**Abstract**:

Using geo-social applications, such as Four Square, millions of people interact with their surroundings through their friends and their recommendations. Without adequate privacy protection, however, these systems can be easily misused, *e.g.,* to track users target them for home invasion. In this paper, we introduce *LocX*, a novel alternative that provides significantly-improved location privacy without adding uncertainty into query results or relying on strong assumptions about server security. Our key insight is to apply secure user-specific, distance-preserving *coordinate transformations* to all location data shared with the server. The friends of a users hare this user’s secrets so they can apply the same transformation. This allows all location queries to be evaluated correctly by the server, but our privacy mechanisms guarantee that servers are unable to see or infer the actual location data from the transformed data or from the data access. We show that LocX provides privacy even against a powerful adversary model, and we use prototype measurements to show that it provides privacy with very little performance overhead, making it suitable for today’s mobile devices.