Cover Sheet: Request 15702

DCP 4XXX – AI in the Built Environment

Info

Process	Course|New|Ugrad/Pro
Status	Pending at PV - University Curriculum Committee (UCC)
Submitter	Abdol Chini chini@ufl.edu
Created	1/20/2021 12:50:23 AM
Updated	1/22/2021 10:43:41 AM
Description of request	To develop a new course that provides the College of Design, Construction and Planning (DCP) students an opportunity to learn about application of AI in their disciplines. This course will be required for DCP students who want to earn the Artificial Intelligence Fundamentals and Applications Undergraduate Certificate.

Actions

Step	Status	Group	User	Comment	Updated
Department	Approved	DCP - Design, Construction and Planning 15010000	Abdol Chini		1/20/2021
No document changes					
College	Approved	DCP - College of Design, Construction and Planning	Abdol Chini		1/22/2021
DCP 4XXX -F21 syllabus.pdf					1/21/2021
University Curriculum Committee	Pending	PV - University Curriculum Committee (UCC)			1/22/2021
No document changes					
Statewide Course Numbering System					
No document changes					
Office of the Registrar					
No document changes					
Student Academic Support System					
No document changes					
Catalog					
No document changes					
College Notified					
No document changes					

Course|New for request 15702

Info

Request: DCP 4XXX – AI in the Built Environment
Description of request: To develop a new course that provides the College of Design, Construction and Planning (DCP) students an opportunity to learn about application of AI in their disciplines. This course will be required for DCP students who want to earn the Artificial Intelligence Fundamentals and Applications Undergraduate Certificate.

Submitter: Abdol Chini chini@ufl.edu
Created: 1/21/2021 1:34:52 PM
Form version: 3

Responses

Recommended Prefix
Enter the three letter code indicating placement of course within the discipline (e.g., POS, ATR, ENC). Note that for new course proposals, the State Common Numbering System (SCNS) may assign a different prefix.

Response:
DCP

Course Level
Select the one digit code preceding the course number that indicates the course level at which the course is taught (e.g., 1=freshman, 2=sophomore, etc.).

Response:
4

Course Number
Enter the three digit code indicating the specific content of the course based on the SCNS taxonomy and course equivalency profiles. For new course requests, this may be XXX until SCNS assigns an appropriate number.

Response:
XXX

Category of Instruction
Indicate whether the course is introductory, intermediate or advanced. Introductory courses are those that require no prerequisites and are general in nature. Intermediate courses require some prior preparation in a related area. Advanced courses require specific competencies or knowledge relevant to the topic prior to enrollment.

Response:
Advanced

- *1000 level = Introductory undergraduate*
- *2000 level = Introductory undergraduate*
- *3000 level = Intermediate undergraduate*
- *4000 level = Advanced undergraduate*
- *5000 level = Introductory graduate*
- *6000 level = Intermediate graduate*
- *7000 level = Advanced graduate*
- *4000/5000= Joint undergraduate/graduate*
- *4000/6000= Joint undergraduate/graduate*

**Joint undergraduate/graduate courses must be approved by the UCC and the Graduate Council)*

Lab Code
Enter the lab code to indicate whether the course is lecture only (None), lab only (L), or a combined lecture and lab (C).

Response:
None

Course Title
*Enter the title of the course as it should appear in the Academic Catalog. There is a 100 character limit for course titles. *

Response:
AI in the Built Environment

Transcript Title
Enter the title that will appear in the transcript and the schedule of courses. Note that this must be limited to 30 characters (including spaces and punctuation).

Response:
AI in the Built Environment

Degree Type
Select the type of degree program for which this course is intended.

Response:
Baccalaureate

Delivery Method(s)
Indicate all platforms through which the course is currently planned to be delivered.

Response:
On-Campus, Online

Co-Listing
Will this course be jointly taught to undergraduate, graduate, and/or professional students?

Response:
No

Effective Term
Select the requested term that the course will first be offered. Selecting "Earliest" will allow the course to be active in the earliest term after SCNS approval. If a specific term and year are selected, this should reflect the department's best projection. Courses cannot be implemented retroactively, and therefore the actual effective

term cannot be prior to SCNS approval, which must be obtained prior to the first day of classes for the effective term. SCNS approval typically requires 2 to 6 weeks after approval of the course at UF.

Response:
Fall

Effective Year
Select the requested year that the course will first be offered. See preceding item for further information.

Response:
2021

Rotating Topic?
Select "Yes" if the course can have rotating (varying) topics. These course titles can vary by topic in the Schedule of Courses.

Response:
No

Repeatable Credit?
Select "Yes" if the course may be repeated for credit. If the course will also have rotating topics, be sure to indicate this in the question above.

Response:
No

Amount of Credit
Select the number of credits awarded to the student upon successful completion, or select "Variable" if the course will be offered with variable credit and then indicate the minimum and maximum credits per section. Note that credit hours are regulated by Rule 6A-10.033, FAC. If you select "Variable" for the amount of credit, additional fields will appear in which to indicate the minimum and maximum number of total credits.

Response:
3

S/U Only?
Select "Yes" if all students should be graded as S/U in the course. Note that each course must be entered into the UF curriculum inventory as either letter-graded or S/U. A course may not have both options. However, letter-graded courses allow students to take the course S/U with instructor permission.

Response:
No

Contact Type
Select the best option to describe course contact type. This selection determines whether base hours or headcount hours will be used to determine the total contact hours per credit hour. Note that the headcount hour options are for courses that involve contact between the student and the professor on an individual basis.

Response:
Regularly Scheduled

• Regularly Scheduled [base hr]
• Thesis/Dissertation Supervision [1.0 headcount hr]
• Directed Individual Studies [0.5 headcount hr]
• Supervision of Student Interns [0.8 headcount hr]
• Supervision of Teaching/Research [0.5 headcount hr]
• Supervision of Cooperative Education [0.8 headcount hr]

Contact the Office of Institutional Planning and Research (352-392-0456) with questions regarding contact type.

Weekly Contact Hours
Indicate the number of hours instructors will have contact with students each week on average throughout the duration of the course.

Response:
3

Course Description
Provide a brief narrative description of the course content. This description will be published in the Academic Catalog and is limited to 500 characters or less. See course description guidelines.

Response:
An introduction to Artificial Intelligence (AI) and its applications to real world problems in planning, design and construction of the built environment. Includes application in professional practice in architecture, construction management, interior design, landscape architecture, and urban and regional planning.

Prerequisites
Indicate all requirements that must be satisfied prior to enrollment in the course. Prerequisites will be automatically checked for each student attempting to register for the course. The prerequisite will be published in the Academic Catalog and must be formulated so that it can be enforced in the registration system. Please note that upper division courses (i.e., intermediate or advanced level of instruction) must have proper prerequisites to target the appropriate audience for the course.
Courses level 3000 and above must have a prerequisite.
Please verify that any prerequisite courses listed are active courses.

Response:
EEL 3872 Artificial Intelligence Fundamentals and PHI 3681 Ethics, Data, and Technology

Completing Prerequisites on UCC forms:

• Use “&” and “or” to conjoin multiple requirements; do not used commas, semicolons, etc.
• Use parentheses to specify groupings in multiple requirements.
• Specifying a course prerequisite (without specifying a grade) assumes the required passing grade is D-. In order to specify a different grade, include the grade in parentheses immediately after the course number. For example, "MAC 2311(B)" indicates that students are required to obtain a grade of B in Calculus I. MAC2311 by itself would only require a grade of D-.
• Specify all majors or minors included (if all majors in a college are acceptable the college code is sufficient).
• “Permission of department” is always an option so it should not be included in any prerequisite or co-requisite.
• If the course prerequisite should list a specific major and/or minor, please provide the plan code for that major/minor (e.g., undergraduate Chemistry major = CHY_BS, undergraduate Disabilities in Society minor = DIS_UMN)

Example: A grade of C in HSC 3502, passing grades in HSC 3057 or HSC 4558, and undergraduate PBH student should be written as follows: HSC 3502(C) & (HSC 3057 or HSC 4558) & UGPBH
* *

Co-requisites
Indicate all requirements that must be taken concurrently with the course. Co-requisites are not checked by the registration system. If there are none please enter N/A.

Response:
N/A

Rationale and Placement in Curriculum
Explain the rationale for offering the course and its place in the curriculum.

Response:
The planning, design, and construction of the built environment is 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), in particular Machine learning (ML), provides planners, designers, and constructors with new models and methods to engage in these data-heavy processes in order to synthesize meaningful information for all areas of their practice from planning to design to fabrication to erection. This course provides the College of Design, Construction and Planning (DCP) students an opportunity to learn about application of AI in their disciplines.

Course Objectives
Describe the core knowledge and skills that student should derive from the course. The objectives should be both observable and measurable.

Response:
Understand how AI technologies can be used to guide planning, design, and construction of the built environment.
Apply existing AI models in architecture, construction management, interior design, landscape architecture, and urban planning disciplines.
Build a simple Machine Learning model.
Understand the current limitations of machine learning technologies.

Course Textbook(s) and/or Other Assigned Reading
*Enter the title, author(s) and publication date of textbooks and/or readings that will be assigned. Please provide specific examples to evaluate the course and identify required textbooks. *

Response:
- Mario Carpo, The Second Digital Turn – Design Beyond Intelligence, Cambridge, MIT Press, 2017
- AI & Architecture: An Experimental Perspective Stanislas Chaillou, Harvard Graduate School of Design | Feb. 24th, 2019
https://towardsdatascience.com/ai-architecture-f9d78c6958e0

- Rajagopal, A., & Tetrick, C. (2017). The rise of AI and machine learning in construction. Autodesk University https://www.autodesk.com/autodesk-university/article/Rise-AI-and-Machine-Learning-Construction-2018
- Blanco, J. L., Fuchs, S., Parsons, M., & Ribeirinho, M. J. (2018). Artificial intelligence: Construction technology's next frontier| McKinsey.

https://www.mckinsey.com/business-functions/operations/our-insights/artificial-intelligence-construction-technologys-next-frontier#

- Tan, P. N., Steinbach, M., & Kumar, V. (2016). Introduction to Data Mining. Pearson Education India, Chapter 2: “Data” and Chapter 3 “Exploring Data.”

- Book: Bradley E Cantrell, Justine Holzman; Responsive Landscapes: Strategies for Responsive Technologies in Landscape Architecture; Routledge, 2016
https://www.routledge.com/Responsive-Landscapes-Strategies-for-Responsive-Technologies-in-Landscape/Cantrell-Holzman/p/book/9781138796652
- Article: Mimi Zeiger; "Live and Learn"; Landscape Architecture Magazine, vol. 109, Iss.2, Feb 2019, pp. 78-89

- Urban Analytics (Spatial Analytics and GIS) First Edition
https://www.amazon.com/Urban-Analytics-Spatial-Gis/dp/1473958636/ref=asc_df_1473958636/?tag=hyprod-20&linkCode=df0&hvadid=312446862670&hvpos=&hvnetw=g&hvrand=5187003182187135649&hvpone=&hvptwo
415427782747&psc=1

Weekly Schedule of Topics
Provide a projected weekly schedule of topics. This should have sufficient detail to evaluate how the course would meet current curricular needs and the extent to which it overlaps with existing courses at UF.

Response:
Week 01 (DCP):
Introduction to AI

Week 02 (URP):
Urban Analytics for Smart and Resilient Cities
Introduction:
Big data at urban scale
Overview of urban analytics/computing approaches
Smart cities applications (transportation, housing)
Resilient cities applications (hazards, SLR, climate change)
Leveraging big data and AI to understand social equity

Week 3 (URP):
Technical Contents:
AI and sentiment analysis for public perception mining (natural language processing)
AI and human mobility analysis (geospatial data & clustering)
Language: Python

Week 04:
AI and Machine Learning in Landscape Architecture
research on public space and public life and environmental conservation. Technology on modeling and simulation of natural disasters, urban and ecological processes.

Week 05 (LAE):
AI and Machine Learning in future Landscape Architecture design and professional practice.

Week 06 (DCP):
Guest Speakers - Application of AI Technologies in URP and LAE

Week 07 (ARC):
Technology and its impact on the profession
Determinants and constraints
Contemporary generative design tools: simulation based procedural modeling

Week 08 (ARC):
Collaborative AI: Machine Learning and Artificial Neural Networks
Image-based Convolutional Neural Networks (CNN)
Generative Adversarial Networks (GAN)

Week 09 (IND):
Demystifying the role of AI in Human-Centered Design
Introduction to public and proprietary data resources for use in Machine Learning

Week 10 (IND):
Understanding ways to include human perspectives and expertise into AI
The potential of using AI as an interactive and vital tool in Interior Design practice

Week 11 (DCP):
Guest Speakers - Application of AI Technologies in ARC and IND

Week 12 (CM):
Augmented and explainable intelligent planning and control of construction processes:
Know when to use supervised versus unsupervised versus semi-supervised versus reinforcement training techniques.
Learn the basics of shallow versus deep neural networks versus Support Vector Machines versus basic Statistical Regression.
Understand how to train, test, and validate a machine learning model to achieve maximum utility.
Understand the current limitations of machine learning technologies

Week 13 (CM):
Computer Vision for Construction Safety Application:
Understand the Basics of computer vision & deep learning, e.g., object detection, segmentation, 3D reconstruction
Using AI to detect selected safety hazards in images collected from construction site

Week 14 (DCP):
Guest Speakers - Application of AI Technologies in CM

Week 15 (DCP):
Final Project Presentations

Grading Scheme
List the types of assessments, assignments and other activities that will be used to determine the course grade, and the percentage contribution from each. This list should have sufficient detail to evaluate the course rigor and grade integrity. Include details about the grading rubric and percentage breakdowns for determining grades. If participation and/or attendance are part of the students grade, please provide a rubric or details regarding how those items will be assessed.

Response:
Module Assignments (5 total@12% each) = 60%
Final Group Project = 30%
Attendance and Participation 10%
Total = 100%

- At the end of each module (URP, LAE, ARC, IND, and CM) an individual assignment will be given that covers topics that were discussed in that module. Specific evaluation criteria will be provided with each assignment.
- A final group project will be assigned that requires applying existing AI algorithms and tools to address planning, design and construction of a building.
- Attendance and participation in the class activities are required. Attendance and participation grade will be computed in proportion to the number of presence on the days the rolls were taken

and participation on a given topic in the class forum.

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.

Instructor(s)
Enter the name of the planned instructor or instructors, or "to be determined" if instructors are not yet identified.

Response:
to be determined

Attendance & Make-up
Please confirm that you have read and understand the University of Florida Attendance policy.
A required statement statement related to class attendance, make-up exams and other work will be included in the syllabus and adhered to in the course. Courses may not have any policies which conflict with the University of Florida policy. The following statement may be used directly in the syllabus.

• Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

Response:
Yes

Accomodations
Please confirm that you have read and understand the University of Florida Accommodations policy.
A statement related to accommodations for students with disabilities will be included in the syllabus and adhered to in the course. The following statement may be used directly in the syllabus:

• Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc/) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Response:
Yes

UF Grading Policies for assigning Grade Points
Please confirm that you have read and understand the University of Florida Grading policies.
Information on current UF grading policies for assigning grade points is require to be included in the course syllabus. The following link may be used directly in the syllabus:

• https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Response:
Yes

Course Evaluation Policy

Course Evaluation Policy

Please confirm that you have read and understand the University of Florida Course Evaluation Policy.

A statement related to course evaluations will be included in the syllabus. The following statement may be used directly in the syllabus:

• 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 how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/public-results/. 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, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

* *

Response:
Yes

COLLEGE OF DESIGN, CONSTRUCTION AND PLANNING
UNIVERSITY OF FLORIDA

AI IN THE BUILT ENVIRONMENT

COURSE NUMBER: DCP 4XXX

TERM: FALL 2021

NUMBER OF CREDIT HOURS: 3

The planning, design, and construction of the built environment is 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), in particular Machine Learning (ML), provides planners, designers, and constructors with new models and methods to engage in these data-heavy processes in order to synthesize meaningful information for all areas of their practice from planning to design to fabrication to erection. This course provides the College of Design, Construction and Planning (DCP) students an opportunity to learn about application of AI in their disciplines.

CLASS LOCATION:

CLASS MEETING TIMES:

INSTRUCTOR:

OFFICE HOURS:

COURSE WEBSITE: http://elearning.ufl.edu

COURSE DESCRIPTION:
An introduction to Artificial Intelligence (AI) and its applications to real world problems in planning, design and construction of the built environment. Includes application in professional practice in architecture, construction management, interior design, landscape architecture, and urban and regional planning.

PREREQUISITE KNOWLEDGE AND SKILLS:

- EEL 3872: Artificial Intelligence Fundamentals
- PHI 3681: Ethics, Data, and Technology

COURSE OBJECTIVES:

- Understand how AI technologies can be used to guide planning, design, and construction of the built environment.
- Apply existing AI models in architecture, construction management, interior design, landscape architecture, and urban planning disciplines.
- Build a simple Machine Learning model.
- Understand the current limitations of machine learning technologies.

INSTRUCTIONAL METHODS:

The class meets three lecture hours per week.

COURSE POLICIES:

ATTENDANCE POLICY:

Attendance and participation in the class activities are required. Attendance and participation grade will be computed in proportion to the number of presence on the days the rolls were taken and participation on a given topic in the class forum. Requirements for class attendance and make-up quizzes, assignments, and other work in this course are consistent with university policies that can be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

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 how to give 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/

UF POLICIES:

UNIVERSITY POLICY ON ACCOMMODATING STUDENTS WITH DISABILITIES:

Students requesting accommodation for disabilities must first register with the Dean of Students Office (https://disability.ufl.edu/). The Dean of Students Office will provide documentation to the student who must then provide this documentation to the instructor when requesting accommodation. You must submit this documentation prior to submitting assignments or taking the quizzes or exams. Accommodations are not retroactive, therefore, students should contact the office as soon as possible in the term for which they are seeking accommodations.

UNIVERSITY POLICY ON ACADEMIC MISCONDUCT:

Academic honesty and integrity are fundamental values of the University community. Students should be sure that they understand the UF Student Honor Code at https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/ . Although joint work on assignments may be acceptable in some cases, duplication of an assignment, both manually or by computer will be considered an act of academic dishonesty and dealt with accordingly. On all work submitted for credit by students at the university, the following pledge is either required or implied**: "On my honor, I have neither given nor received unauthorized aid in doing this assignment.**"

GETTING HELP:

For issues with technical difficulties for E-learning in Canvas, please contact the UF Help Desk:

- Learning-support@ufl.edu
- (352) 392-HELP - select option 2
- https://lss.at.ufl.edu/help.shtml

GRADING POLICIES:

Assignment	Percentage
Module Assignments (5 total@12% each)	60%
Final Group Project	30%
Attendance and Participation	10%
Total	100%

GRADING SCALE:

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.

- At the end of each module (URP, LAE, ARC, IND, AND CM) an individual assignment will be given that covers topics that were discussed in that module. Specific evaluation criteria will be provided with each assignment.

- A final group project will be assigned that requires application of existing AI algorithms and tools to facilitate planning, design and construction of a building.

COURSE CONTENT:

Architecture (ARC):

Architecture sits at the crossroads of concerns of both design and construction, but also of art, function, technique, culture, community, place, politics, history, etc. Architects draw influence from these sources and respond to integrate a wide variety of competing factors and criteria that can be simultaneously precise and vague, qualitative and quantitative, measurable and immeasurable. The application of cutting-edge technology has long impacted the design and production of architecture on many levels, be it theoretical, cultural, or technical. These advances have deep influences on the design process and the resultant architectural artifact. The module introduces and discusses the following topics:

What happens when an architect no longer draws explicitly, but works in collaboration with AI?

The implication of AI technologies for the discourse of the discipline.

Foundational technical know-how in the emerging ecology of AI applications.

Reading Materials:

Mario Carpo, The Second Digital Turn – Design Beyond Intelligence, Cambridge, MIT Press, 2017

AI & Architecture: An Experimental Perspective

Stanislas Chaillou, Harvard Graduate School of Design | Feb. 24th, 2019
https://towardsdatascience.com/ai-architecture-f9d78c6958e0

Software/Language:

Rhino+Grasshopper+Galapagos

PyTorch/TensorFlow

StyleTransfer/StyleGAN

Construction Management (CM):

AI has been implemented in several domains, and the construction industry has also seen the value of using AI-driven solution methods to increase efficiency and decrease risk. Construction researchers and professionals have been exploring different Machine Learning, Computer Vision, Natural Language Processing methods for various applications such as design optimization, scheduling, estimating, project documentation, safety inspection, and construction project monitoring. AI abilities in the construction together with misconceptions around its capabilities, and its limitations will be discussed.

Reading Materials:

Rajagopal, A., & Tetrick, C. (2017). The rise of AI and machine learning in construction. Autodesk University
https://www.autodesk.com/autodesk-university/article/Rise-AI-and-Machine-Learning-Construction-2018

Blanco, J. L., Fuchs, S., Parsons, M., & Ribeirinho, M. J. (2018). Artificial intelligence: Construction technology's next frontier| McKinsey. https://www.mckinsey.com/business-functions/operations/our-insights/artificial-intelligence-construction-technologys-next-frontier#

Software/Language:
Matlab
Pycharm
Arduino or Raspberry PI
Python
Pytorch
TensorFlow

Interior Design (IND):

Using AI to Create Human Centered Interior Environments

The use of intelligent and assistive technologies to guide the design of the environments in which we live, learn, and work is growing at an increasing rate. Interior Design involves the creation of data driven, well-conceived, and adaptive spaces by expert practitioners that support and foster human resilience. Using AI-based approaches such as Human in the Loop (HITL) Machine Learning leverages both numerical data as well as the opinions and viewpoints of people occupying a space to optimize both design functionality and human experience. This approach to AI-guided Interior Design offers a vehicle for applying both human and machine intelligence to forecast a design's ability to meet expected and evolving performance outcomes. Examples of how AI can be used to inform space programming and environmental planning will be reviewed. For example, how Machine Learning can be used as an evidence basis to guide the design of spaces in safety critical environments. Additionally, possibilities of using AI and Distributed AI in conjunction with discipline specific software platforms such as AutoCAD and Revit will also be discussed.

Reading Materials:
Tan, P. N., Steinbach, M., & Kumar, V. (2016). ***Introduction to Data Mining.*** Pearson Education India, Chapter 2: "Data" and Chapter 3 "Exploring Data."

Software/Language:
Python Jupyter Notebooks

Landscape Architecture (LAE):

The application of Artificial Intelligence and Machine Learning in Landscape Architecture is emerging. AI and ML could efficiently collect, analyse and digest information from the built environment for Landscape Architects. AI and ML provide Landscape Architects great tools for innovative design and creation. The lifestyle that AI changes, provides opportunities and challenges for Landscape Architects to create a desirable built environment. AI and ML also help us understand, monitor and conserve nature.

Reading Materials:

Book: Bradley E Cantrell, Justine Holzman; Responsive Landscapes: Strategies for Responsive Technologies in Landscape Architecture; Routledge, 2016
https://www.routledge.com/Responsive-Landscapes-Strategies-for-Responsive-Technologies-in-Landscape/Cantrell-Holzman/p/book/9781138796652

Article: Mimi Zeiger; "Live and Learn"; Landscape Architecture Magazine, vol. 109, Iss.2, Feb 2019, pp. 78-89

Software/Language used:
Python

Urban and Regional Planning (URP):

The world is becoming more urban while large quantities of data are being generated by humans about the built environment on an unprecedented scale. Urban data are pervasive, and computing is ubiquitous that creates a great opportunity for reinvigorating and revamping traditional urban planning. According to the National Science Foundation, "Knowledge of computer science and computer programming is becoming a necessary skill... in marketing, advertising, journalism, and the creative arts." Urban planning is no exception. Both the pervasiveness of ubiquitous sensor technology and the growth of information technology produce large quantities of data and making sense of these gathered data requires computer and data science skills. Examples of technologies that are already highly concentrated in the built environment include, but not limited to autonomous vehicles, embedded environmental sensors, distributed intelligence and control in infrastructure, the sharing economy, and social networks. To understand and take advantage of these vast amounts of new data, the traditional data analysis methods in the urban planning field is insufficient, and thus requires advanced data analysis skills for large data such as machine learning, and deep learning.

Reading Materials:
Urban Analytics (Spatial Analytics and GIS) First Edition
https://www.amazon.com/Urban-Analytics-Spatial-Gis/dp/1473958636/ref=asc_df_1473958636/?tag=hyprod-20&linkCode=df0&hvadid=312446862670&hvpos=&hvnetw=g&hvrand=5187003182187135649&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9011703&hvtargid=pla-415427782747&psc=1

Software/Language used:
Python

COURSE SCHEDULE:

Week	**Discipline**	**SUBJECT**
Week 01	DCP	Introduction to AI
Week 02	URP	Urban Analytics for Smart and Resilient Cities Introduction: Big data at urban scale Overview of urban analytics/computing approaches Smart cities applications (transportation, housing) Resilient cities applications (hazards, SLR, climate change) Leveraging big data and AI to understand social equity
Week 03	URP	Technical Contents: AI and sentiment analysis for public perception mining (natural language processing) AI and human mobility analysis (geospatial data & clustering) Language: Python
Week 04	LAE	AI and Machine Learning in Landscape Architecture research on public space and public life and environmental conservation. Technology on modeling and simulation of natural disasters, urban and ecological processes.
Week 05	LAE	AI and Machine Learning in future Landscape Architecture design and professional practice.
Week 06	DCP	Guest Speakers - Application of AI Technologies in URP and LAE
Week 07	ARC	Technology and its impact on the profession Determinants and constraints Contemporary generative design tools: simulation based procedural modeling
Week 08	ARC	Collaborative AI: Machine Learning and Artificial Neural Networks Image-based Convolutional Neural Networks (CNN) Generative Adversarial Networks (GAN)
Week 09	IND	Demystifying the role of AI in Human-Centered Design Introduction to public and proprietary data resources for use in Machine Learning

Week 10	IND	Understanding ways to include human perspectives and expertise into AI The potential of using AI as an interactive and vital tool in Interior Design practice
Week 11	DCP	Guest Speakers - Application of AI Technologies in ARC and IND
Week 12	CM	Augmented and explainable intelligent planning and control of construction processes: Know when to use supervised versus unsupervised versus semi-supervised versus reinforcement training techniques. Learn the basics of shallow versus deep neural networks versus Support Vector Machines versus basic Statistical Regression. Understand how to train, test, and validate a machine learning model to achieve maximum utility. Understand the current limitations of machine learning technologies
Week 13	CM	Computer Vision for Construction Safety Application: Understand the Basics of computer vision & deep learning, e.g., object detection, segmentation, 3D reconstruction Using AI to detect selected safety hazards in images collected from construction site
Week 14	DCP	Guest Speakers - Application of AI Technologies in CM
Week 15	DCP	Final Project Presentations

<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.