

Recognizing Scene Viewpoint using Panoramic Place Representation

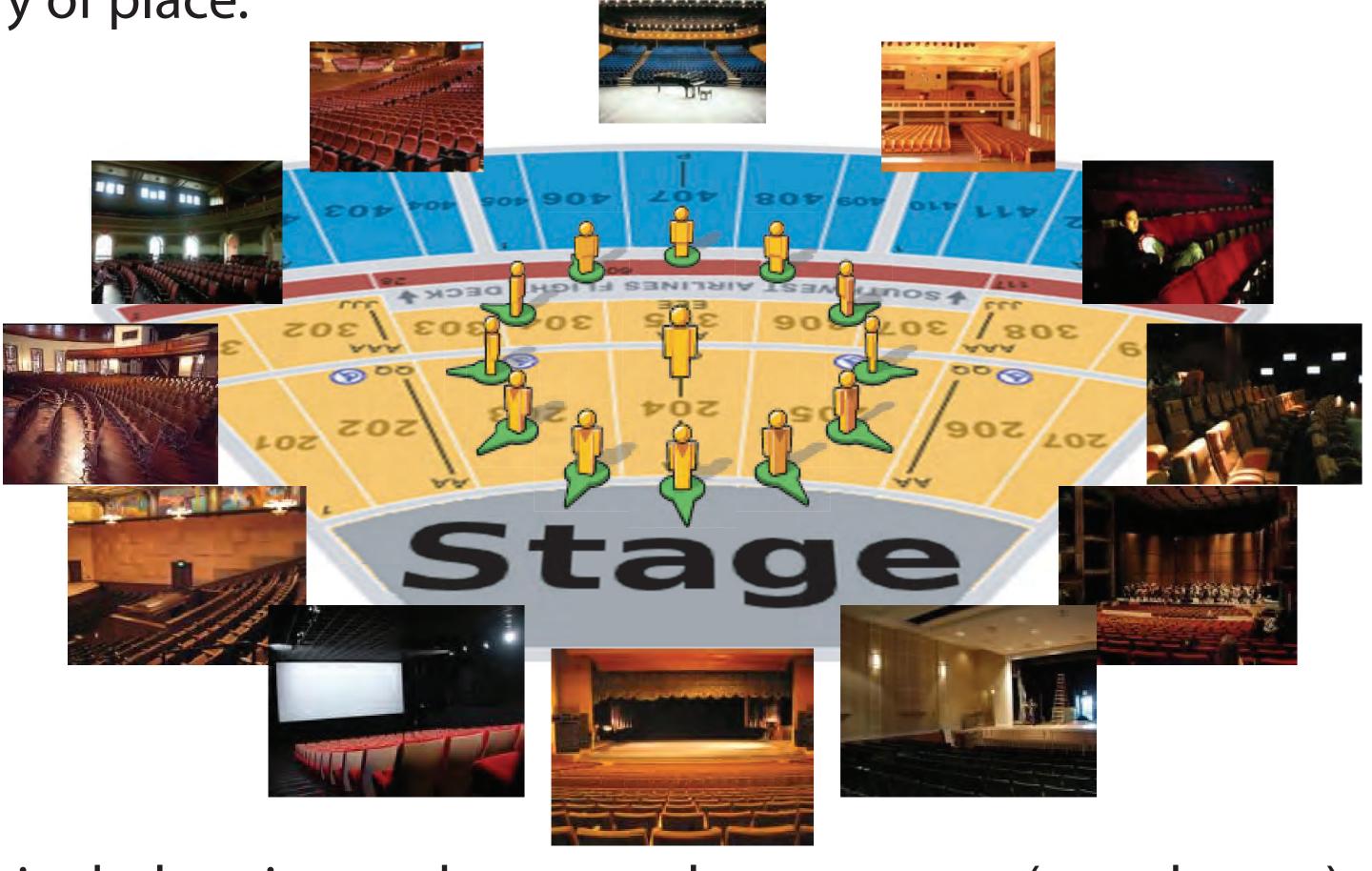
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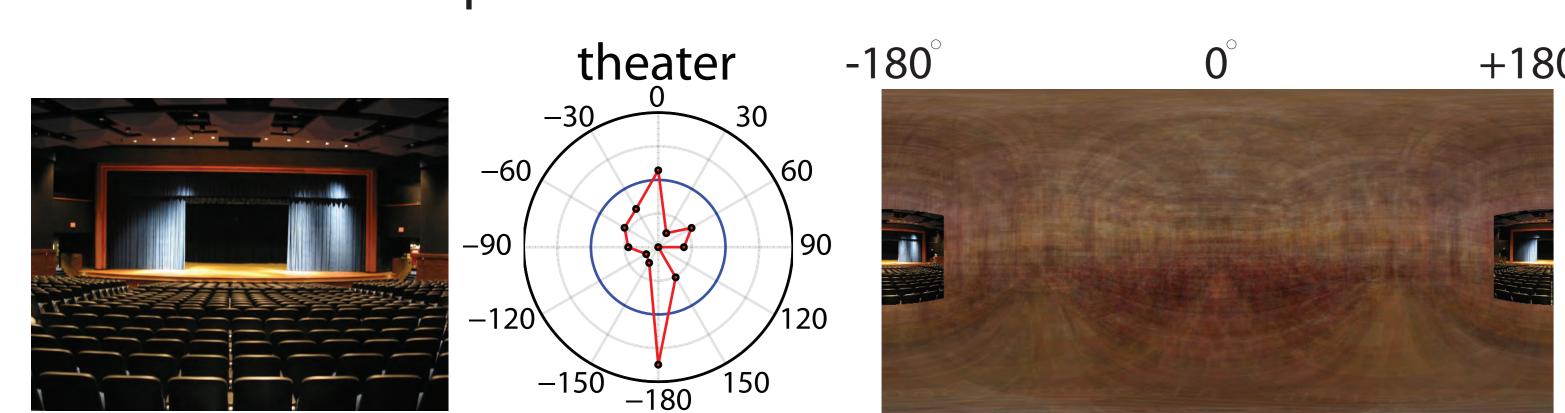


Scene Viewpoint Recognition

We introduce the problem of scene viewpoint recognition, the goal of which is to classify the type of place shown in a photo, and also to recognize the observer's viewpoint within that category of place.



photos taken by an observer inside a place look very different from different viewpoints.

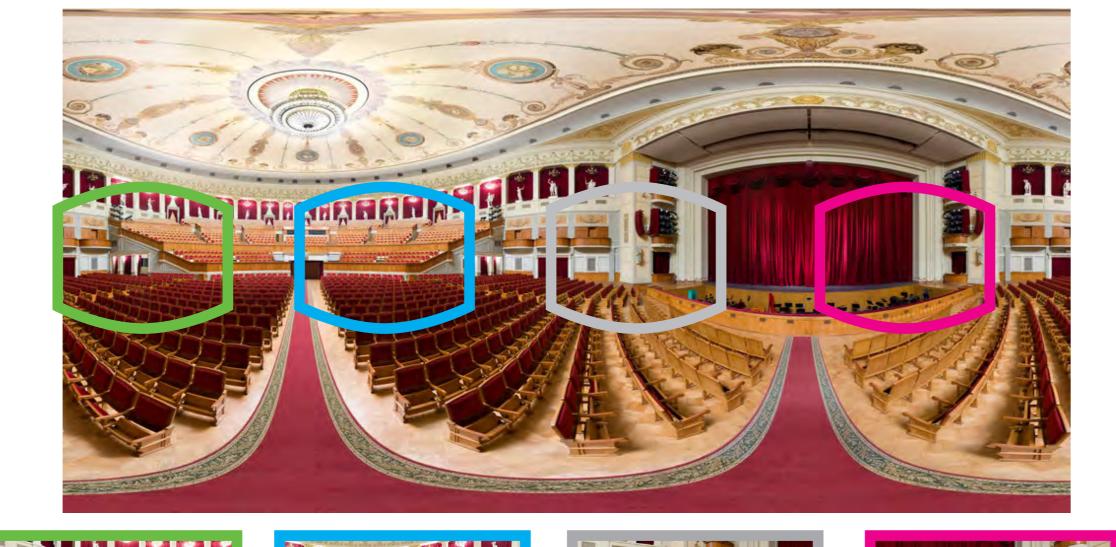


We design a model that, given a photo, can classify its place category and predict the direction in which the observer is facing within that place. Once we have a compass-like prediction of the observer's viewpoint, we superimpose the photo onto an averaged panorama of the place category to automatically predict the possible layout that extends beyond the available field of

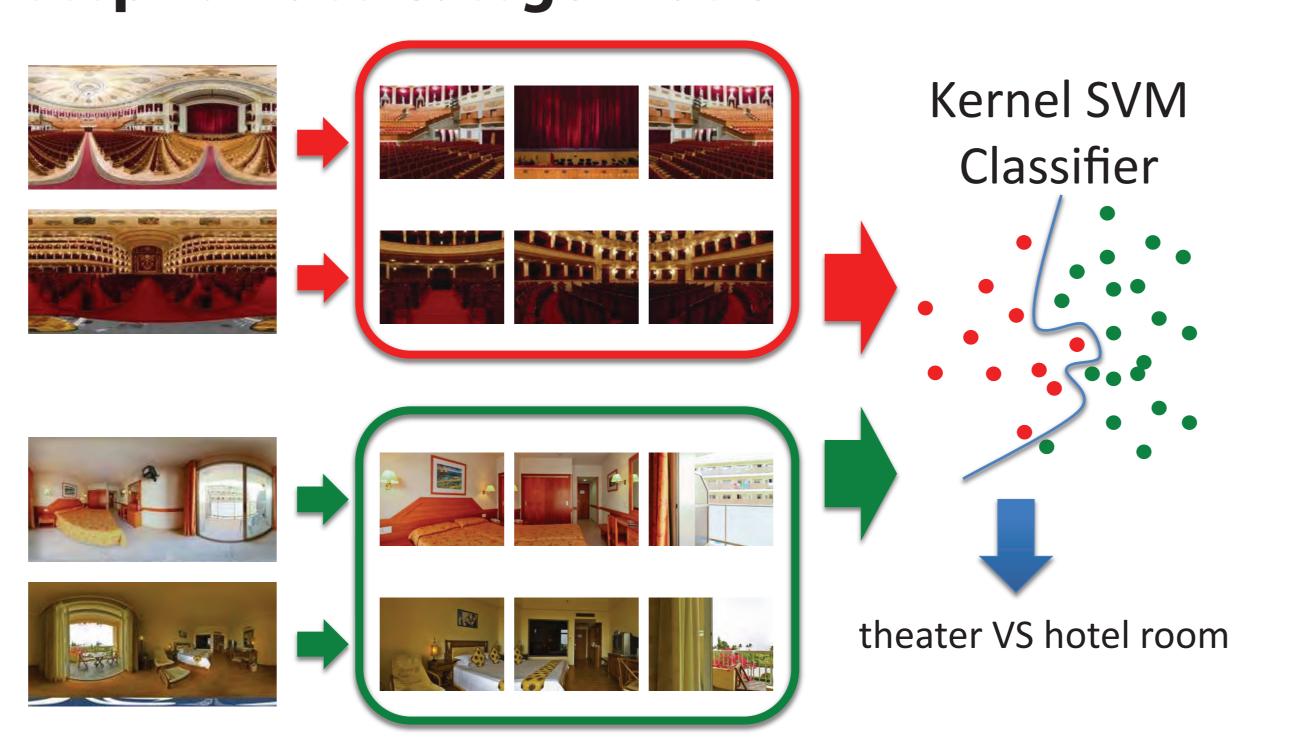
SUN360 Panorama Database

Place Categorization & Viewpoint Recognition

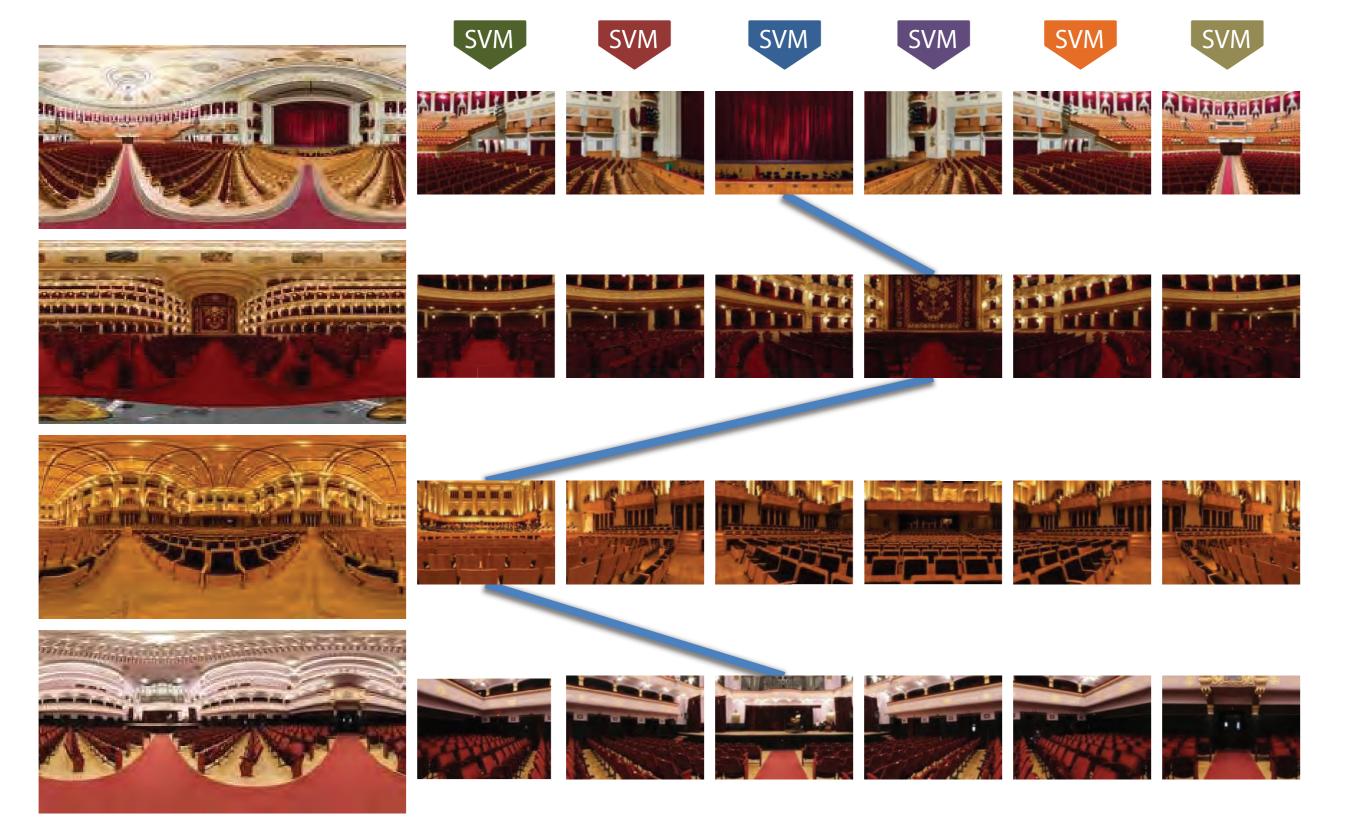
Step 0: Sample Normal Photos from Panorama



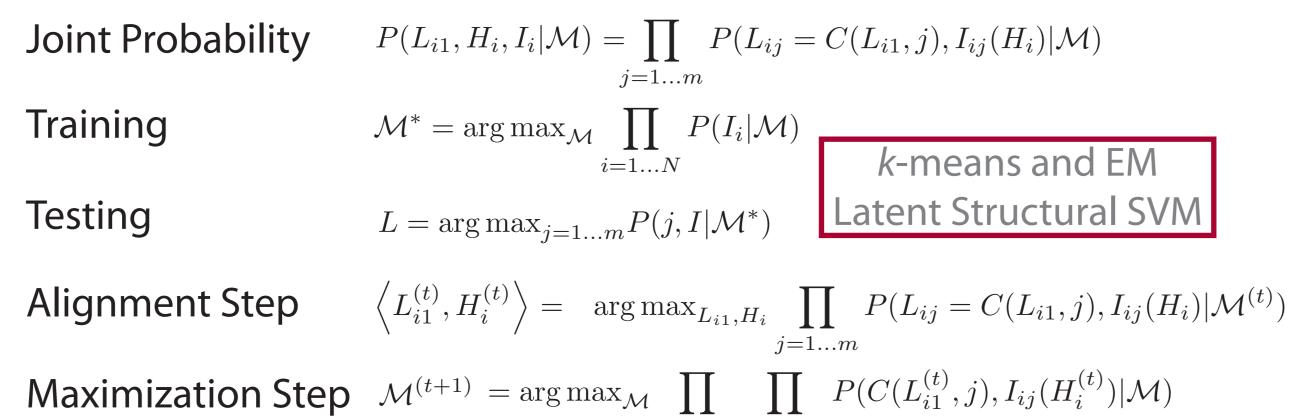
Step 1: Place Categorization

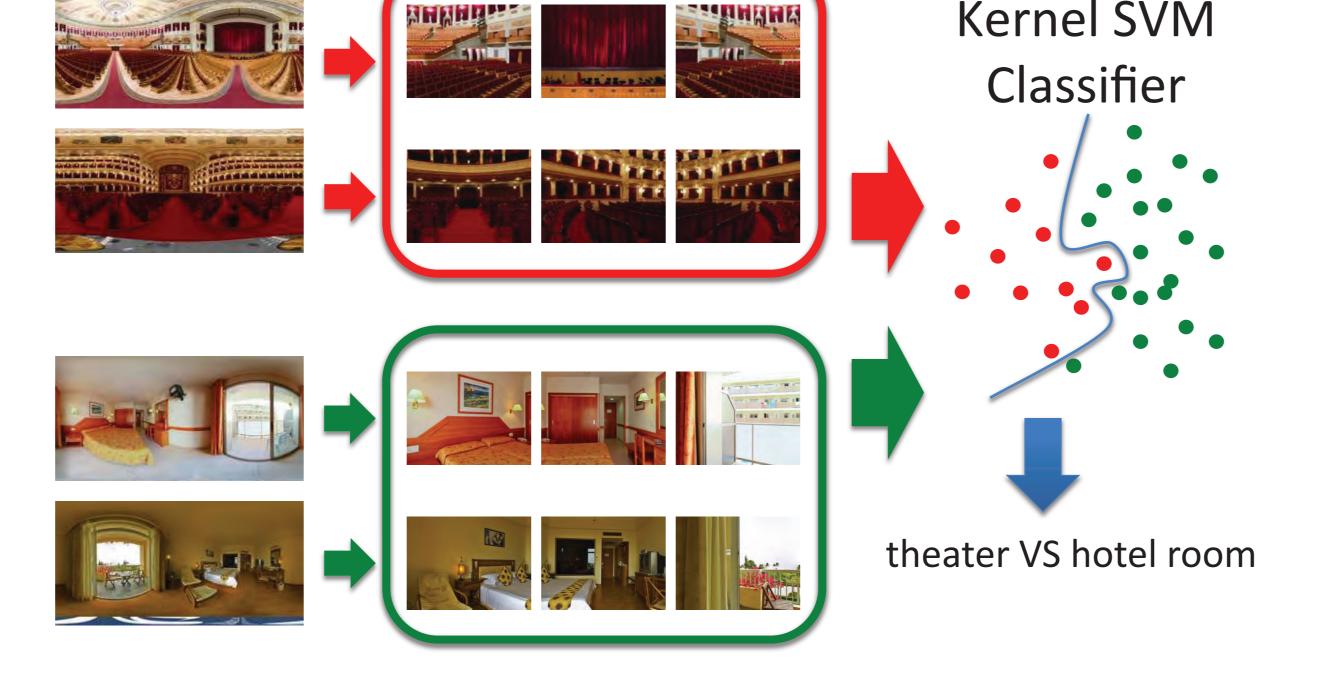


Step 2: Simultaneously Align Panoramas and Train Viewpoint Classifier



Analysis: Maximum-likelihood Interpretation





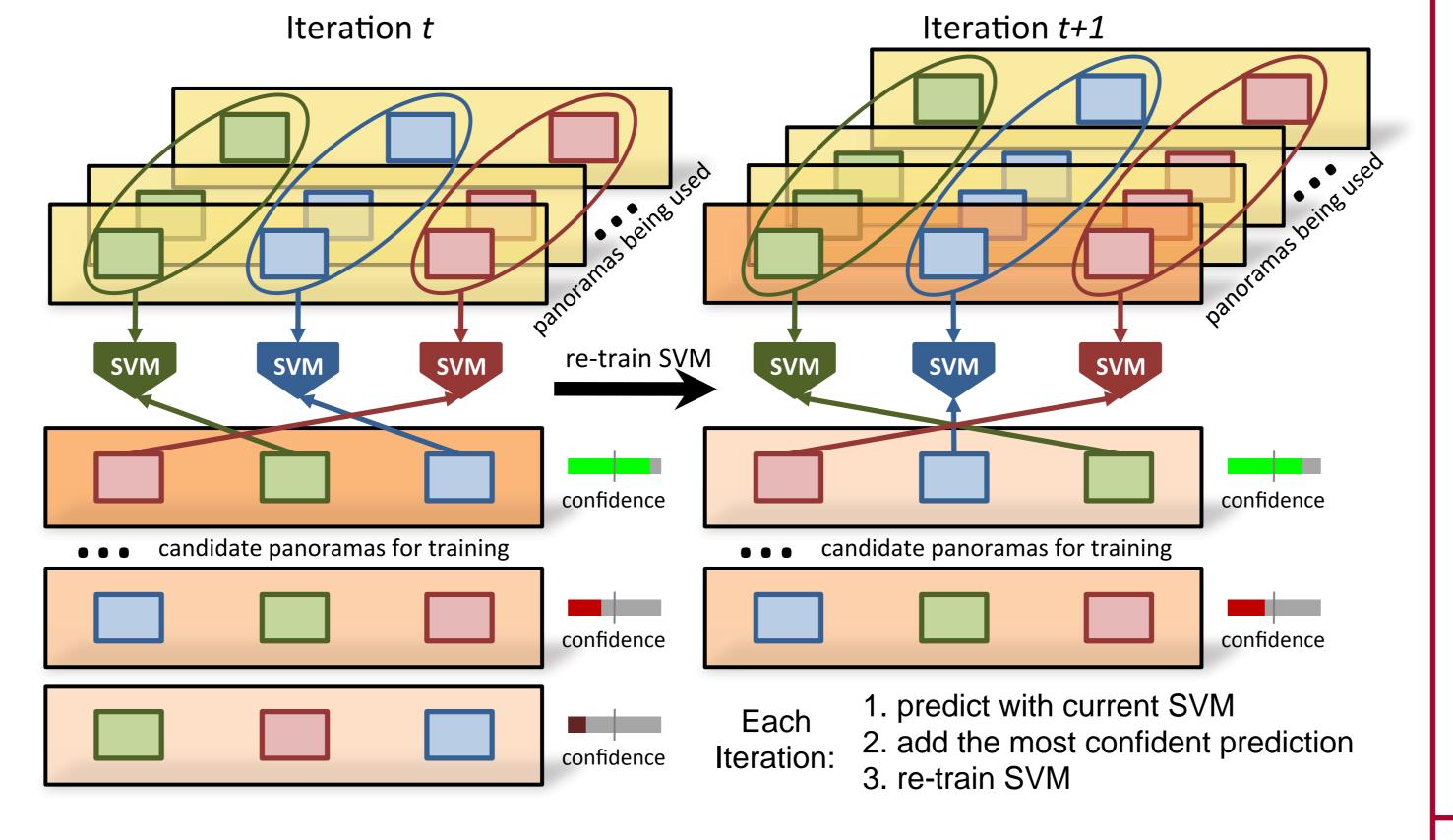
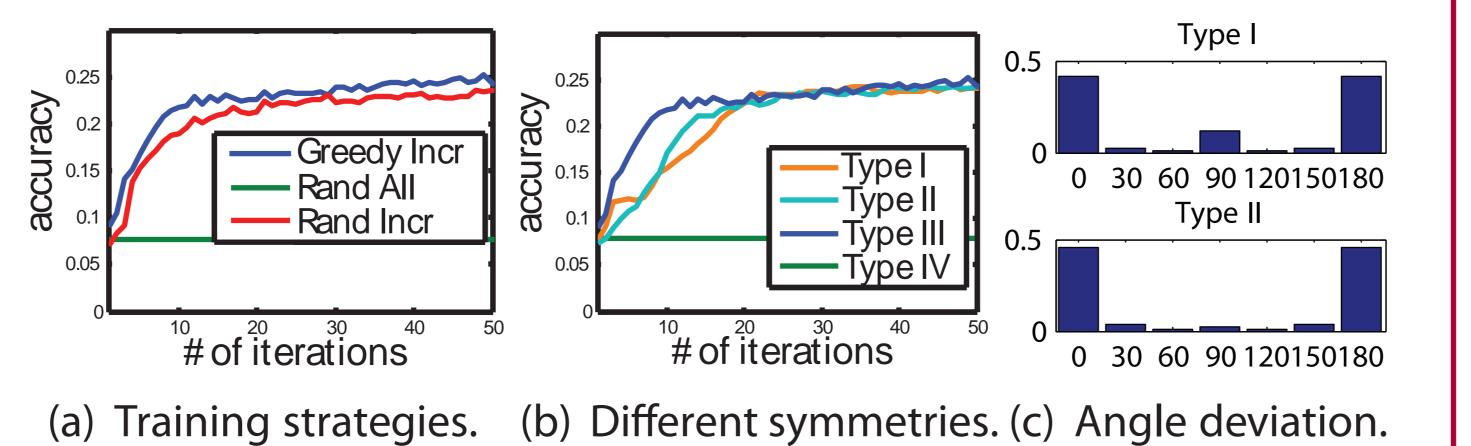
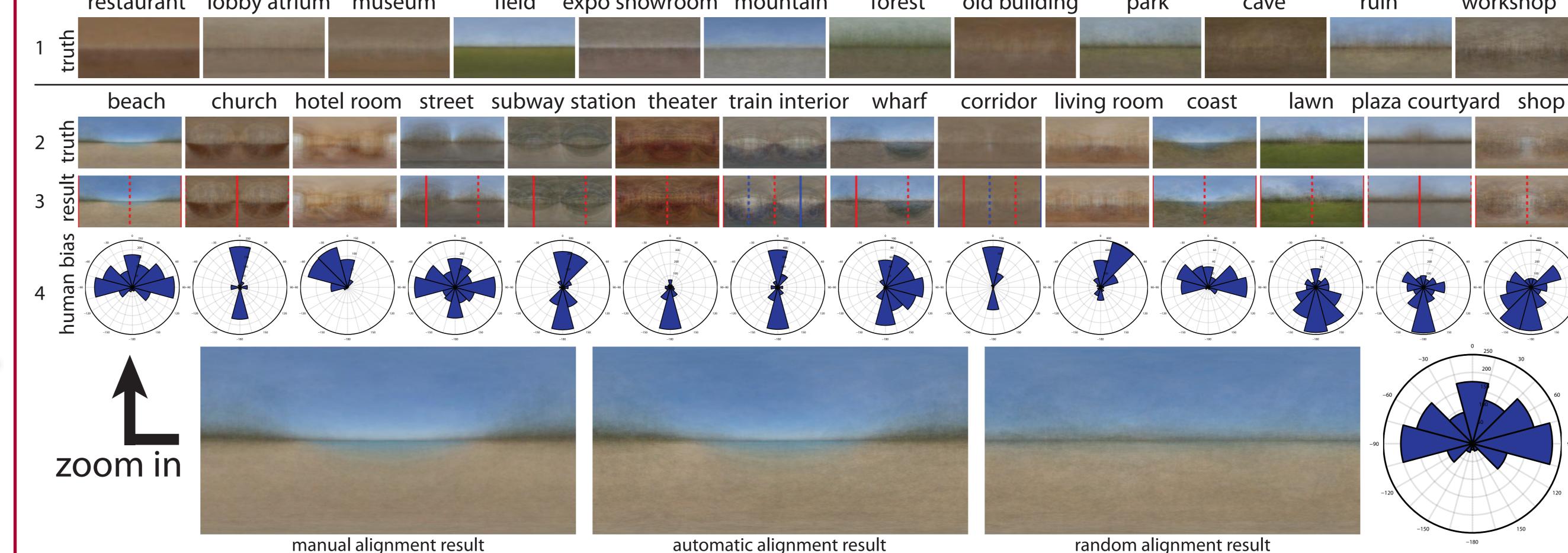


Illustration: Algorithm Behavior for street.



Canonical View of Scenes

We study the canonical views of different place categories, i.e. the viewpoints people most often choose when they take a photo of a particular type of place. We obtain ground-truth viewpoint information for normal limited-field-of-view photos from the SUN database [1] by running a view-matching task on Amazon Mechanical Turk.

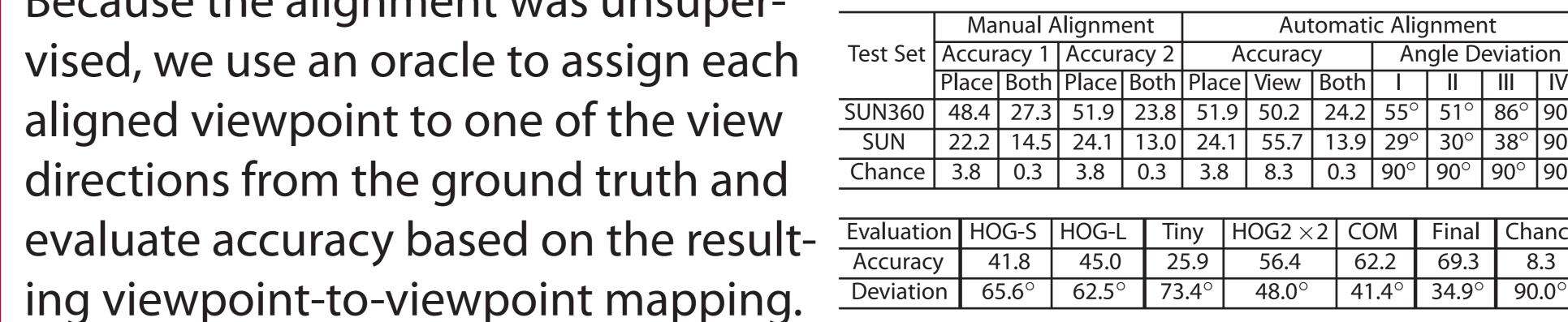


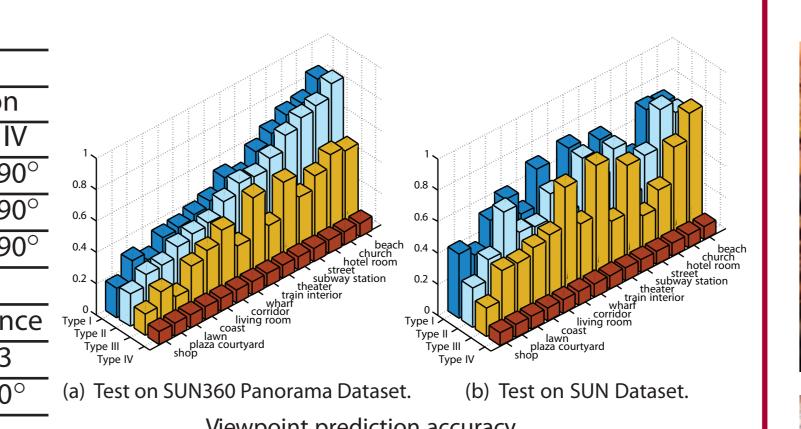
correlated with specific scene categories, we run the scene category classifier from [1] on normal photos extracted from the panoramas.

Because the alignment was unsupervised, we use an oracle to assign each aligned viewpoint to one of the view directions from the ground truth and evaluate accuracy based on the result-

Symmetry Discovery & View Sharing

Evaluations





Results

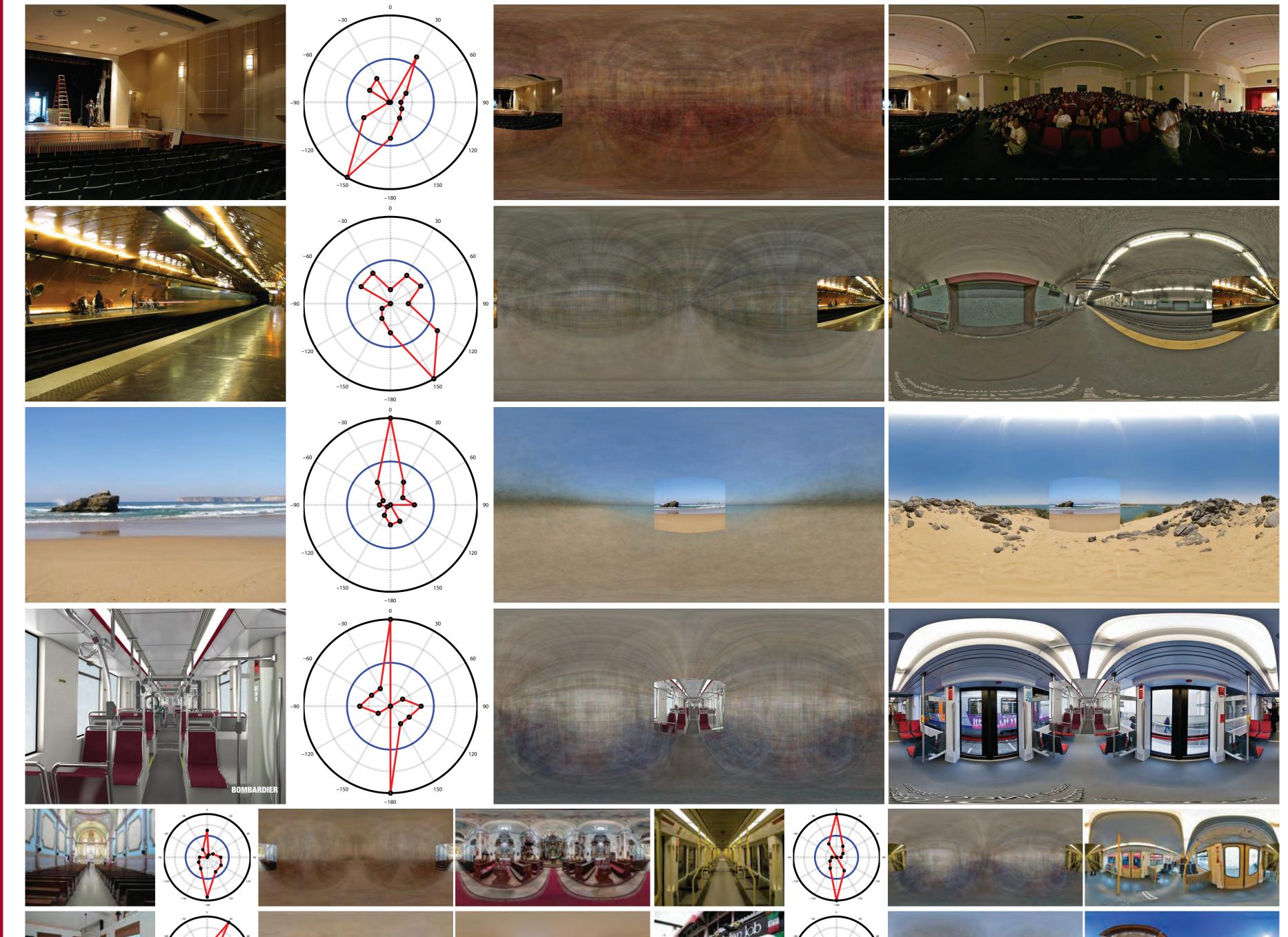


Image Extrapolation













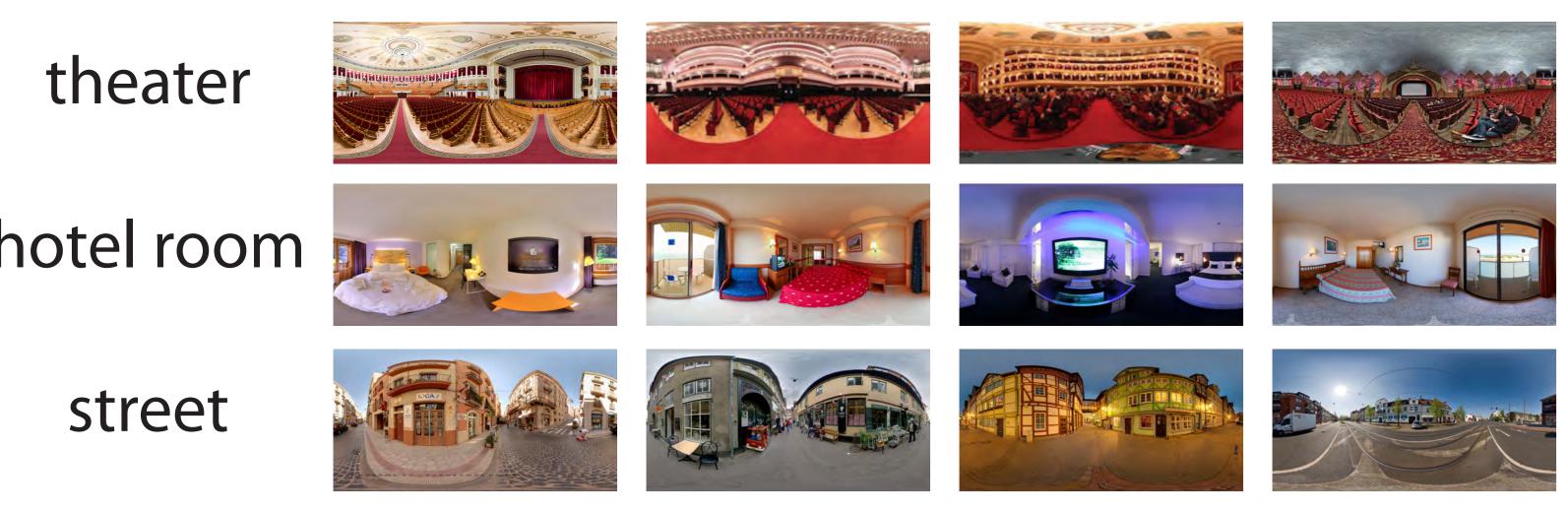


] **SUN database**: Large-scale scene recognition from abbey to zoo. J. Xiao, J. Hays, K. A. Ehinger, A. Oliva, and A. Torralba. CVPR, 2010. [2] Canonical perspective and the perception of objects. S. Palmer, E. Rosch, and P. Chase. Attention and Performance IX, 1981.

[3] What your design looks like to peripheral vision. A. Raj and R. Rosenholtz. APGV, 2010.

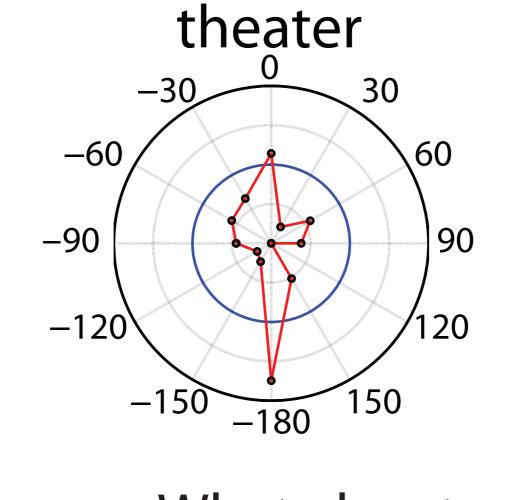
Definition of Scenes

We construct a panorama database for training, because panoramas densely cover all possible views within a place.



80 place categories and 67,583 panoramas (resolution 9104x4552)

Place + Viewpoint vs. Traditional Labels



Theater-related Categories in SUN: orchestra_pit

What about unnamable viewpoints?