

Analyzing GPS data using density ranking

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Abstract: A common approach for analyzing a point cloud is based on estimating the underlying probability density function. However, in complex datasets such as GPS data, the underlying distribution function is singular, so the usual density function no longer exists. To analyze this type of data, we introduce a statistical model for GPS data in the form of a mixture model with different dimensions. To derive a meaningful surrogate of the probability density, we propose a quantity called density ranking. Density ranking is a quantity representing the intensity of observations around a given point that can be defined in a singular measure. We then show that one can consistently estimate the density ranking using a kernel density estimator even in a singular distribution such as the GPS data. We apply density ranking to GPS datasets to analyze activity spaces of individuals.

Bio: Yen-Chi Chen is an Assistant Professor in the Department of Statistics, a data science fellow in the eScience Institute, and a statistician in the National Alzheimer's Coordinating Center at the University of Washington. Yen-Chi obtained a PhD in Statistics from Carnegie Mellon University in June 2016, advised by Professor Larry Wasserman and Christopher Genovese. His current research interest includes missing data, nonparametric statistics, topological data analysis, cluster analysis, and applications in Astronomy, industrial engineering, and medical research.