PRESS RELEASE

AI Station

CAMBRIDGE, MA: July 2019:

More than 500 million passengers use train stations in Paris every year. With such a high volume of daily commuters rushing to catch their trains and tourists frantically searching for departure platforms, using these stations can be challenging and exhausting. Now, in collaboration with SCNF Gares & Connexions, the MIT Senseable City Lab proposes two new methods to better understand how passengers use visual clues to perceive spaces in train stations and how they navigate through them.

Visual information can help or hinder what is called spatial legibility; that is, how each person identifies a space and finds their way through it. To understand how passenger's perceive the visual features of a train station, we collected half a million geotagged 360° images at the Gare de Lyon and Gare St. Lazare, two of the busiest train stations in Paris. Over 250,000 passengers pass through each of these stations every day.

To measure the legibility of the stations, we developed a probabilistic inference model using Deep Convolutional Neural Networks (DCNN), which are structurally similar to a human perception system. The performance of the model was tested by its ability to assign each image to the spatial segment of the station in which it was taken. All told, the model achieved 98.6% of prediction accuracy at Gare de Lyon and 95.9% at Gare St. Lazare.

"Although the model performed well, one question remained: Is the model using the same visual features as humans use to identify spaces?" asked Qianhui Liang, co-author of the research paper, which was recently published in the journal *Building and Environment.* To answer this question, and to test the validity of our DCNN model, we deployed a survey on Amazon Mechanical Turk, a crowdsourcing platform. The over 4000 responses that we received confirmed that there is indeed a correlation between how humans and machines perceive space. Researchers were also able to show how spatial legibility is influenced by a building's age and architectural style.

Spatial legibility is one aspect of the problem; the other is navigability, or how easily passengers can find their way around a train station. To address this problem the MIT Senseable City Lab and SNCF Gares & Connexions joined forces with the Austrian Institute of Technology to analyze the movements of passengers at Gare de Lyon. Whenever passengers use WIFI at the station, they leave behind digital traces, in the form of anonymous?? connection logs. Using this anonymized data, we explored passenger movements and lengths of stay at the station, over a one-week time period. We analyzed how passengers arriving, departing, or simply changing trains have different trajectories and stay at the station for different lengths of time.

"This anonymized dataset of WIFI patterns showcases new ways of analyzing patterns of movement, and could help us to design train stations that are more efficient to use and more enjoyable to wander through," said Carlo Ratti,Director of the MIT Senseable City Lab.

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ABOUT THE MIT SENSEABLE CITY LAB:

The Senseable City Lab at the Massachusetts Institute of Technology is a transdisciplinary research group that studies the interface between cities, people and technologies. Not bound by the methodologies of a single field, the Lab is characterized by an omni-disciplinary approach, and speaks the language of designers, planners, engineers, physicists, biologists and social scientists. Senseable is as fluent with industry partners as it is with metropolitan governments, individual citizens and disadvantaged communities. Through design and science, the Lab develops and deploys tools to learn about cities—so that cities can learn about us.