs, Diffusion models and examples in computational design.	**A3 (SLO3)**: Conduct a study on how different attributes modify the final output from sketch to rendering **application on architecture context** with generative algorithms. And create a pipeline to identify AI generated context in XFigura **15 points**
Week 10				**Generative Algorithms.** Lecture on **XFigura**, and how to use text to image, image to 3 generative algorithms	
Week 11	Special Topics	6	-	**Project Ideas.** Propose a Machine Learning Tool for the future city. Please remember to include Motivation/ or existing problem you are trying to solve. What data will you need? Would the ML algorithm be supervised or unsupervised? What is the desired output?	**A4 (SLO3)**: Project definition having: **Goal, Data**, **ML Algorithm**, and **Desired Output**. **15 points**
Week 12					
Week 12-15	-	9	-	Final Project and Presentations	**Final project (SLO3)**: specific application based on students' interest. **30 points**

<u>Disclaimer:</u> This syllabus represents the current plans and objectives. As we go through the semester, those plans may need to change to enhance the class learning opportunity. Such changes, communicated clearly, are not unusual and should be expected.

EVALUATION OF WORK AND GRADES:

Assignments	Percentage
Module Assignments (6 total@10% each)	60%
Final Group Project	30%
Attendance and Participation	10%
Total	100%

Grades will be computed according to the following scale:

A=93-100; A- =90-92.9; B+ =87-89.9; B=83-86.9; B- =80-82.9; C+ = 77-79.9; C=73-76.9; C-=70-72.9; D+ =67-69.9; D=63-66.9; D- =60-62.9; E<60.

- The attendance grade will be computed in proportion to the number of presences on the days the rolls were taken, and the participation grade is based on responding to a given discussion topic in the class forum.

- At the end of each module, an assignment that covers topics discussed in that module will be given. Specific evaluation criteria will be provided with each assignment.

- A final group project will be assigned that requires implementing existing AI algorithms in a project in the built environment to facilitate planning, design, and construction strategies.

UF Grading Policy: More information on UF grading policy may be found at:
UF Undergraduate Catalog
Grades and Grading Policies

ATTENDANCE POLICY, CLASS EXPECTATIONS, AND MAKE-UP POLICY

Attendance is mandatory. Three or more unexcused absences may result in the student being administratively dropped from the course. The requirements for class attendance, make-up exams, assignments, and other coursework in this course are consistent with university policies. Click here to read the university attendance policies.

Faculty must be notified of all absences: at a minimum, advance notice is required according to attendance policies and is appreciated whenever possible. It is also helpful if your project partners are informed of any absences.

If something is seriously wrong, please talk to us about it and connect with on-campus resources. Faculty can also help connect you to situation-specific campus resources and administrative processes to address situations that may arise. Arrangements will be made to cope with serious illness, family or personal crises, etc.

Chronic lateness can adversely affect your grade. It is never permissible to miss a scheduled critique. It is similarly not permissible to leave class early, prior to dismissal by

faculty, without providing notice to your faculty; in addition to being detrimental to your learning, neglecting to do so can be considered a direct insult to your faculty, classmates, and any invited critics or presenters.

READING MATERIALS:

There is no required textbook for this studio.

Strongly Recommended

- *Alvarez-Marin, Diana, and Karla Saldana Ochoa. "Indexical cities: articulating personal models of urban preference with geotagged data." arXiv preprint arXiv:2001.10615 (2020).*
- *Saldana Ochoa, Karla. "Can Artificial Intelligence Mark the Next Architectural Revolution? Design Exploration in the Realm of Generative Algorithms and Search Engines." Decoding Cultural Heritage: A Critical Dissection and Taxonomy of Human Creativity through Digital Tools (2024): 3.*
- Saldana Ochoa, Karla. "Innovación consciente: el futuro de la arquitectura en tiempos de IA." *Estoa. Journal of the Faculty of Architecture and Urbanism* 14.28 (2025): 8-10.
- Saldana Ochoa, Karla. *Event protocol: Enhancing disaster response with architectonic capabilities by leveraging machine and human intelligence interplay*. Diss. ETH Zurich, 2021.
- Saldana Ochoa, Karla, et al. "Playing Dimensions: Images/Models/Maps: Conceptualizing Architecture with Big Data and Artificial Intelligence." *Proceedings of the 43rd Annual Conference of the Association for Computer Aided Design in Architecture*. Vol. 2. Association for Computer Aided Design in Architecture, 2023.
- Stanislas Chaillou, Harvard Graduate School of Design | Feb. 24th, 2019 https://towardsdatascience.com/ai-architecture-f9d78c6958e0

SOFTWARE / LANGUAGE:
Google Colab Notebooks, XFigura, Hugging Face / Python

AI CATEGORY: USE-AI

Use & Apply AI: Applying AI knowledge, concepts, and applications in different scenarios. AI course content is over 50%

AI STUDENT LEARNING OUTCOMES

Know and Understand
SLO2. Recognize, identify, describe, define and/or explain applications of AI in multiple domains.
Lecture Weeks 01, 02, 03, 04, 06, 08, 10

Use and Apply
SLO3. Select and/or utilize AI tools and techniques appropriate to a specific context and application.
Assignments: A1, A2, A3, A4, Final Project

COURSE EVALUATION

Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on providing feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/students/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/

ACADEMIC POLICIES & RESOURCES

For additional UF "Academic Policies & Resources," go to: https://go.ufl.edu/syllabuspolicies. These resources include information about:

- Requirements for class attendance, make-up exams, and assignments
- Processes for students with disabilities who may require accommodations
- Current UF grading policies
- Expectations for course evaluations and constructive feedback
- The University's Honesty Policy regarding cheating, plagiarism, etc.
- In-class recording of class lectures for personal use
- Academic resources, including contact information
- Campus health and wellness resources, including contact information