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## INTRODUCTION

- Gaze patterns vary according to the information viewers want to extract

Buswell, 1935; Castelano et al, 2009; Yarbus, 1967

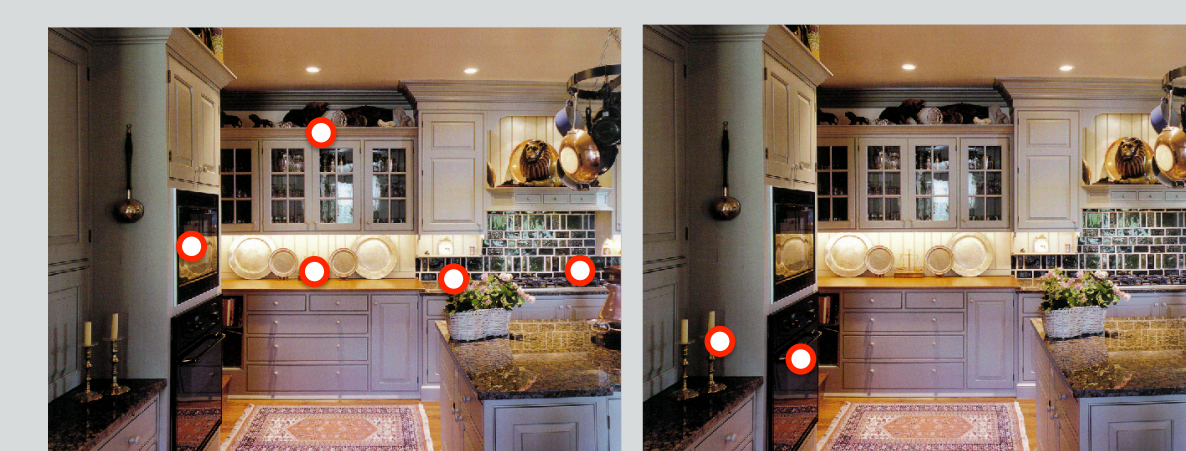
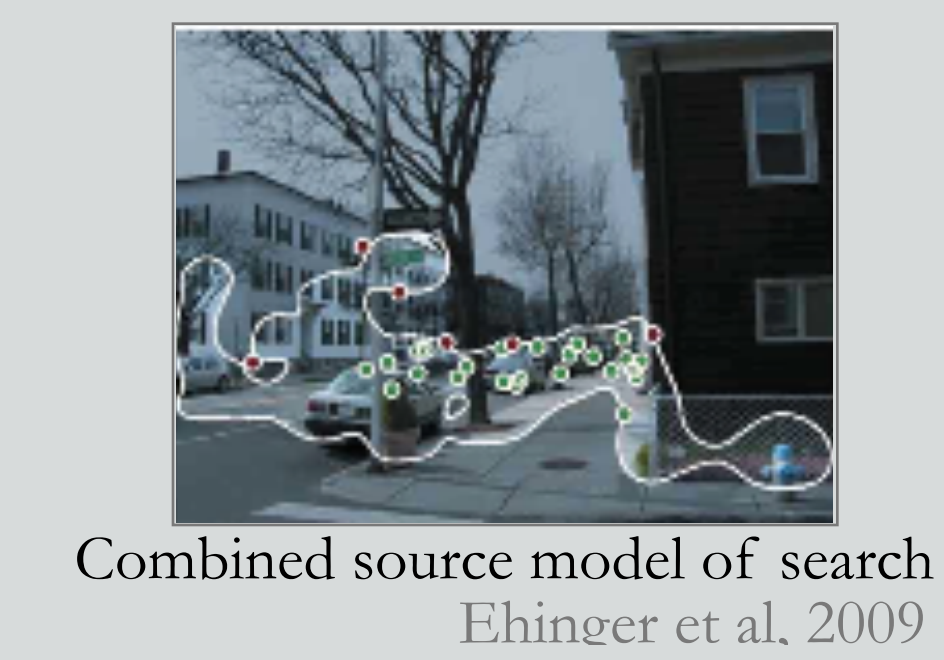
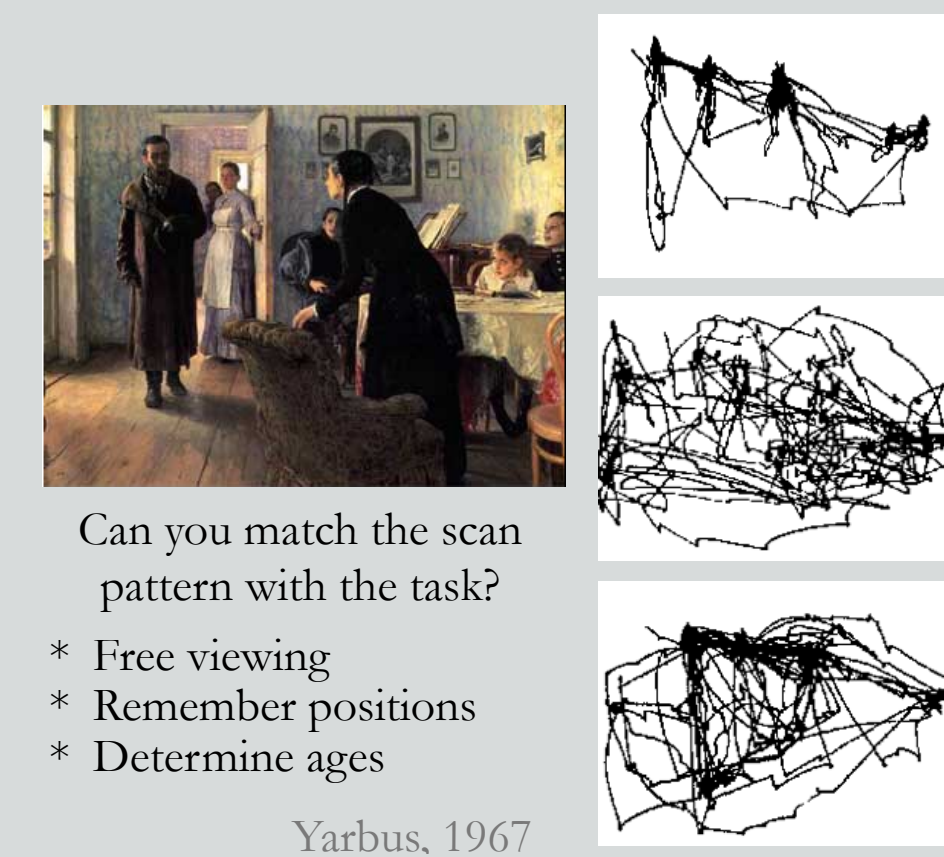
- Models of search fixations suggest that target features, saliency, and scene context guide attention in novel real world scenes

Ehinger et al, 2009; Hwang et al, 2009; Torralba et al, 2006

- Recognition & guidance processes help locate targets more quickly when viewers have experience searching specific scenes

Brockmole et al, 2006; Chun et al, 1998; Peterson et al, 2001

- Eye movements are notoriously variable across viewers, even when performing the same task



**Do viewer-specific gaze patterns guide attention when searching familiar scenes?**

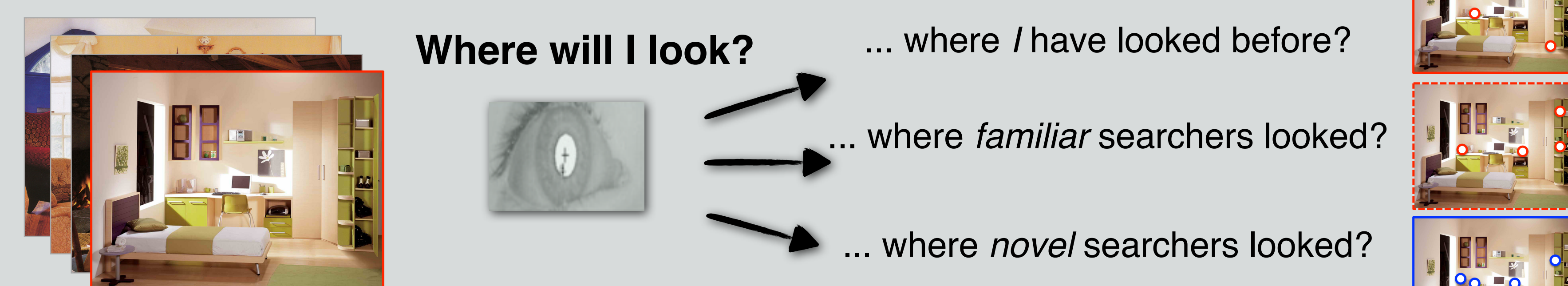
## APPROACH

### Comparative Map Analysis

Purpose: Evaluate how well different fixation distributions predict where an observer will look in a particular scene.

Logic: Record fixations of observers as they use different sources of information to guide their search of a specific scene:

1. "Person" information: scene context + *viewer-specific* experience
2. "Past" information: scene context + experience
3. "Place" information: scene context

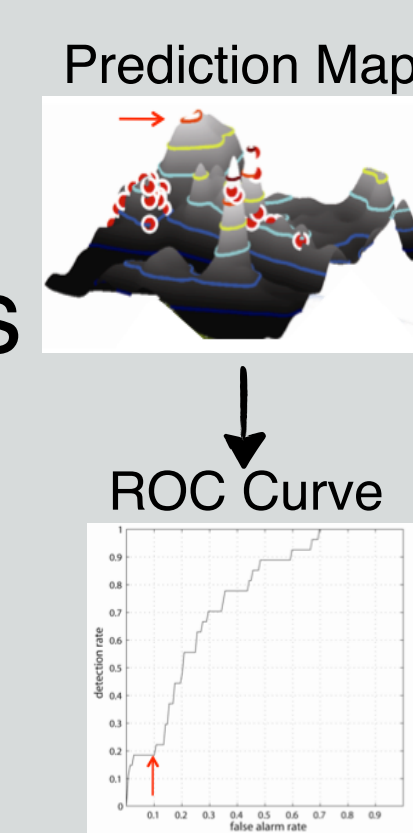


Each familiar observer has several trials per scene: iteratively remove 1 trial & use remaining fixations to create a prediction map ("Person" information)

Strategically sample other fixation populations to build prediction maps of "Past", "Place", and baseline comparisons

Assess how well the excluded-trial's fixations are predicted by evaluating the ROC curve for each prediction map.

Repetition	X	Y
1	N <sub>1</sub>	N <sub>1</sub>
2	N <sub>2</sub>	N <sub>2</sub>
3	N <sub>3</sub>	N <sub>3</sub>
4	N <sub>4</sub>	N <sub>4</sub>
5	N <sub>5</sub>	N <sub>5</sub>
6	N <sub>6</sub>	N <sub>6</sub>
7	N <sub>7</sub>	N <sub>7</sub>
8	N <sub>8</sub>	N <sub>8</sub>
9	N <sub>9</sub>	N <sub>9</sub>
10	N <sub>10</sub>	N <sub>10</sub>



## EXPERIMENTS

### Book Search Experiment

#### Behavioral Methods

TASK: "Look for the book in the scene"

Target present in all scenes

DESIGN: 8 blocks of search (48 trials/block)

- 22 Observers
- Each block: 24 repeated + 24 novel scenes, counterbalanced across Os

#### Behavioral Results

Collapsed across blocks:

	Repeated Scenes	Novel Scenes
Reaction Time (ms)	1628 6.7	2401 5.4
Num. Search Fixations	2.1 0.22	4.5 0.16
Sch Fixation Duration (ms)	176 6.6	212 6.9
Saccade length (deg)	7.9 0.18	7.8 0.18

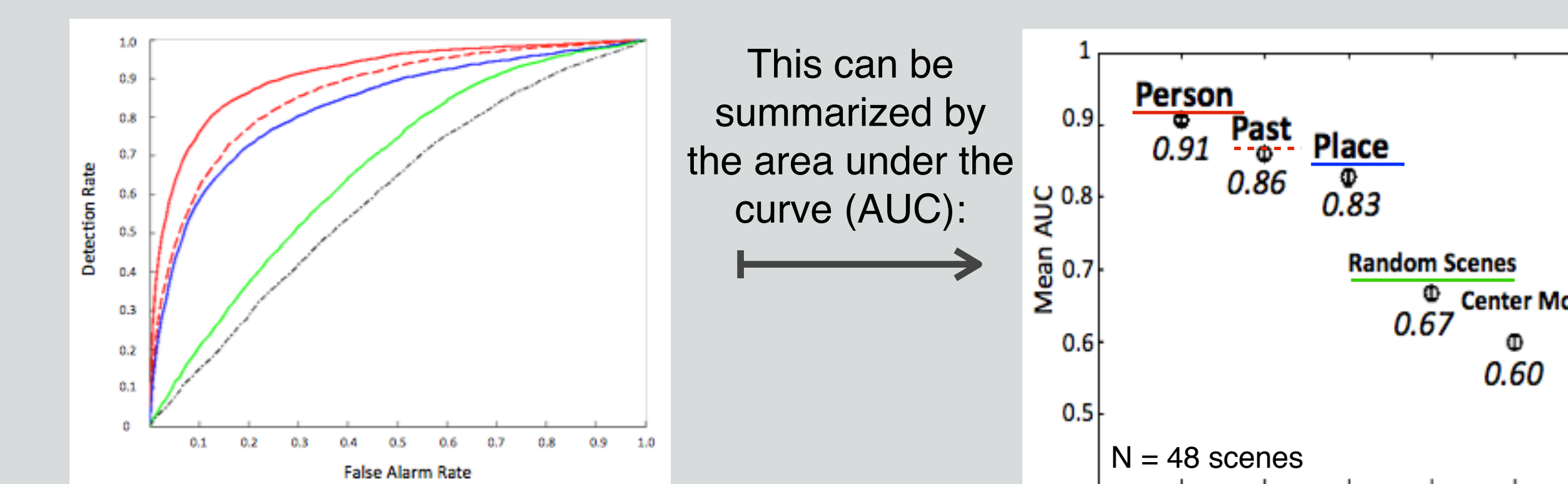
Observers learn where the books are in the repeated scenes (faster RTs, fewer fixations).

Beyond an overall speed advantage from searching a scene repeatedly, does experience bias the placement of individual fixations?

#### Comparative Map Analysis

Each curve summarizes the accuracy of prediction maps based on fixations from (1) the same person, (2) other familiar searchers, or (3) novel searchers.

Baseline control is 4) random fixations from different scenes.



These results were obtained using the first 3 fixations from each trial.

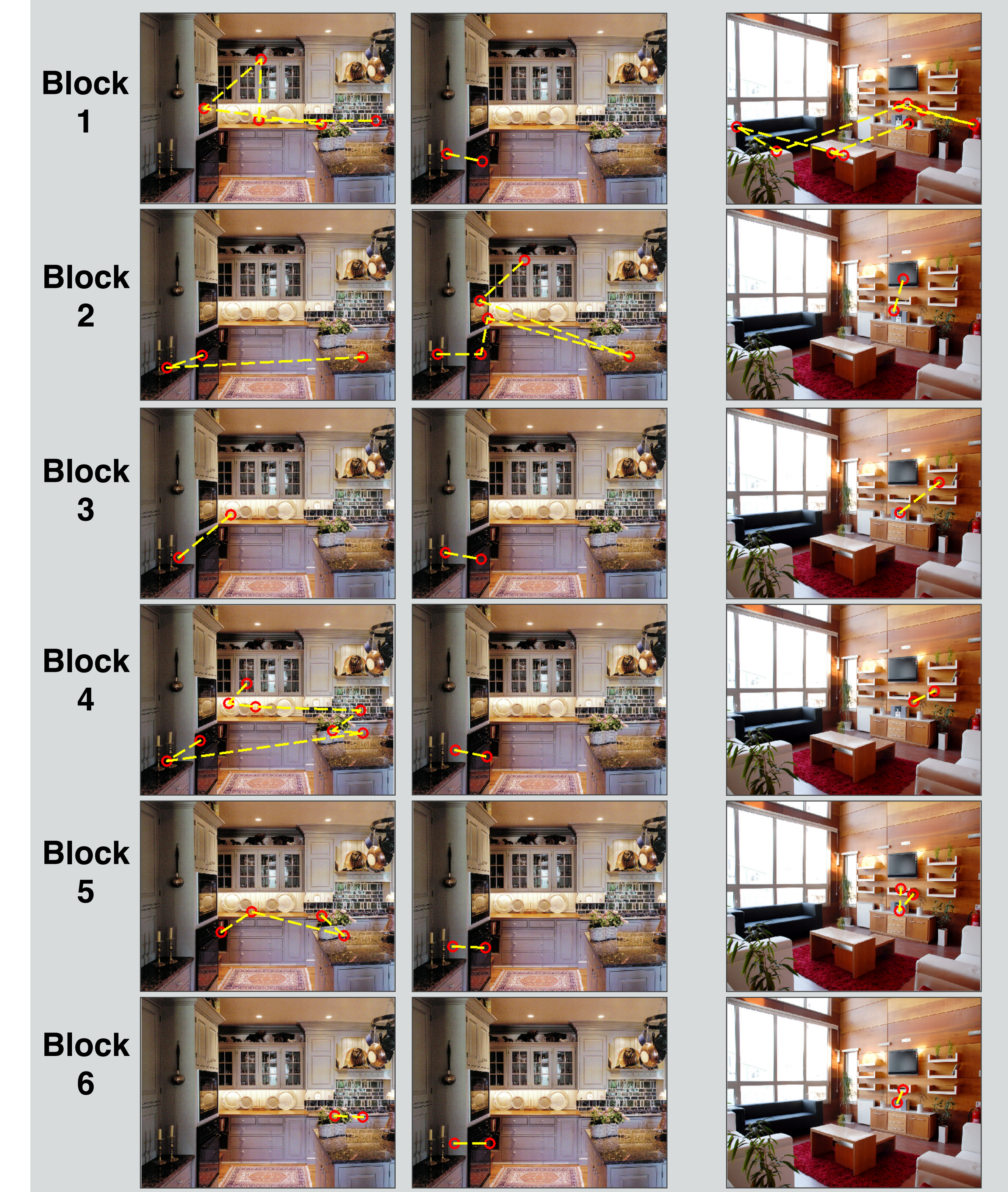
Result 1: Scene context ("Place" information) predicts gaze location

Result 2: Search experience ("Past" information) provides only slightly better gaze prediction than scene context alone

Result 3: A viewer's own experience ("Person" information) predicts gaze with the most accuracy and specificity

## INDIVIDUAL DIFFERENCES

Observer DB Observer TF Observer DB



Self-Consistency: 68% 99% 95%

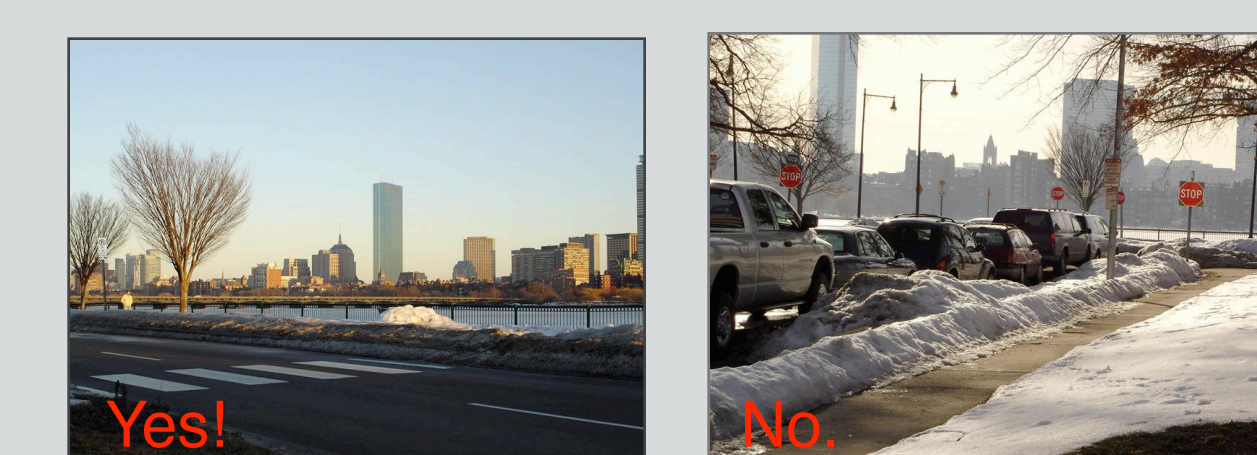
## Does viewer-specific guidance occur ...

... in familiar target-absent scenes?

... in familiar scenes with an inconsistent response?

### People Search Experiment 1

TASK: "Is there a person in the scene?"



Distinctive scenes for Target Present & Target Absent

#### Behavioral Methods (Exp. 1 & 2)

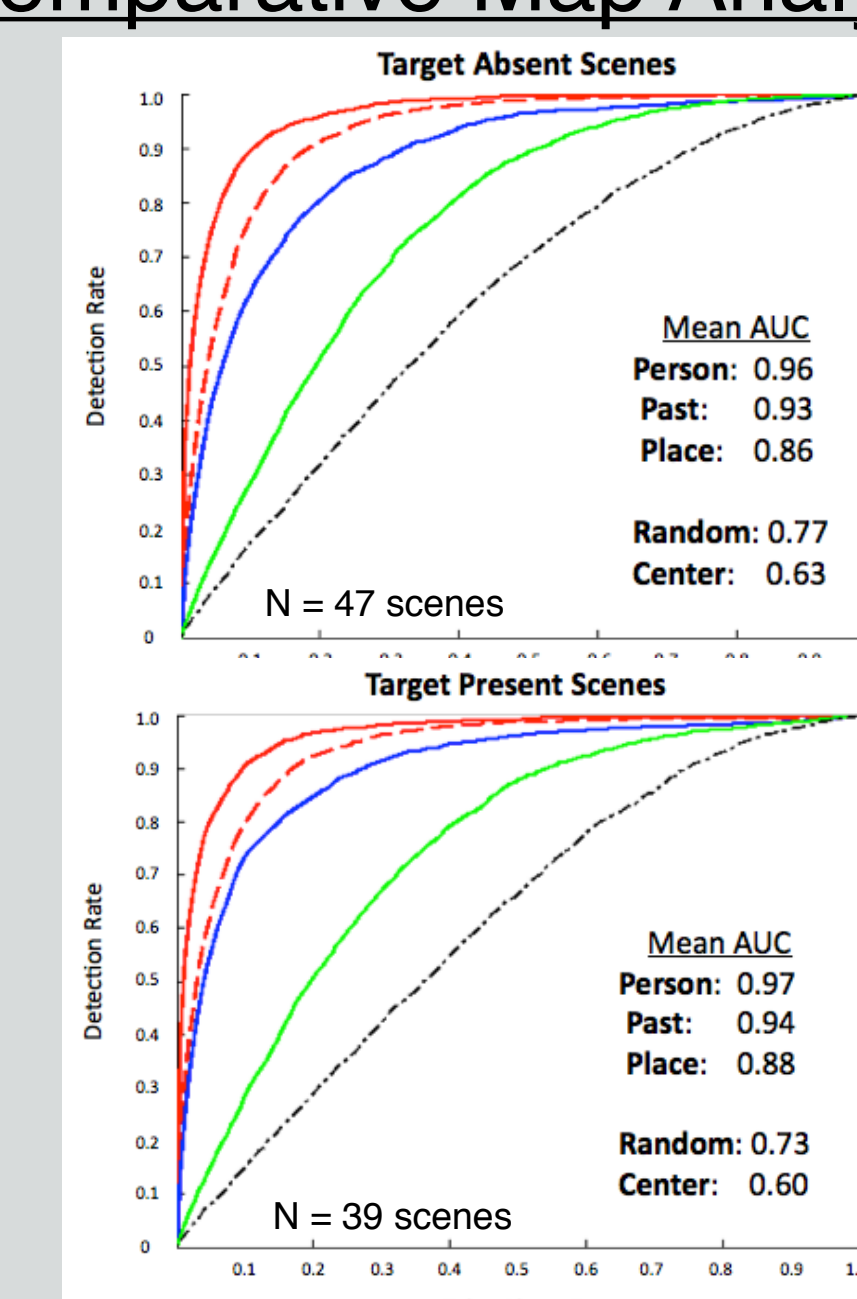
Hidalgo-Sotelo et al, 2005

- 20 blocks, 48 scenes per block
- 50% Target Present, 50% Target Absent
- 12 Observers (different Os for each exp.), scenes counterbalanced for target presence
- Novel search data from Ehinger et al, 2009 (same scenes, viewed once, 14 novel observers)

#### Results:

A replication of the pattern of results (Person > Past > Place), independently of the presence of a target in the familiar scene.

#### Comparative Map Analysis

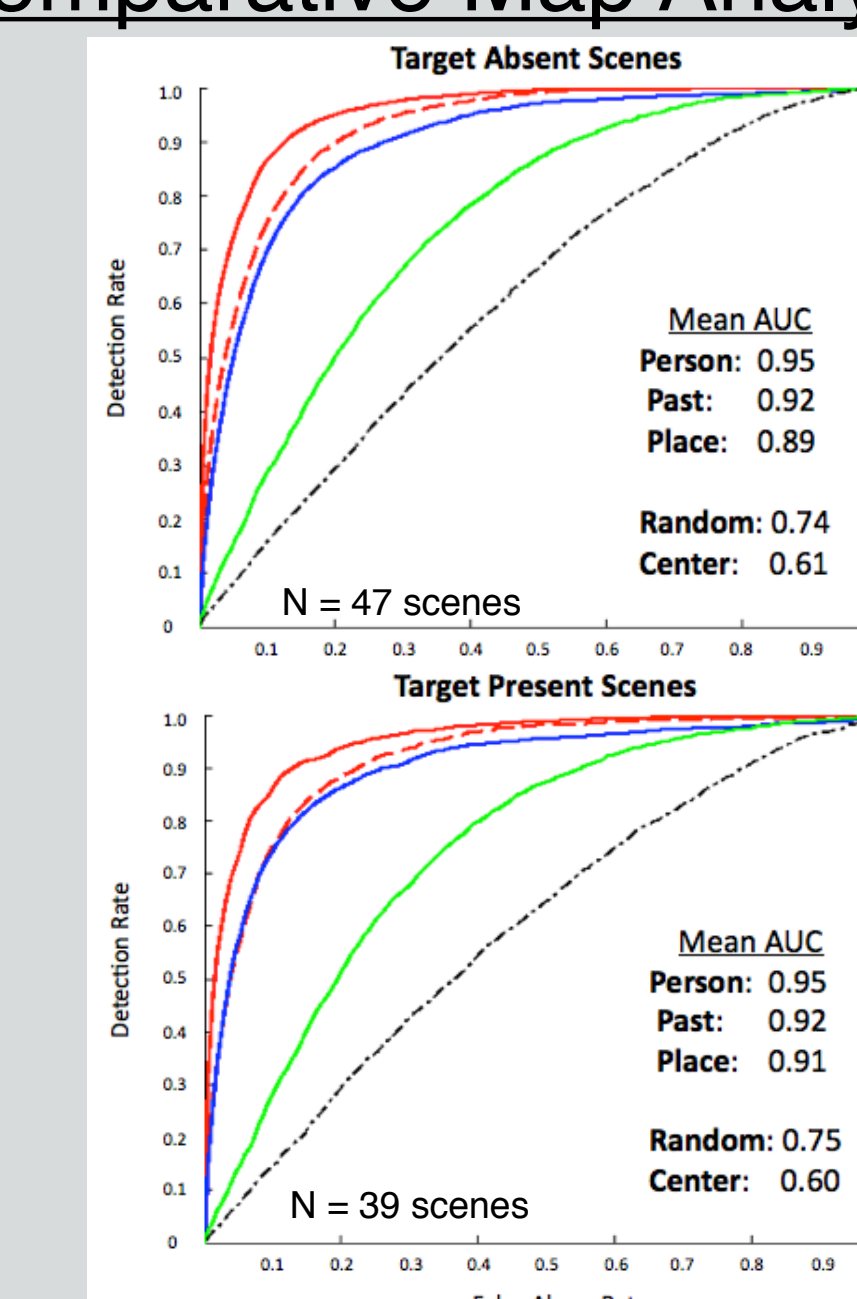


### People Search Experiment 2

TASK: "Is there a person in the scene?"



#### Comparative Map Analysis



Results: A replication of the pattern of results, despite uncertainty of target presence in a familiar scene.

## CONCLUSIONS

1. Comparative Map Analysis is an approach used to assess the informativeness of different sources of eye guidance.
2. In three visual search experiments, we demonstrated:
  - Guidance by the "Person": A viewer's own search experience plays a uniquely informative role in guiding where they look in a familiar scene.
  - Guidance by the "Past": Other viewers with experience searching a scene provided little more information than being guided by "Place" information alone.

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