



UTC Project Information – <b>Center for Transportation, Environment, and Community Health</b>	
<i>Project Title</i>	Sustainable and Healthy Communities through Integrating Mobility Simulations in the Urban Design Process
<i>University</i>	Cornell University
<i>Principal Investigator</i>	Timur Dogan
<i>PI Contact Information</i>	<a href="mailto:tkd9@cornell.edu">tkd9@cornell.edu</a> /607-255-9591
<i>Funding Sources and Amount Provided (by each agency or organization)</i>	USDOT: \$65,117 Cornell University: \$32,075
<i>Total Project Cost</i>	\$97,192
<i>Agency ID or Contract Number</i>	Sponsor Source: Federal Government CFDA #: 20.701 Agreement ID: 69A3551747119
<i>Start and End Dates</i>	10/01/2020 – 09/30/2021
<i>Brief Description of Research Project</i>	A design focused active mobility simulation tool called <a href="https://urbano.io">Urbano.io</a> that facilitates the design of healthy and sustainable urban habitats was developed and validated. This project added the ability to 1) adapt statistical and behavioral models from the transportation literature to incorporate street quality and thermal comfort-aware active mobility mode choices over others, and 2) validate the new behavioral models with urban data from NYC. More specifically, an hourly outdoor comfort map for NYC was created that was correlated with CitiBike usage and pedestrian count data to investigate the link of urban form, microclimate, and life in the streets. In addition, the most requested features from the community to remove a number of limitations that were revealed during intensive use in practice, online workshops, and conference calls with practitioners and researchers over the last four months were implemented. Key limitations that were addressed were: 1) accelerated algorithms and data structures to speed up analysis to allow larger analysis domains, 2) support for multimodal trips and other travel modes (such as biking, transit, and shared mobility), 3) support for customizable choice models to determine which modes would be used for different mobility needs, and 4) 3D terrain support to accurately model effort of sloped pathways.

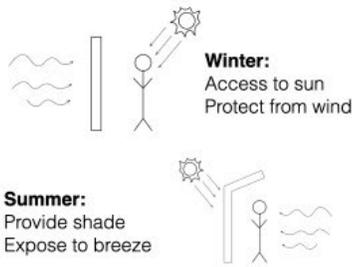
<p><i>Describe Implementation of Research Outcomes (or why not implemented)</i></p> <p><i>Place Any Photos Here</i></p>	<p>The mobility model in Urbano has been rewritten to accelerate large scale simulations and provide multi-modal simulations. We received access to NHTS Add-on data for NYC and California and developed a novel, data driven Mode-Distance and Activity choice model within Urbano.io. This framework is unique as it can incorporate quality factors of the built environment such as outdoor thermal comfort. This allows us to like mobility patterns with the urban microclimate.</p> <p>See Appendix A.</p>
<p><i>Impacts/Benefits of Implementation (actual, not anticipated)</i></p>	<p>Urbano.io version 1.3.3 has been released publicly on Food4Rhino.com and www.Urbano.io and has been downloaded over 9000 times. Urbano users are affiliated with leading Architecture, Engineering and Construction (AEC) industry such as AECOM, KPF, Miller Hull, Ramboll, Buro Happold, Henning Larsen, Transsolar, Perkins+Will, Graphisoft, SOM, HKS, LINK, and AS+P. Further, Urbano is being used in leading academic institutions for research and teaching including Cornell, MIT, Harvard GSD, Carnegie Mellon, Columbia, TU Delft, TU Berlin, Technion, University of New South Wales, Polytechnico Milano and many more. Recently also planners that are affiliated with municipalities joined user group such as City of Calgary, NYC Department of Transportation.</p> <p>KPF leveraged Urbano.io in a COVID-19 web tool for sidewalk crowding prediction.</p> <p><a href="https://medium.com/@kpfui/sidewalk-crowding-in-the-age-of-covid-19-3ca9d20039a7">https://medium.com/@kpfui/sidewalk-crowding-in-the-age-of-covid-19-3ca9d20039a7</a></p> <p>In the light of the current COVID-19 crisis, with Professor Nathaniel Hupert from Weill Cornell Medicine, we initiated a new funded collaboration at the nexus of urban mobility design and epidemiology. This study leverages Urbano.io to investigate how urban design attributes like density, housing typology, demographic and programmatic mix, mobility infrastructure, walkability, and bike-ability relate to epidemics.</p> <p><a href="https://journal-buildingscities.org/articles/10.5334/bc.130/">https://journal-buildingscities.org/articles/10.5334/bc.130/</a></p>
<p><i>Web Links</i></p> <ul style="list-style-type: none"> <li>• <i>Reports</i></li> <li>• <i>Project website</i></li> </ul>	<p><a href="http://ctech.cee.cornell.edu/final-project-reports">http://ctech.cee.cornell.edu/final-project-reports</a></p> <p><a href="http://www.Urbano.io">www.Urbano.io</a></p>

Appendix A

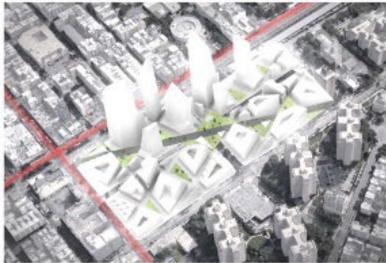
Outdoor Comfort Toronto



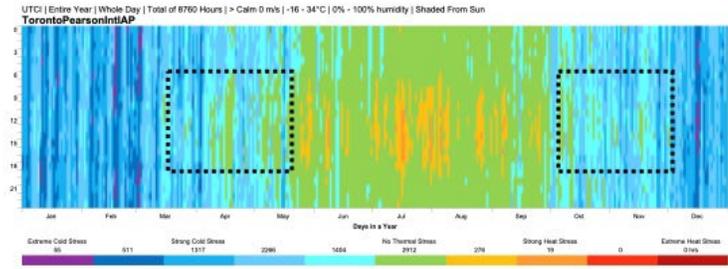
Impact of a built environment that slows wind and provides access to the sun



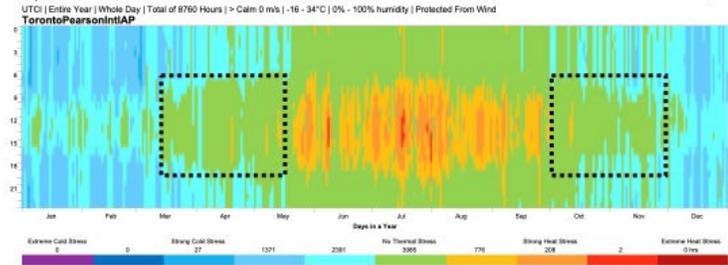
Diagrams: Hernaut Dana



Studio Project: Anderson Barner



26% increase in comfort hours

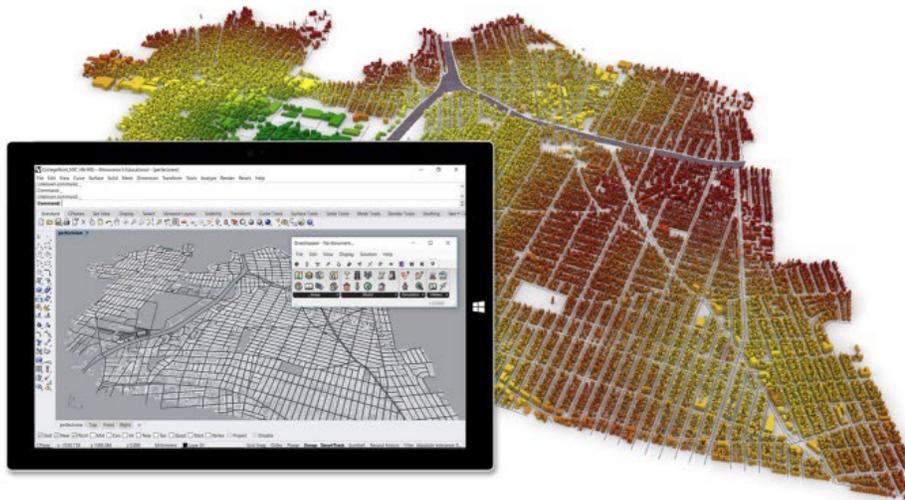


Outdoor spaces can be used for an additional **4 month**

Urbano.io



The only tool that connects **urban design, mobility, and sustainability**



Tutorials and free download at: [www.urbano.io](http://www.urbano.io)

Timur Dogan, Yang Yang, Samitha Samaranyake & Nikhil Saraf (2020) Urbano: A Tool to Promote Active Mobility Modeling and Amenity Analysis in Urban Design, Technology(Architecture + Design), 4:1, 92-105.



**8000+**  
downloads by

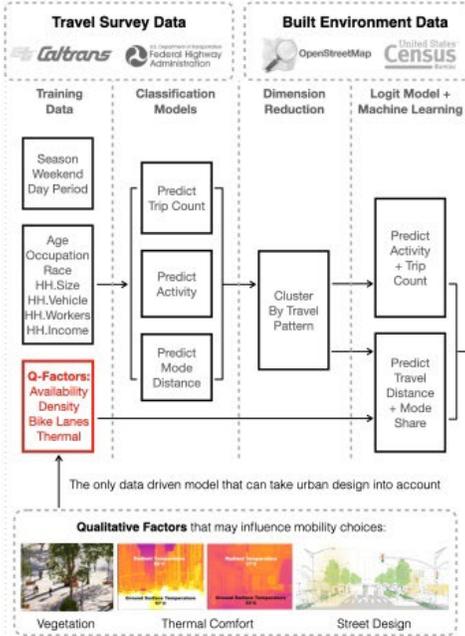
Industry:



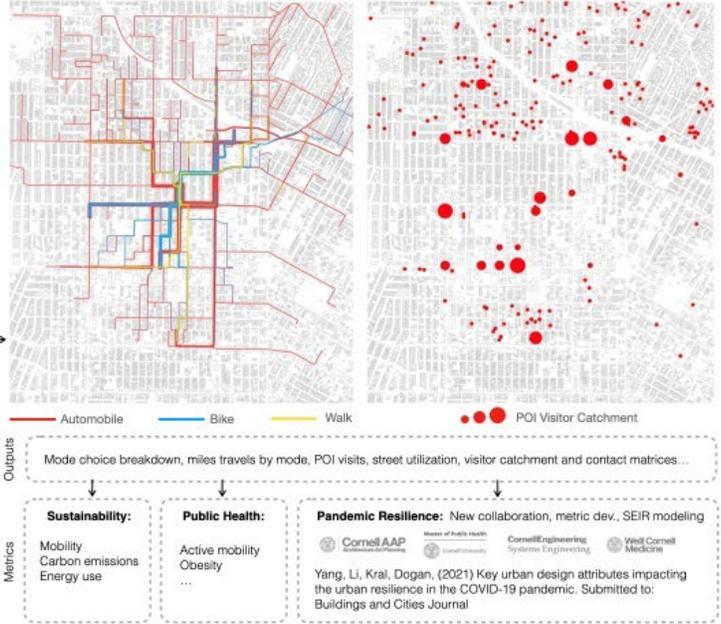
Academia:



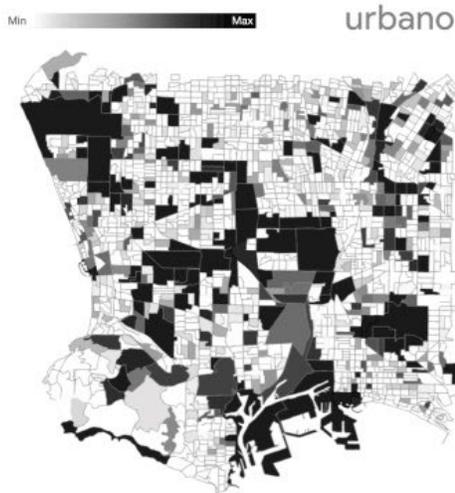
## Data-driven Choice Models



## Urbano Simulation Outputs and Metrics

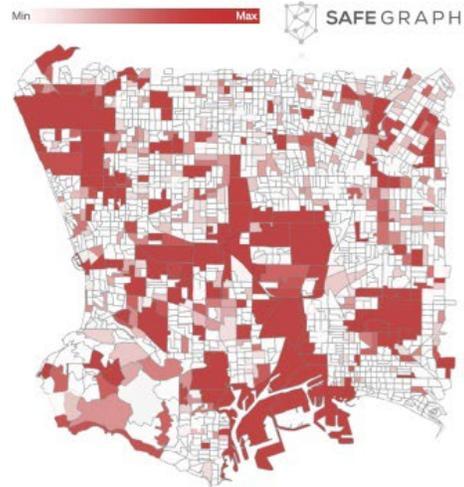


## Urbano can simulate mobility patterns that are comparable to aggregated cellphone data



### Urbano Neighborhood Stops

- A visit is counted if a synthesized traveler makes a trip to the given CBG.
- Results are aggregated by time periods. (early morning, morning, noon, afternoon, evening, night)



### Safegraph Neighborhood Stops

- A stop is counted if a mobile device resides for at least 1 minute at the given CBG.
- Data is aggregated by hour. Multi-hour stops will only be counted once at the starting hour.



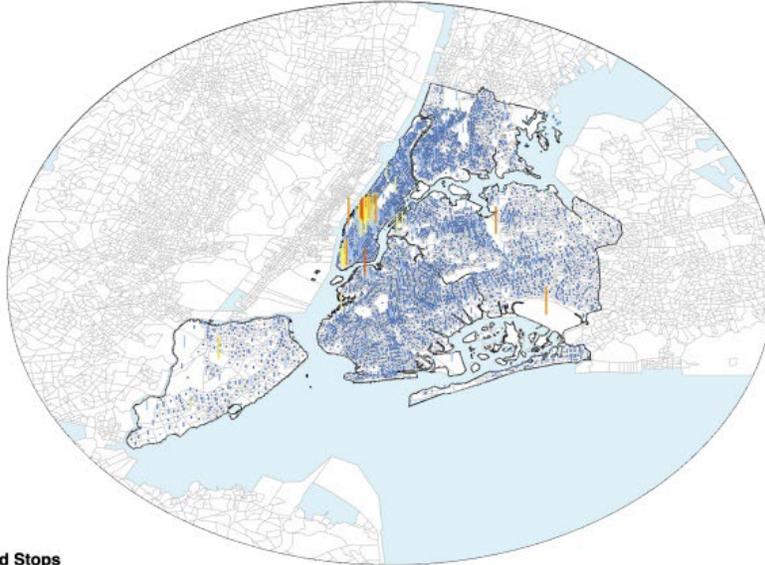
**Short-Term Interventions**

Optimize location, services, and connections of NYC OpenStreets

**Long-Term Planning**

Optimize density, usage-mix, and POI and PT access

Partners and advisers



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NYC DOT



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Director of Urban Interface  
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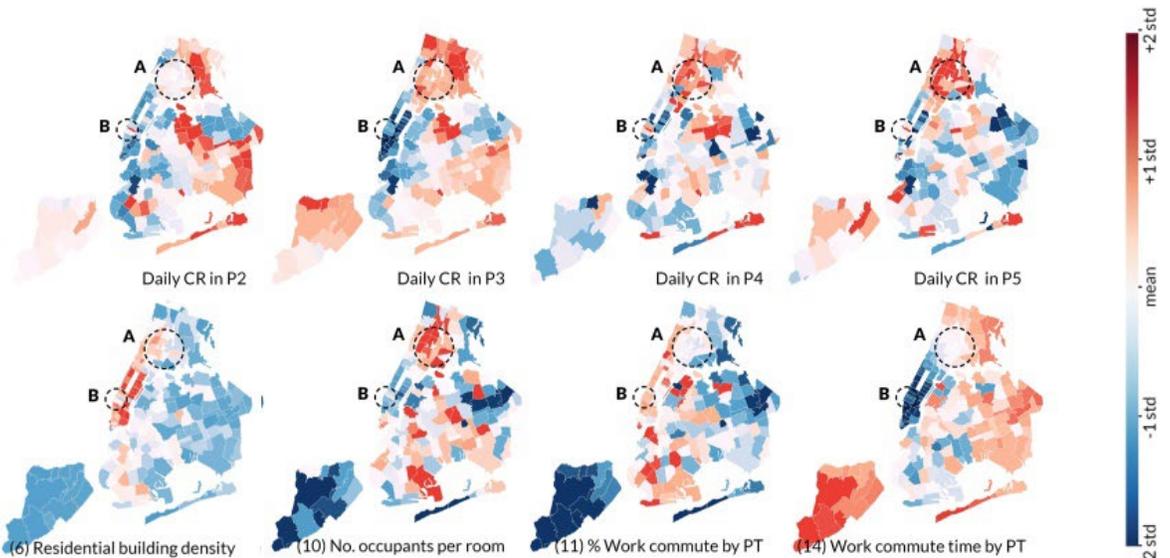
Nathaniel Hupert  
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Member of the COVID-19  
International Modeling  
Consortium  
Cornell Weill Medicine



**Neighborhood Stops**

- A visit is counted if a synthesized traveler makes a trip to the given CBG.
- Results are aggregated by time periods (early morning, morning, noon, afternoon, evening, night)

How do **urban density, mobility, and access to services** influence pandemic resilience?  
Longer commutes and household crowding linked to higher COVID-19 case rates



Yang, Li, Kral, Dogan, (2021) Key urban design attributes impacting the urban resilience in the COVID-19 pandemic: Evidence from New York City. Submitted to: Sustainable Cities and Society

