A Convolutional Neural Network-Based Model for Predicting The Perceived Attractiveness of Urban Places

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An understanding of how people perceive attractive or unattractive places in cities is vitally important to urban planning and policy making. Given the subjective nature of human perception and the ambiguous character of attractiveness as an attribute of urban places, it is challenging to quantify and reliably assess the extent to which a place is perceived as attractive or not. It is even more difficult to do this at scale. This research proposes a novel machine learning approach to quantifying and predicting the perceived attractiveness of urban places. It introduces a predictive model, employing a Convolutional Neural Network (CNN), to automatically estimate the attractiveness of places in cities, based on their Google Street View representation. A set of street-level images (four consecutive images make up the panoramic overview of each place) with similar daylight conditions and level of complexity (e.g. amount of people present in a scene) is assessed by means of crowdsourcing, drawing on attractiveness-related factors identified in environmental psychology studies. Using these judgments as ground truth, in combination with a new CNN architecture, the model automatically assesses the perceived attractiveness of any place in a city, by rating them on the basis of a five-point Likert scale score. Moreover, it identifies features of the urban environment that could influence positively or negatively the overall attractiveness of a place. The resulting accuracy of 55.9% and root-mean-square error of 0.70 illustrate that the model holds promise as a scalable and reliable tool for estimating the perceived attractiveness of urban places.