**Using Artificial Intelligence Wisely: Age-Friendliness, ‘Snow Moles’ and Deep Mapping Urban Perception**

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**Keywords**: CNN, deep learning, mapping, urban perception, remote sensing, environmental psychology, mapping

**Abstract**

We demonstrate the use of convolutional neural networks (CNN) in computer vision to map perceptual constructs related to outdoor spaces: "connection to nature", "beauty and appeal", "safety", and "activity". We use a siamese architecture, a type of CNN that learns to map pairs of inputs to a common latent space to extract salient features and a sub-network to rank images of outdoor spaces according to the perceptions of senior citizens in Ottawa, Canada. We collected approximately 5000 examples of senior citizens' choices between two street-level images of outdoor spaces for each construct. We trained a sub-network to learn an image ranking function for each construct to predict an unconstrained regression score on more than 100,000 geocoded images of city streets and produced fine-scale maps of how senior citizens perceive the city. Our results indicate that the siamese architecture is effective in distinguishing between images based on all four constructs, achieving high accuracy. We also evaluated the degree to which features and scores were consistent with human perception of the four constructs, such as greenery and natural elements for "connection to nature", symmetry and color for "beauty and appeal", and people and buildings for "activity". Finally, we analyzed the spatial structure of the mapped results to gain insights into spatial inequalities. This study demonstrates the potential of using deep learning models and siamese architectures to understand complex perceptual constructs in outdoor spaces. These findings have potential applications in urban planning, landscape design, and environmental psychology.