

# Understanding Social Behaviors via Structured Social Saliency Field

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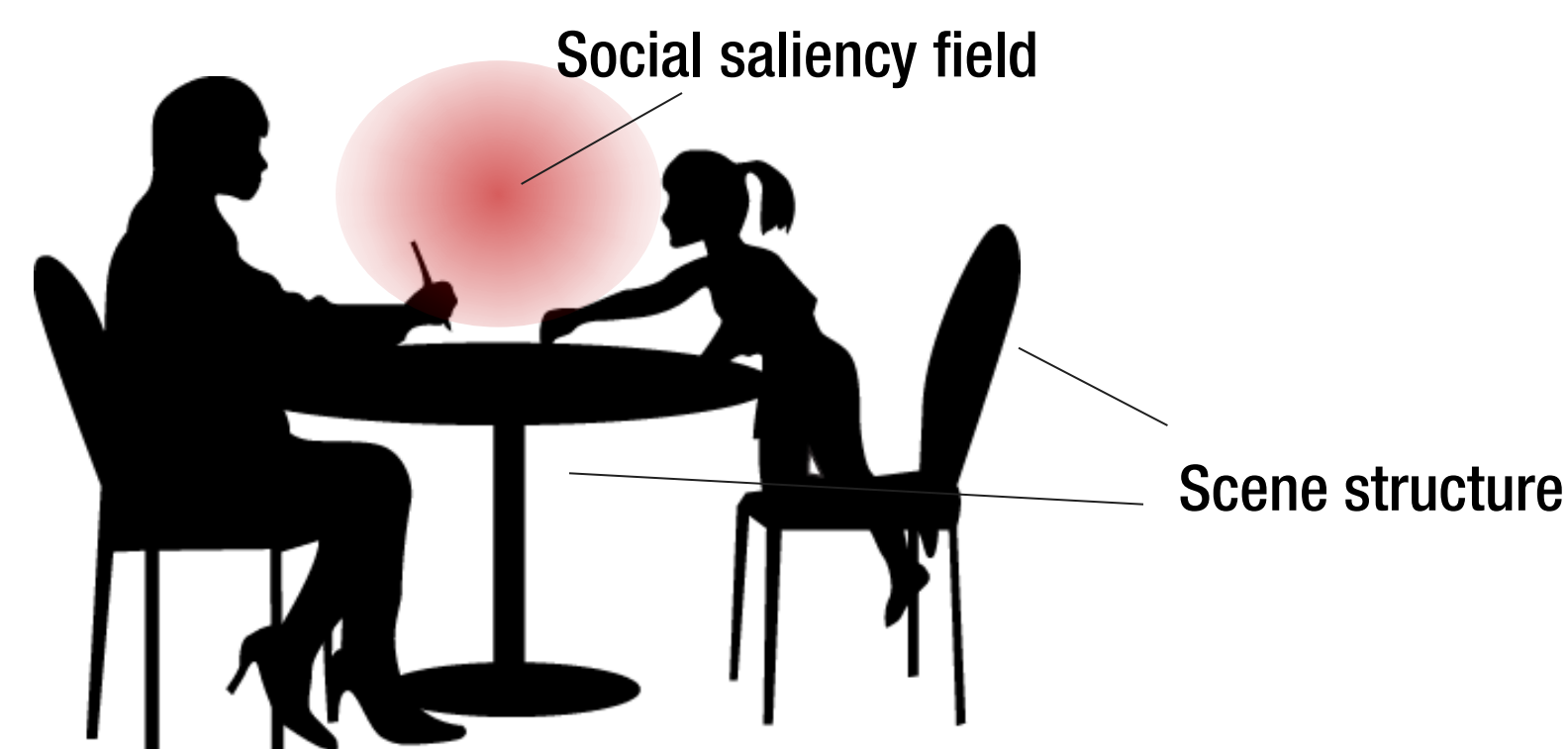
## Abstract

Humans often interact with others at a particular location in structured space, such as a table in meeting room, a bench in a park, or a couch in a lobby. The locations of the human interactions are not uniformly distributed, i.e., people interact more frequently in front of a whiteboard than under the table. Social behaviors adaptively change according to the spatial constraints of the structured space. In this project, we are developing a representation that models the relationship between the structured space and social behaviors such as gaze directions, gestures, or body poses via a social saliency field.

A social saliency field is a scalar field that measures joint attention in 3D and social behaviors are highly related to the social saliency field. We relate the social saliency field with 3D static structure in space and time. This will enable us to computationally understand the relationship between social behaviors and static structure, and to enrich social scene representations that can improve a prediction ability of the social behaviors.

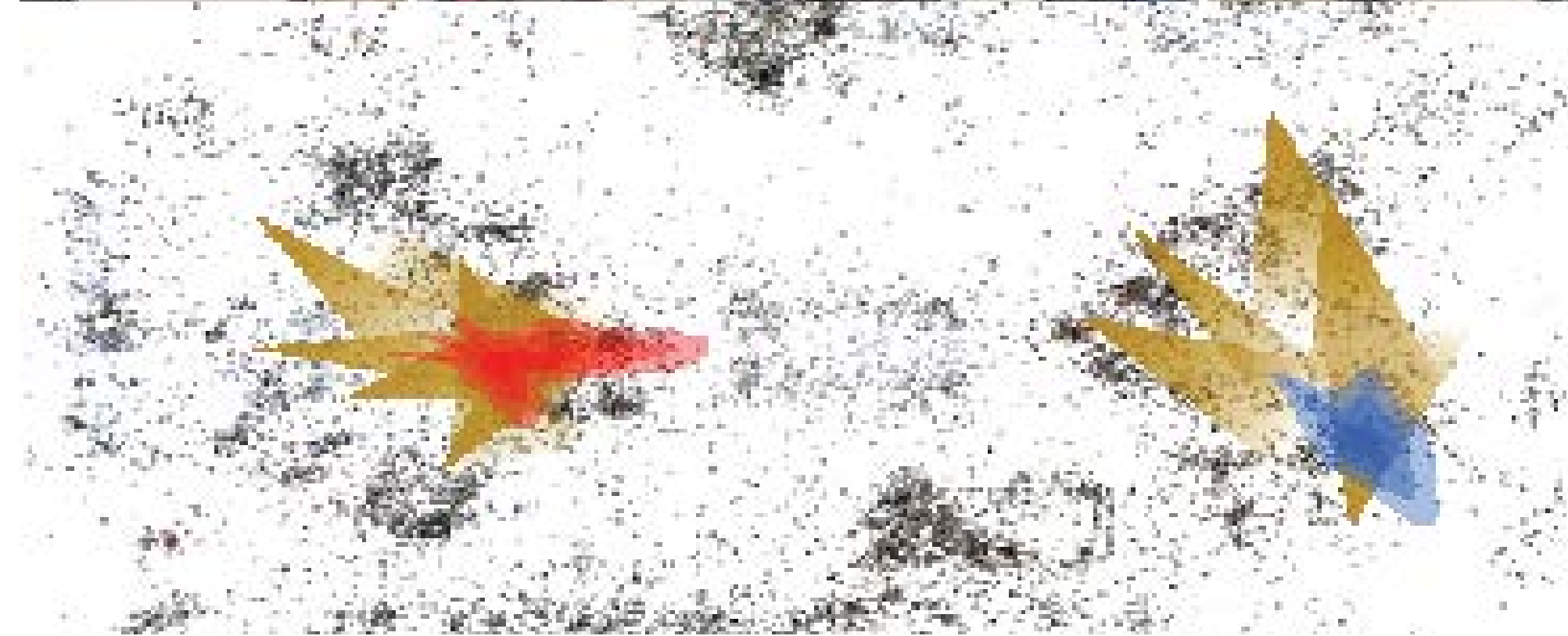
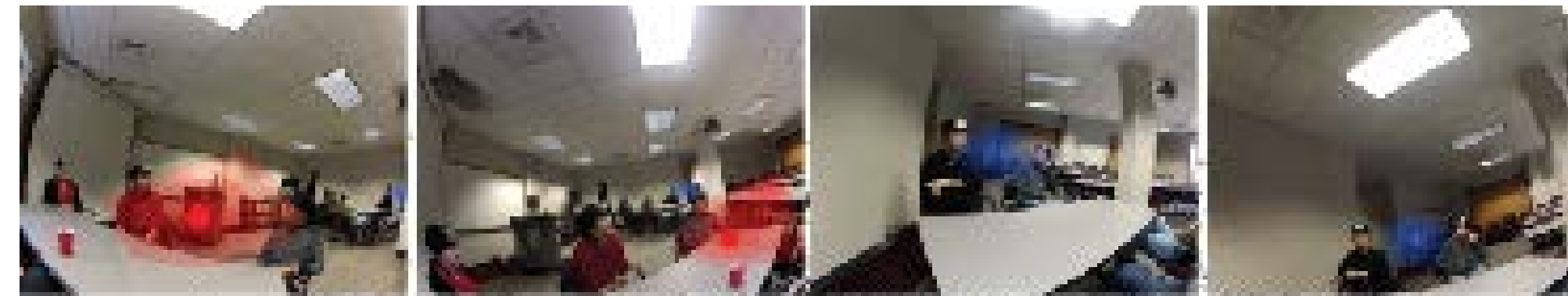
## Goal

To learn the relationship between social behaviors and scene structure via a social saliency field given 3D reconstruction of the scene.



## Social Saliency Field

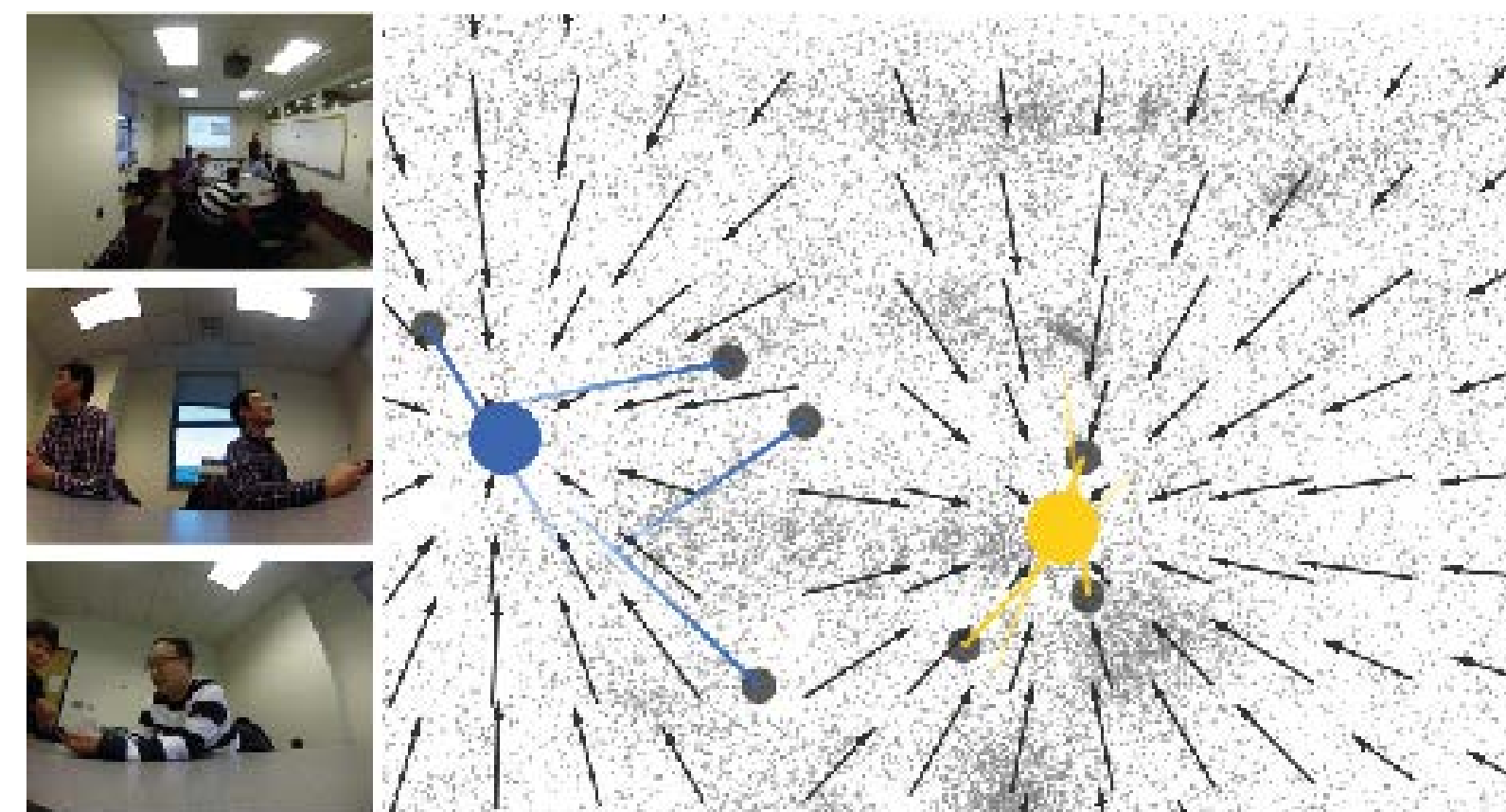
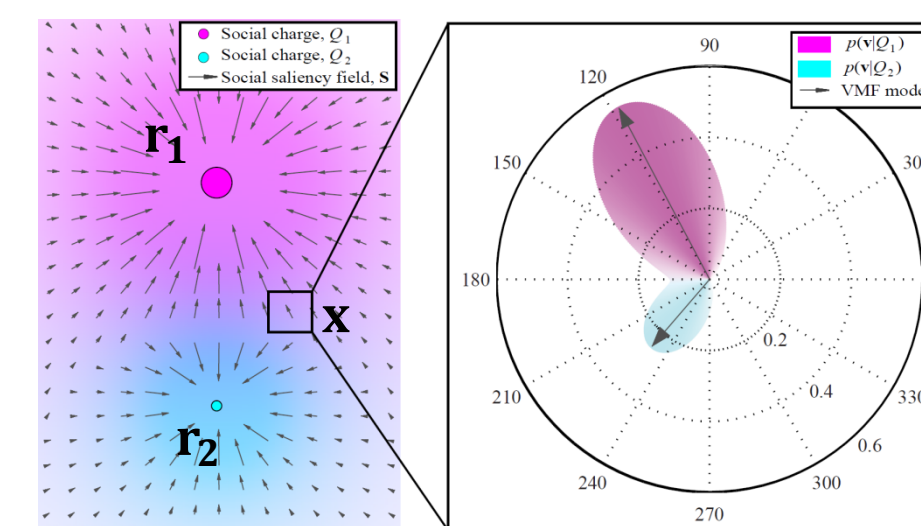
A social saliency field is a spatio-temporal scalar field that measures joint attention. We estimate the social saliency field using the gaze directions of the interacting people.



## Relationship with Social Behaviors

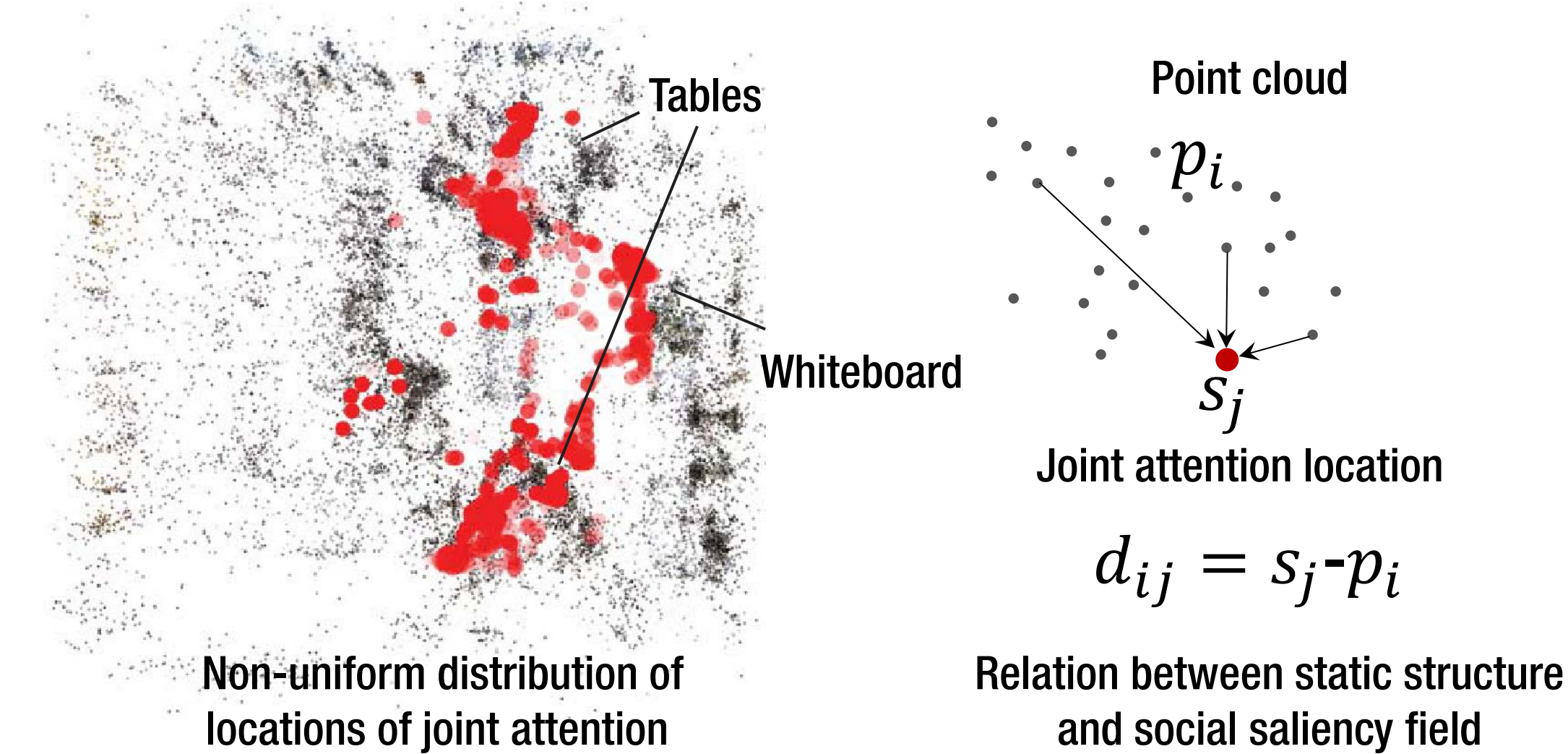
We can understand social behaviors such as primary gaze direction using the social saliency field. We model the probability of gaze directions inspired by the study of electric field.

$$S(x) = \operatorname{argmax}_{\{S_i(x)\}_i} \left\| K \frac{q(\mathbf{r}_i - \mathbf{x})}{\|\mathbf{r}_i - \mathbf{x}\|^3} \right\|$$



## Relationship with Scene Structure

The social saliency field is highly related with the scene structure as social interactions often take place particular locations such as a couch in a lobby. We can learn the relationship between the scene structure (3D point cloud) and social saliency field. The relationship encodes how the social interactions are embedded in the social scene and allows us to recognize *socially salient structure* that can influence their behaviors.



## Social Behavior Prediction

Based on the relationship between the social saliency field and static structure in 3D, we can predict the social saliency field given 3D point cloud of a novel scene. This will enable us to predict the social behaviors.

