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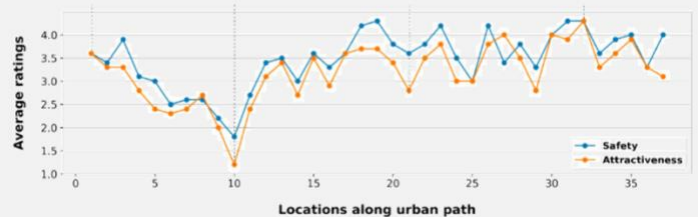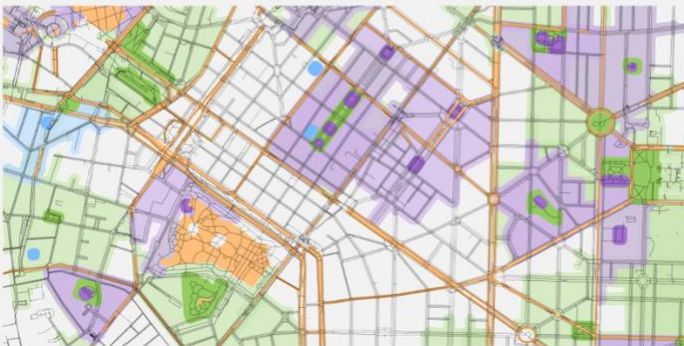
Urban Analytics

*If we want to have a chance of achieving the SDGs,
we need to get our cities right.*

Maimunah Mohd Sharif
Executive Director of UN-Habitat
in her opening speech at the World Urban Forum #9, Kuala Lumpur in February 2018

General information

Course Coordinator: Dr Achilleas Psyllidis

- o Office: 32 B-3-270
- o Office hours: by appointment
- o E-mail: a.psyllidis@tudelft.nl

Guest speakers:

- o **Dr Carissa Champlin** (Delft University of Technology)
- o **Lior Steinberg** (Humankind)
- o **Vasileios Milias** (Delft University of Technology)
- o **Roos Teeuwen** (Delft University of Technology)

Class schedule:

We will meet on Fridays at **Bernd Schierbeek Hall (32 D-1-710)** at 9 a.m.

- o Course start date: Friday, April 28, 2023
- o Course end date: Friday, June 30, 2023 (Final Presentation)

Course resource: https://brightspace.tudelft.nl/d2l/home/500132

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Course context

Transitioning to a more sustainable, healthy, and liveable future for all entails a slew of complex societal challenges. Cities and urbanised regions play a critical role in driving the necessary transitions. This is emphasised further by the fact that more than one-third of the UN's Sustainable Development Goals (SDGs) indicators include an urban component[1]. Cities around the world are expected to meet the SDGs and WHO's and UN-Habitat's public health equity goals by 2030. So, the challenge for planners, designers, and policymakers is to create liveable, sustainable, and attractive urban spaces that promote the well-being of all. And this requires radical changes in every possible sector—from mobility and energy to food and land use.

Achieving these goals necessitates the development of specific evidence-based targets and indicators that are consistently measured and globally comparable. This is crucial for benchmarking and monitoring progress at the city and, more importantly, at the street and neighbourhood levels to uncover and mitigate spatial inequities.

But how can we help cities in framing the priorities and consistently track progress toward these goals? What kinds of globally applicable indicators can facilitate the transition to healthier, fairer, and more sustainable cities and societies? What analytical methods and tools best capture the most meaningful qualities of the urban environment? And how can designers play a key role in making this happen?

Course description

The Urban Analytics elective is founded on SDGs for Cities and how to achieve them by exploring various methods for measuring the urban environment. You will learn the key indicators as well as different quantitative and qualitative approaches to measuring the physical environment of cities. You will also take a critical stance from the standpoint of a designer. What urban qualities do different metrics capture? Are they meaningful? When should we use what? Who is considered, and who is left out? And, more importantly, can we reframe how we measure progress toward these goals?

We will look at walkability, accessibility, and liveability through well-being, quality of life, and environmental justice lenses. You will become acquainted with various data sources, analytical approaches, and measurement techniques. You will test different measures and analytical techniques in real-world urban settings through case studies and hands-on assignments. And you will create your own composite indicators and suggest design interventions to help our communities and cities become healthier, more sustainable, and attractive to all citizens. Guest speakers from academia and industry will join some of the classes and highlight specific aspects of urban analytics and environmental design qualities. This elective aims to equip you with the skills and tools needed to provide a new approach to measuring the urban environment that prioritises the diverse needs of citizens.

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[1] UN-Habitat. (2020). *The New Urban Agenda Illustrated.* Available at https://unhabitat.org/the-new-urban-agenda-illustrated (accessed 16 March 2023).

Learning objectives

By the end of this course, you will be able to:

- o **Discuss** different methods for measuring the physical and perceived design qualities of the urban environment.
- o **Apply** a variety of quantitative and qualitative measurement methods and analytical techniques in real-world urban settings.
- o **Formulate** pathways toward designing more inclusive SDG indicators and interventions for cities.

Course outline

WEEK | DATE	ACTIVITIES		LECTURER
W4.1 28 April 2023	In class	Introduction to the course Driving the urban transitions with urban analytics: Measuring universal SDGs for Cities	Achilleas Psyllidis
W4.2 05 May 2023	Preparation	Read and prepare literature.	
	In class	NO CLASS (Public Holiday)	
W4.3 12 May 2023	In class	Measuring resilient behaviour for context-driven policy design Street network metrics (Activity: Compute simple topological street metrics)	Carissa Champlin Vasileios Milias
W4.4 19 May 2023	Preparation	Read and prepare to discuss literature on measuring walkability. Become acquainted with the Healthy Streets Index.	
	In class	NO CLASS (Collective Leave Day)	
W4.5 26 May 2023	In class	Measuring objective and perceived walkability Introduction to OpenStreetMap and Overpass API	Achilleas Psyllidis
W4.6 02 June 2023	In class	Urban data for human-centric cities Discuss and work on group assignment (Quantitative assessment)	Lior Steinberg
W4.7 09 June 2023	In class	Measuring accessibility Discuss and work on group assignment (Qualitative assessment)	Achilleas Psyllidis
W4.8 16 June 2023	In class	Fundamentals of spatial analysis (MAUP, proximity matrices, spatial autocorrelation) Practising spatial analysis with GeoDa	Achilleas Psyllidis
W4.9 23 June 2023	Preparation	Finalise group assignment (preparation of posters)	
W4.10 30 June 2023	FINAL PRESENTATION		

Assignment

Pathways to healthier, fairer, and more attractive city streets and neighbourhoods for all

Introduction

Throughout the course, you learned about various methods for measuring the physical (design) layout and environmental qualities of cities. This assignment allows you to put what you have learned into practice in real-world urban settings. You will first form groups and then each group will be assigned an area representing the 10-minute walkshed around a place of interest (e.g., a park, a playground, a public square). Each group will conduct a quantitative and qualitative assessment of each area's street environment through network metrics, street-level imagery, and on-site visits. When conducting your analyses, you will consider aspects of health, well-being, inclusivity, justice, and accessibility in accordance with SDG targets and from the perspective of a specific population group (e.g., children, elderly, women, and visually or mobility-challenged people).

Learning objectives

This assignment addresses all three of the elective's learning objectives (see p. 2).

Purpose

- o To test different quantitative and qualitative measures and analytical techniques in real-world urban settings.
- o To become acquainted with and critically evaluate various approaches to measuring the urban environment in a way that prioritises the diverse needs of citizens.
- o To create your own composite indicators and suggest design interventions to help our communities and cities become healthier, more sustainable, and attractive to all citizens.

Instructions

Preparation

- o The first step is to form groups of 3 students. You will then notify the course coordinator of the group formations and any changes by May 8, 2023, at the latest.
- o Each group is assigned a 10-minute walkshed around a place of interest (e.g., a park, a playground, a public square). The course coordinator will provide digital files of the walkshed areas, which will be available on Brightspace.
- o Some walkshed areas are shared by at least two student groups. What differs is the population group and associated angle of interest (e.g., inclusivity, accessibility, justice).

Analysis

- o You will first conduct a quantitative analysis of the area's streets using network metrics to evaluate the street layout and topology in terms of connectivity, compactness, and spatial

access. You will use OSM data collected via the Overpass API, and workflows demonstrated in class.

- o You will then conduct a qualitative analysis by navigating the streets using Google Street View. You will assess the environmental and experiential qualities of walkability and accessibility (e.g., traversable streets, perceived safety, attractiveness) using methodologies you learned in class and the Healthy Streets Qualitative Assessment Tool.
- o Finally, you will conduct an observational analysis of selected paths through physical on-site observation. You will again assess the various qualities of walkability and accessibility using the qualitative assessment tool and, if possible, through short interviews with street users.

Discussion, outcomes, and presentation

- o You will be given time to work on the assignment in class. You are encouraged to exchange ideas with your classmates. The assignment will be active for the duration of the course. Student groups with similar walksheds will meet halfway through the course to compare their analyses and exchange insights from the perspective of the specific population group and angle of interest.
- o You will devise an ideal composite indicator that best captures the analysis criteria, and provide a kitemark for your area, similar to the energy labels or Nutri-scores found on appliances and food products. In addition, you will propose design interventions to improve the overall quality of your area, guided by the population group and angle of interest.
- o You will present your findings at the final presentation in the form of an A1 poster (portrait layout). You are free to use techniques such as deep mapping, context mapping, and any other visuals that best summarise your analyses and findings.

Deliverables

To fulfil the requirements of this assignment, you are expected to deliver:

- o An A1 poster (portrait layout) summarising your analyses and findings. You can use your own template and any visuals that best support your work. You will present the printed poster at the final presentation and upload a PDF copy to Brightspace.
- o A selection of the data (quantitative and qualitative) that you gathered for your analyses. The data will be uploaded to Brightspace.
- o The deadline for submitting the poster and associated data is on June 30, 2023.

Assessment criteria

You will be graded with the following rubric:

Learning objective	Assessment criteria	Excellent (9–10)	Very good (7–8)	Sufficient (6)	Insufficient (<6)
Discuss different methods for measuring the physical and perceived design qualities of the urban environment	Understanding and critically thinking about the measurement methods	Excellent understanding of various qualitative and quantitative methods for measuring urban design qualities, and thoughtful approach to choosing relevant metrics.	Good or very good understanding of various qualitative and quantitative methods for measuring urban design qualities, and a good or very good consideration in choosing relevant metrics.	Little understanding of various qualitative and quantitative methods for measuring urban design qualities, and a rudimentary consideration in choosing relevant metrics.	Poor or insufficient grasp of various qualitative and quantitative methods for measuring urban design qualities, with no justifiable consideration in metric selection.
Apply a variety of quantitative and qualitative measurement methods and analytical techniques in real-world urban settings	Coverage and completeness of the analyses	Excellent implementation of the three methods of analysis (qualitative, quantitative, observational), resource utilisation, and justifiable argumentation of choices made about the qualities of interest.	Good or very good implementation of the three methods of analysis (qualitative, quantitative, observational), resource utilisation, and relatively justifiable argumentation of choices concerning the qualities of interest.	Rudimentary implementation of the three methods of analysis (qualitative, quantitative, observational), resource utilisation, and borderline argumentation of choices made about the qualities of interest.	Poor or insufficient execution of the three methods of analysis (qualitative, quantitative, observational), resource utilisation, and insufficient argumentation of choices concerning the qualities of interest.
Formulate pathways toward designing more inclusive SDG indicators and interventions for cities	Clarity of argumentation and creativity	There is an excellent synthesis of analysis results, and the suggested indicators and design interventions are inventive and clearly justified.	There is a good or very good synthesis of the analysis results, and the suggested indicators and design interventions are relatively imaginative and justified.	There is some synthesis of analysis results, however the suggested indicators and design interventions are weakly justified.	There is no synthesis of analysis results, and any suggested indicators and design interventions are poorly or inadequately justified.
	Presentation quality & participation	Excellent visual quality of the poster, with clear, coherent, and logical layout that clearly delivers important concepts and fulfils all required components of the assignment. All team members contribute equally and enthusiastically.	Good or very good visual quality of the poster, with a generally clear, coherent, and logical layout that expresses key concepts and arguments in a more or less clear manner. The required components of the assignment are addressed properly. Team members have relatively equal contribution, and there is some enthusiasm and confidence.	Acceptable visual quality of the poster, with a basic logical layout that superficially presents important concepts and arguments. The required components of the assignment are addressed. Team members do not contribute evenly, and excitement and confidence are low.	Poor visual quality of the poster, with unclear layout that fails to represent any essential concepts or arguments. The required components of the assignment are either addressed partially or not addressed at all. Team members exhibit little to no excitement or confidence.

Course policies

General
- o The elective will take place at TU Delft's IDE Faculty, in Hall N – Bernd Schierbeek (D-1-710). Attendance at all classes is required. Absences that are not correctly justified will result in a 0.5-point deduction from the individual's final grade.
- o Announcements and communication will be done through the dedicated Brightspace channel: https://brightspace.tudelft.nl/d2l/home/500132.
- o Given the assignment-centric nature of the elective, there will be no re-sit opportunity.

Academic integrity
Developing an academic attitude that includes a sense of integrity is an important part of your education at TU Delft. It is critical to understand the types of behaviour that are considered a violation of integrity. Examples include plagiarism (i.e., copying from others without quoting, crediting, or citing original authors), taking credit for others' work or ideas, and misrepresenting one's own work or the work of others to suit one's agenda. These examples are by no means exhaustive. To learn more about what constitutes a violation of academic integrity at TU Delft, please consult TU Delft's online resources on academic integrity and the Code of Conduct for more details.

Grading
- o The final passing grade will fall between **6.0** and **10**.
- o The assignment is worth **100%** of your overall grade. Specifically, the poster is worth 80% of the total, while the supplementary material (i.e., the data you gathered for your analyses and any other supporting material) is worth 20%.
- o The submission of the poster and the supplementary material is due by **17:30** on **June 30, 2023**. Late submissions will incur the following penalties: (1) late by 2 hours after the deadline = **10%** deduction, (2) late by 3 hours to 24 hours after the deadline = **20%** deduction, (3) late by two days after the deadline = **50%** deduction, and (4) late by three or more days after the deadline = **100%** deduction (i.e., zero grade). Given the assignment-centric nature of the elective, there will be **no re-sit** opportunity.

In the event of illness
We all know that unexpected illnesses occur. If you are unable to attend due to illness, you are expected to notify the elective coordinator. You should also notify your teammates so that they can make any necessary adjustments to their assignment planning. In addition to notifying the coordinator, you should register your illness on IDE's illness reporting app. Select the course and the day you want to register as ill for. If you have a long-term illness, you should notify the elective coordinator and you will be referred to the academic counsellors if necessary. You can schedule an appointment with one of IDE's academic counsellors using this link.

Diversity and inclusion statement

To help accomplish a learning environment that supports a diversity of thoughts, perspectives, and experiences and honours your identities (including race, gender, class, sexuality, religion, ability, etc.), please contact the course coordinator:

- o If you would like to be addressed using a different set of pronouns and/or a name than those listed in the official records,
- o If you feel like your performance in the class is being impacted by your experiences outside of class,
- o If you feel like your identity is not being respected, or that your ideas and perspectives are being judged based on your identity.

Mutual respect for each other's worldviews, thoughts, and identities is a prerequisite for the successful implementation of this course.