Intro
Social scientists have long theorized that people behave differently depending on how they see their environment. Within my field of criminology, scholars have argued that people have greater ability to take action against crime (calling 911, verbally admonishing a perpetrator, etc.) when they can see easily through the environment. For example, homeowners are more easily able to detect would-be burglars if the sight-lines from their windows are not obscured by trees. Similarly, it has been argued that people are more motivated to actively respond to crime when they live in an area they perceive to be aesthetically pleasing. Although social scientists have had a lot of ideas about how visual features of places impact behavior, visual features have historically been challenging to measure, making it hard to test such ideas. To address this problem, I have been working with my colleagues in the Environmental Neuroscience Lab to develop computer vision AI models that can "look" at Google Streetview images to tell us about the presence of visual cues that may alter the way people behave.

Measuring Perceptions of Urban Visuals
To train an AI model that can look at an image and tell us the information that is important to us, we need to give it some information about what to look for. For example, if we want to develop a model that can look at an urban image and tell us how easy it is to see through the environment, we need to show it images with varying levels of environmental transparency so the model knows how to interpret the images it is shown. To create a "training dataset" our AI can learn from, we have created a FastRating Image Task where research subjects are shown a grid of Google Streetview images and asked to select the 4 images where they can most easily see through the environment. By having people do this many times, and then repeating the exercise with many people, we can rank images across Chicago in terms of their environmental transparency.

The Submit button will appear 8 seconds after the trial starts, so please take your time to inspect images.

The FastRating Image Task asks respondents to quickly identify images meeting certain criteria. In this example, the user is being asked to identify images featuring environmental transparency.
Measuring Neighborhoods Visually
While this fast rating task gives us insight into how people perceive visual features such as environmental transparency, it would be unfeasible to have humans rate all 200,000 of the Google Streetview images we have collected across Chicago. As such, we take our smaller sample of human rated images and show them to a computer vision AI to develop a ResNet-50-based model that can look at any Google Streetview image and assign it an environmental transparency score. Because each image has an associated GPS coordinate, we are able to identify which neighborhood each image comes from. By averaging scores of images within the same neighborhood, we can then create city-wide neighborhood maps of visual features such as environmental transparency. In the map below, we can see that Chicago's Loop and North Side neighborhoods, with many densely compacted buildings, tend to have less environmental transparency compared to the rest of Chicago. Sightlines then tend to open up as we move away towards the city's outskirts and then the suburbs.

![Environmental Transparency Scores Across Chicago](image)

Figure 1: By averaging AI-assigned environmental transparency scores over many images from the same area, we can create neighborhood measures of environmental transparency. In this map, greener areas are more transparent while areas in purple are less transparent.

Understanding Crime & Behavior
Given that there appears to be great difference in urban visual features across Chicago neighborhoods, we investigated whether these visual features explain differences in behaviors or social outcomes.
across communities. By connecting our neighborhood data on visual features to neighborhood crime
data provided by the Chicago Police Department, we evaluated if places with certain types of visual
features tend to experience more crime. Using structural equation models that allowed us to assess how
different neighborhood features lead to crime, we found that neighborhoods that were more visually
transparent and aesthetically pleasing tended to experience less violent and non-violent crime even
when controlling for residential demographic features associated with crime such as economic
disadvantage and segregation. In the next stage of this research, we are interested to measure these
visual features over time to more directly test if crime can be stopped by changing the way places look.
Additionally, because our approach allows us to train computer vision models for any visual feature of
our choosing, we are excited to broaden our scope to think about how visual features of places more
broadly alter the way people think and behave across urban contexts.