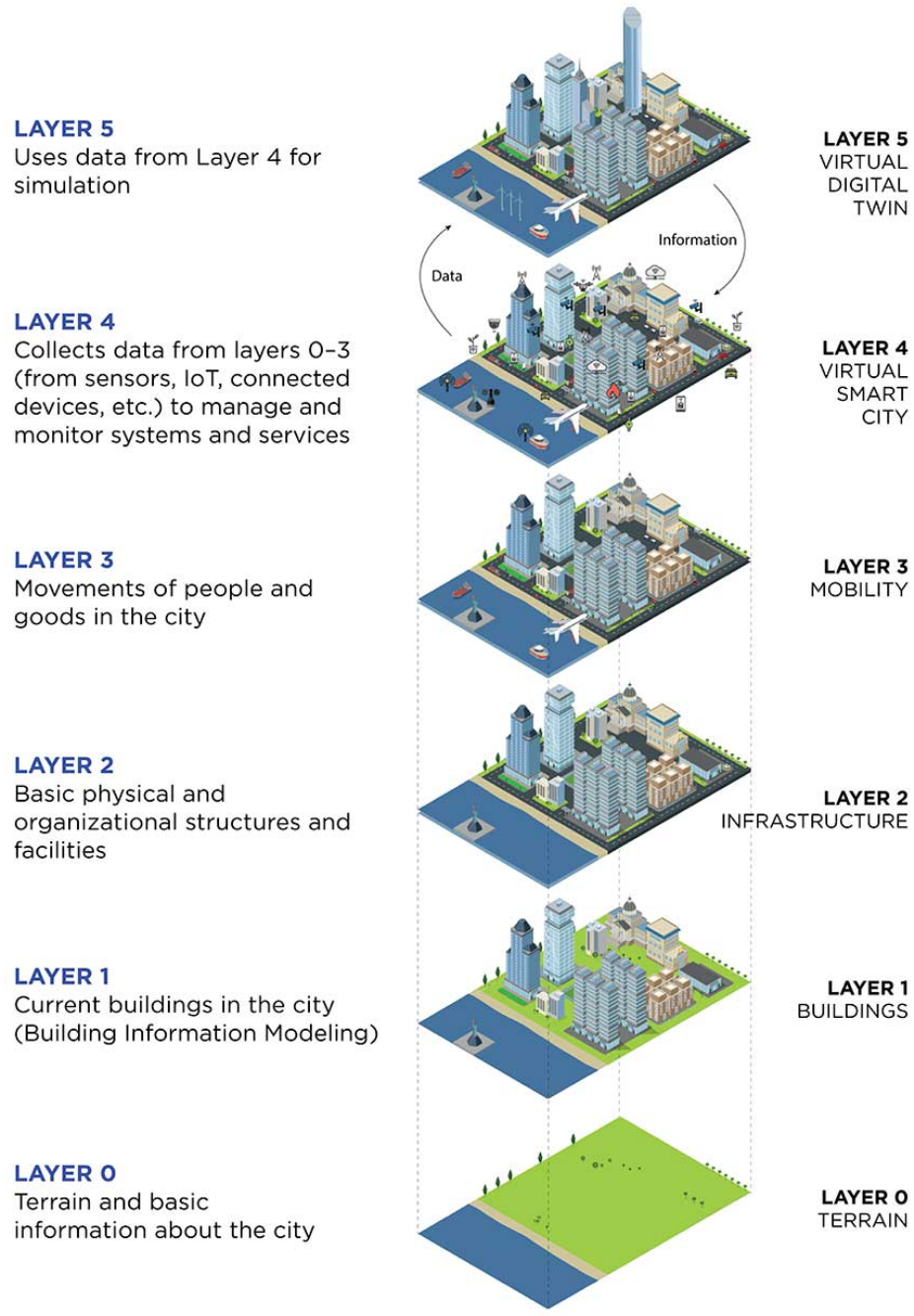
Fall 2022—Smart City Practicum Syllabus

CRP395C: Smart City Practicum

Instructors: Prof. Junfeng Jiao

(Contents subject to possible changes/updates)



(Title: Smart City Digital Twin;
Source: Trinity College Dublin: "A Digital Twin Smart City for Citizen Feedback.")

General Information

Title	CRP395C: Smart City Practicum
Unique Number	01625
Faculty	Junfeng Jiao
Credit	3.0
Class Time	Tuesday 2:00 pm – 5:00 pm
Location	GAR 2.124
Alternative Zoom	https://utexas.zoom.us/j/393778291
Office	SUT 3.120
Email	jjiao@austin.utexas.edu

Office Hours

Junfeng Jiao: Thursday 2:00-4:00 or By Appointment
TA: Huihai Wang
Time: Tuesday 12-2pm or Thursday 1-2pm
Email: hw9998@utexas.edu

Introduction

This Smart City Practicum will introduce basic knowledge of smart city, smart city technologies. Then it will be narrowed down to one smart city project. Students will be able to design, develop and build community hubs for smart mobility (CHSMs) in city of Austin. The goal is to provide a sustainable, scalable, and transferable proof of concept for addressing the spatial mismatch between housing affordability and jobs by co-creating a Community Hub for Smart Mobility (CHSM) in vulnerable neighborhoods. CHSMs will be community-level hubs where residents can access multiple modes of transport such as shared (e-)bikes, e-scooters, ride hailing, electric vehicle charging stations, and public transit. It will provide more mobility options to residents, increase their access to jobs, ameliorate existing transit deserts, and improve the efficiency of the overall transportation system. The CHSM concept will likely benefit all kinds of communities, with the greatest benefits going to those who are most underserved by the current transportation system and most under-resourced due to the job/housing mismatch.

We will use different smart city technologies to develop, implement, and evaluate a Community Hub for Smart Mobility (CHSM) to solve the job/housing mismatch in US cities and beyond. The recommended course site is the Georgian Acres, a historically under-resourced neighborhood in northeast Austin, Texas and work with multiple civic partners to address the unique transportation needs of the neighborhood. These findings will contribute to the literatures on transportation planning, community planning, and participatory design and will serve as a model for tackling the job/housing mismatch through community-based mobility solutions.

COURSE CONTENT

Course Goals:

The learning objectives for Smart City Practicum include the following:

1. **Understand Basic Concepts of Smart Cities:** Students will be able to describe and explain basic concepts of smart cities and discuss related topics.
2. **Integrate Research and Planning Praxis:** Students will be able to unite planning, urban studies, housing policy, urban analytics, and other science research with planning practice.
3. **Resolve Complex Problems:** Students will experience planning scenarios in which the goals may appear straightforward, but the means of achieving such goals are anything but straightforward.
4. **Develop Analytical, Presentation and Writing Skills:** Planners should present and write clearly and defensibly. Strategic thinking is critical for all planners, regardless of their professional setting.
5. **Design Research Agendas and Develop Models:** Students will be able to construct proper research design and develop initial research questions into models. They will be able to learn to work as a team, managing tasks to be completed in a timely manner.

General

Students must come to class prepared to discuss them. Also, we will have guest speakers in several of our classes, and students must come to class prepared to engage with them. Class participation, oral presentations, writing a report and class discussion will be important in this class.

Three main presentations and one individual report will be due during the semester. Students will be able to choose their own course related topics with the approval of the professors. Also, each student will present their progress to the class. There will not be a midterm or a final; instead, students will actively participate in a class discussion in each class. And they will lead an individual research project with a written report and a class presentation component.

Your written report will be evaluated on content and writing style. Both what you say and how you say it matter. I would suggest reviewing a copy of *The Elements of Style* by Strunk and White, and a grammar source, such as *Minimum Essentials of English* by Barron's. I will have additional information on writing and presentation in Canvas.

Introduction to Smart City Digital Twin

During the semester, most of the classes will have Part 1 and Part 2 sections. Part 1 will include the following important smart city concepts:

- Concept of Smart City and Smart Community
- Open Data & Analytics
- GIS & GEO Data
- Smart Transportation
- Smart Energy
- Smart Building
- Smart City Digital Twin
- Artificial Intelligence (AI) Analysis & AI Decision Support System
- Internet of Things, Blockchain, Alternate Reality, Virtual Reality

Students will bring questions and participate in the class discussion actively.

Smart Mobility Analysis—Semester Project

While students develop some basic knowledge about smart communities in Part 1 section, Part 2 section in the course will become more of a workshop environment. The instructor will work with students to apply their smart community knowledge in real projects with a Georgian Acres case. Students will either lead the research project individually or form research teams. Data will be provided by the Austin entities and the instructors. This could include open data, financial data, GIS etc., in the following areas:

- shared (e-)bikes
- e-scooters
- ride hailing
- drones
- robot delievery
- electric vehicle charging stations
- pedestrian paths
- public transit (Bus, Light Rail, etc.)

This course aims to integrate all research products by the team and develop a smart city digital twin for a Georgian Acres neighborhood through a smart mobility lens. Each team will share and present their progress to the class during the semester: (1) Presentation 1 for motivation and topic selection; (2) Presentation 2 for exploratory analysis; and (3) Presentation 3 for modeling and planning recommendations. At the end of the semester, students will publish their semester projects online through Google Site (https://sites.google.com/new?tgif=c) and turn in a final report. Students may share the outcomes with related stakeholders such as: planners, city officials, business leaders, and engineers.

GRADING

Presentation 1: 15%
Presentation 2: 30%
Presentation 3 (Website, Presentaiton, and Final Report): 40%
Class Participation: 15%

ASSIGNMENTS – DUE DATES

All presentations are due as a pdf format at the beginning of the assigned class.
Pdf should be uploaded to the canvas website.

Our submission rule is very simple: NO LATE SUBMISSIONS

August 30: Topic Selection Due
September 20: Presentation 1 Due
October 4: Presentation 2 Topic Due
October 18: Presentation 2 Due
November 1: Final Presentation Topic Due
November 29: Final Presentation & Website Publication Due
December 6: Research Project Reports Due

CLASS PARTICIPATION

You must let instructors know in advance if you are going to be absent from a class.

Class participation is neither about the person who flaps his or her gums the most, nor about being an introvert or an extrovert. In this class, participation is about quality engagement. Students will be expected to lead some class discussions. To participate you must read and contemplate prior to class. Good class participation involves the following: active listening, consideration of your peers, making comments, asking questions, taking risks and giving opinions. Our class will be a safe environment, and I will be assessing whether you can back up your comments by applying the course concepts.

All cell phones, PDA's, and other hand held devices must be turned off during class. Laptops/tablets will be allowed in class only for the purpose of taking notes or consulting course readings, unless I advise you otherwise. Surfing the web, texting or sending emails during class is prohibited; it is a breach of professionalism and will result in a loss of laptop/tablet privileges.

ADDITIONAL INFORMATION

Students with Disabilities:

Qualified students with disabilities may request appropriate accommodations from the Division of Diversity and Community Engagement, Services for Students with Disabilities at http://www.utexas.edu/diversity/ddce/ssd/ or 471-6259.

Academic Dishonesty/Plagiarism:

Students are expected to respect the LBJ School's standards regarding academic dishonesty. You owe it to yourself, your fellow students, and the institution to maintain the highest standards of integrity and ethical behavior. A discussion of academic integrity, including definitions of plagiarism and unauthorized collaboration, as well as helpful information on citations, note taking, and paraphrasing, can be found at the Office of the Dean of Students web page. (http://deanofstudents.utexas.edu/conduct/) and the Office of Graduate Studies (http://www.utexas.edu/ogs/ethics/transcripts/academic.html). The University has also established disciplinary procedures and penalty guidelines for academic dishonesty, especially Sec. 11.504 in Appendix C of the Institutional Rules on Student Services and Activities section in UT's General Information Catalog.

Emergency Evacuation Routes:

The following recommendations regarding emergency evacuation from the Office of Campus Safety and Security, 512-471-5767, http://operations.utexas.edu/units/csas/terms.php:

a. Occupants of buildings on The University of Texas at Austin campus are required to evacuate buildings when a fire alarm is activated. Alarm activation or announcement requires exiting and assembling outside.
b. Familiarize yourself with all exit doors of each classroom and building you may occupy. Remember that the nearest exit door may not be the one you used when entering the building.
c. Students requiring assistance in evacuation shall inform their instructor in writing during the first week of class. In the event of an evacuation, follow the instruction of faculty or class instructors.

d. Do not re-enter a building unless given instructions by the following: Austin Fire Department, The University of Texas at Austin Police Department, or Fire Prevention Services office.
e. Behavior Concerns Advice Line (BCAL): 512-232-5050
f. Link to information regarding emergency evacuation routes and emergency procedures can be found at: https://preparedness.utexas.edu/emergency-plans

Religious Holidays:

By UT Austin policy, you must notify me of your pending absence at least fourteen days prior to the date of observance of a religious holyday. If you must miss a class, an examination, a work assignment, or a project in order to observe a religious holyday, you will be given an opportunity to complete the missed work within a reasonable time after the absence.

Campus Safety and Wellness Resources:

More information on how to sign up for emergency text alerts, contact information for various UT offices, wellness resources, and campus initiatives relating to safety and/or wellness can be found at https://www.utexas.edu/campus-life/safety-and-security

Class Schedule

Readings: Canvas

(Subject to Change Due to Guest Speaker Schedules)

Week			In-class	Note
1	Tuesday	23-Aug	Introduction - Class Introduction - Syllabus - Project Overview (Topics) - What is a Smart City? - Making Presentations ➢ Presentations ➢ Topic selection	First Class
2	Tuesday	30-Aug	**Smart Cities Marco View and Case Studies** -- Part1: Smart Cities Macro (Chelsea Collier/Kijin Seung) -- Part2: Smart Cities & Robotics Technologies (Huihai Wang)	Topic Selection Presentation (pdf submission is not required) (5 min)
3	Tuesday	06-Sep	**About Georgian Acres (Context), At a Glance** - Part 1: District, Service Area, & Properties (Lecture) - Part2: Smart Cities & Drones (Huihai Wang) - Part 3: Student Discussion & Interactions (Georgian Acres Brief Approaches) - Part 4: Site Visit	
4	Tuesday	13-Sep	**Open Data & Analytics** **- Part 1 Guest: City of Austin Data** - Part2: Student Discussion & Interactions (Data Collection for SCDT: Open Data & City Data) - Part3: Topic Selection Discussion (Professor/TA/team interaction) - shared (e-)bikes - e-scooters - robot/drone - ride-hailing - electric vehicle charging stations public transit (Bus, Light Rail, etc.)	
5	Tuesday	20-Sep	**First Presentation (10 min.)** Section 1: Motivation - Why important? What is problem? And What is stimuli? - Why do you select this **topic**? - What kinds of **data** will you use?	**First Presentation** Data Collection Feedback - Layer 0 (Terrain) - Layer 1 (Buildings) - Layer 2 (Infrastructure)

			- Specific topic on Georgian Acre related to Community Hub for Smart Mobility	- Layer 3 (Mobility/Population)
6	Tuesday	27-Sep	**GIS & GEO Data** - Part 1 Guest: Connor Philips - Part2: Student Discussion & Interactions (Background research)	
7	Tuesday	04-Oct	**Smart Transportation** - Part 1 Guest: Smart Mobility (TBD) City of Austin - Part2: Student Discussion & Interactions (Individual data analysis)	Second Presentation Topic Due
8	Tuesday	11-Oct	**Smart Energy** - Part 1 Guest: Clean Energy (Alex Payson) - Part2: Student Discussion & Interactions (Energy and smart mobility)	
9	Tuesday	18-Oct	**Second Presentation (10 min.)** Section 2: Exploratory Analysis - What is your primary **dataset**? - What information do you mainly focus on? - Exploratory analysis for Community Hub for Smart Mobility in Georgian Acres - How can your analysis contribute to smart city digital twin?	**Second Presentation**
10	Tuesday	25-Oct	**Austin AI Housing Analysis** - Part 1: Yefu Chen (Lecture) - Part2: Student Discussion & Interactions (Housing and smart mobility)	
11	Tuesday	01-Nov	**Smart Buildings** - Part 1 Guest: Dr. Juliana Felkner (TBD) - Part 2: Student Discussion & Interactions (Smart and connected community)	Final Presentation Topic Due
12	Tuesday	08-Nov	**Smart City Digital Twin** - Part 1 Guest: Mathias Auffray (TBD) - Part2: Student Discussion & Interactions (Smart City Integration)	
13	Tuesday	15-Nov	**AI Decision-Support Systems for Optimization an Automation** - Part 1 Guest: Dr. Arya Farahi (UT Austin) - Part2: Student Discussion & Interactions (AI technologies and smart mobility)	
14	Tuesday	22-Nov	No Class	Happy Thanksgiving
15	Tuesday	29-Nov	**Final Project Presentations (15 min.)**	**Final Project Presentations**

			Section 3: Modeling and Planning Recommendations - Modeling - Optimization - Planning recommendation	
16	Tuesday	06-Dec	Study Days	**Project Report Due**

References

Substantial Portions of the following books are on Canvas for readings for this class. **We suggest that you look at which ones you want to purchase. See below:**

Smart Cities: Big Data and the Quest for a New Utopia, Anthony M. Townsend,
ISBN: 978-0-393-08287-6

Beyond Transparency: Open Data and the Future of Civic Innovation, Editors: Brett Goldstein with Lauren Dyson
ISBN: 978-0-615-88908-5

Beyond Smart Cities: How Cities Network, Learn and Innovate, Tim Campbell
ISBN: 978-1-84971-426-6

Building Smart Cities: Analytics, ICT and Design Thinking, Carol L. Stimmel,
ISBN: 978-1-4987-0276-8

Smart Cities for a Bright Sustainable Future: A Global Perspective, Shark, Toporkoff and Levy
ISBN: 978-1-4973-3945-6

** Smart City Talk Series (https://smartcity.tacc.utexas.edu/pages/events.html#E164014514)
If you are interested in the Smart Cities, the Urban Information Lab has lightning presentations from 11-11:30am CST every second and fourth Friday.

The Smart Cities Consortium is a group of researchers, city officials, and others interested in smart cities research and development. Lightning presentations are 11 - 11:30 am CST every other Friday. We welcome researchers, city officials, and others interested in smart city emerging technology. Check out our future and past events through the link.