Automatic data-based bin width selection for rose diagram

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Abstract

A rose diagram is a representation that circularly organizes data with the bin width as the central angle. This diagram is widely used to display and summarize circular data. Some studies have proposed the selector of bin width based on data. However, only a few papers have discussed the property of these selectors from a statistical perspective. Thus, this study aims to provide a data-based bin width selector for rose diagrams using a statistical approach. We consider that the radius of the rose diagram is a nonparametric estimator of the square root of two times the circular density. We derive the mean integrated square error of the rose diagram and its optimal bin width and propose two new selectors: normal reference rule and biased cross-validation. We show that biased cross-validation converges to its optimizer. Additionally, we propose a polygon rose diagram to enhance the rose diagram.

Keywords Rose diagram · Bin width estimator · Circular data · Nonparametric density estimator · Histogram estimator

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