



## Enhancing Cities' Walkability using AI and Network Analysis

Smart Steps: Revolutionizing Pedestrian Routing with Artificial Intelligence

### 1. Workshop Instructor Information

<b>Name</b>	<ul style="list-style-type: none"> <li>• Mostafa Khaled</li> <li>• Ahmed Osama</li> </ul>
<b>Organization/Affiliation</b>	Smart & Future Cities Laboratory for Sustainable Urban Solutions (SFCL), Ain Shams University, Cairo
<b>Email</b>	<ul style="list-style-type: none"> <li>• <a href="mailto:Mostafa.KhaledAhmed@eng.asu.edu.eg">Mostafa.KhaledAhmed@eng.asu.edu.eg</a></li> <li>• <a href="mailto:Ahmed.Osama@esrina.com">Ahmed.Osama@esrina.com</a></li> </ul>
<b>Short Biography</b> (150 words max.)	<ul style="list-style-type: none"> <li>• Mostafa is an urban designer and an architect with 5 years of experience in architecture, urban design, research, and higher education. Master's degree holder graduated with high distinction in integrated urbanism and sustainable design. Over the past 5 years worked in overlapping fields ranging from academia to practice. Teaching 400+ students in architecture and urban design domains, participating in updating 3+ courses and 3 graduation projects, a key member of smart and future cities laboratory for sustainable urban solutions, he is primarily engaged in exploring the application of design computation and artificial intelligence within the field of architecture and urban design. Beside the academic role worked on 20+ urban design and architecture design projects on various scales and participated in 2 national guidelines preparation projects aiming at regulating urbanization in Egypt.</li> <li>• Ahmed is a GIS analyst and an architect with 5 years of experience in the fields of Software Development, Urban Planning, and Spatial Analysis. Ahmed instructed leading organizations, such as Dar Al-Handasah and The British University in Egypt on ArcGIS CityEngine and ArcGIS Pro. As well as, implementing Computer Generated Architecture (CGA) to optimize modelling process. Also, he implemented efficient GIS solutions and administered the Enterprise GeoDatabase of mega national and international projects, such as Haya Karima Initiative and The World Bank's Atlas.</li> </ul>



**Head Shot**



**2. Workshop Information**

<b>Length</b>	5 hours (excluding 30 minutes breaks)
<b>Short Abstract</b> (500 words max.)	<p><b>Aims &amp; Objectives:</b>          This workshop aims to explore how artificial intelligence (AI) can be leveraged to route more walkable and pedestrian-friendly pathways within the context of smart cities.          Existing navigation systems usually target the shortest routes however users might have different preferences like green route, shaded route, ...etc. That's why this workshop aims to fill this gap through exploring open data and utilizing AI tools to complete the missing information to develop a more tailored navigation system that responds to user preferences.</p>

**Proposed Methods:**

This workshop will follow a hands-on approach to encourage participants to learn by doing.

using a predefined methodology of scraping open data from the internet and filling in the missing parts using AI tool for example segment anything model can be used to detect buildings over hangs, that can be used to define weather protected routes.

**Program, Format & Duration:**

The workshop will span a duration of 5 hours, divided into 8 sessions. The format will be a blend of theoretical knowledge sharing and hands-on activities, designed to keep participants engaged and encourage active participation throughout the event as following:

1. Walkability in Smart Cities (Duration: 15 mins)
  - 1.1. Defining Walkability and its Importance
  - 1.2. Benefits of a Walkable City
2. Introduction to Network Analysis (Duration: 45 mins)
  - 2.1. Theory behind.
  - 2.2. The Role of AI in Advancing Urban Development
- Break 1 (Duration: 15 mins)**
3. Project pseudo code generation session (Duration: 30 mins)
  - 3.1. Methodology outline.
  - 3.2. Defining needed data.
  - 3.3. Defining needed tools.
4. Data Collection (Duration: 30 mins)
  - 4.1. GIS data and existing network datasets.
  - 4.2. Scrapping needed data from online sources.
- Break 2 (Duration: 15 mins)**
5. Hands-On Workshop (Duration: 2.5 hours)
  - 5.1. Data Exploration and Analysis
  - 5.2. Applying Segmentation AI Models
  - 5.3. Building Suitable Workflow
  - 5.4. Evaluation and Interpretation of Results
6. Q&A and Closing Remarks (Duration: 30 minutes)
  - 6.1. Addressing Participant Questions
  - 6.2. Recap of Key Learnings

**Expected Number of Participants:**

An estimated 10-15 participants are expected to attend the workshop.

**Expected Outcomes:**


By the end of the workshop, participants are expected to build a complete interactive network dataset of a neighborhood in any city considering various parameters.

**Why is this workshop important?**

The workshop is crucial as it addresses the need to make cities more responsive to residents' preferences and needs. With the global population moving towards urban areas, promoting walkability is essential to reduce congestion, improve air quality, and enhance the overall quality of life for city dwellers. Integrating AI into urban planning enables optimized pedestrian pathways, safer streets, and efficient transportation, contributing to a sustainable and inclusive smart city future. The workshop encourages knowledge exchange, collaboration, and innovative ideas to tackle real-world urban challenges, taking a significant step towards building smarter, more walkable cities for the future.



<p><b>Handouts and Materials</b></p>	<p><b>Materials Provided by the Workshop Organizer (ASCAAD):</b></p> <ol style="list-style-type: none"> <li>Software: <ul style="list-style-type: none"> <li>Rhino 7 incl. Grasshopper</li> <li>Google Collab (only requires stable internet connection)</li> <li>ArcGIS Pro 3.1.2 (optional)</li> </ul> </li> <li>Notebooks</li> <li>Whiteboard or Flipchart</li> <li>Pens, Markers, and Stationery</li> </ol> <p><b>Materials Provided by the Workshop Instructors:</b></p> <ol style="list-style-type: none"> <li>Presentation Slides</li> <li>Ready-to-use Python notebooks to run on Google Collab</li> <li>Ready-to-use grasshopper scripts</li> <li>Reference materials.</li> </ol> <p><b>Items Participants Should Bring (if applicable):</b></p> <ol style="list-style-type: none"> <li>Personal Laptops (minimum 4 cores of processor)</li> </ol>
<p><b>Learning Objectives</b></p>	<ol style="list-style-type: none"> <li>Gain a comprehensive understanding of new technologies and techniques promoting walkability and their significance in building smarter cities.</li> <li>Acquire knowledge about various AI applications in enhancing pedestrian routing and city navigation.</li> <li>Develop creative and innovative ideas for applying AI solutions to enhance walkability in their own urban environments.</li> <li>Establish potential collaborations and networks for future smart city projects</li> </ol>
<p><b>Sample Outcome</b></p>	<p>1 True Ortho sat image</p> <p>2 Adding buildings footprint</p> <p>3 Detecting shades using Meta SAM</p> <p>4 Adding Tree Canopies</p> <p>5 Adding buffer for ped network</p> <p>6 Calculating the intersection between ped buffer and trees + shades</p> <p>7 Encoding the protection %</p> <ul style="list-style-type: none"> <li>Buildings footprint</li> <li>Detected Buildings shades</li> <li>Tree canopies</li> <li>Ped network buffer</li> <li>Protected Areas</li> </ul>

	 <p>Project Video link: <a href="https://youtu.be/987O3kMP5no">https://youtu.be/987O3kMP5no</a>          Project Web App: <a href="https://arcg.is/1q89uK">https://arcg.is/1q89uK</a>          Project details: <a href="https://blog.iaac.net/compath/">https://blog.iaac.net/compath/</a></p>
<p><b>Corresponding Conference Theme</b></p>	<p>Smart Cities and Buildings</p>

**3. Attendees Information**

<p><b>Who should attend this workshop?</b></p>	<p>The workshop aims to accommodate a diverse group of professionals involved in urban planning, architecture, smart city development, AI technologies, and computational designers.</p>
<p><b>Prerequisites</b></p>	<ul style="list-style-type: none"> <li>General Awareness of Urban Planning: Participants should have a basic understanding of urban planning concepts and the challenges faced by cities in terms of walkability, transportation, and sustainable development.</li> </ul>



- **Basic Data Literacy:** It is helpful for attendees to be familiar with basic data concepts, including data collection, data analysis, and data visualization. This will enable participants to better grasp the data-driven aspects of walkability analysis and AI applications.
- **Technical Proficiency (Optional):** While not mandatory, participants with a basic technical background (e.g., programming, data analysis tools, Grasshopper, GIS software) may find it easier to engage in the hands-on workshop activities involving AI tools and data analysis.