Text Classification Using Conformal Transformations of Kernels - A Riemannian Geometry Approach

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In the article [4] we investigate the effects of conformal transformations on kernel functions used in Support Vector Machines. Our focus lies in the task of text document categorization, which involves assigning each document to a particular category. We introduce a new Gaussian Cosine kernel alongside two conformal transformations. Building upon previous studies [1-6] that demonstrated the efficacy of conformal transformations in increasing class separability on synthetic and low-dimensional datasets, we extend this analysis to the high-dimensional domain of text data. Our experiments, conducted on the Reuters dataset on two types of binary classification tasks, compare the performance of Linear, Gaussian and Gaussian Cosine kernels against their conformally transformed counterparts. The findings indicate that conformal transformations can significantly improve kernel performance, particularly for sub-optimal kernels. Specifically, improvements were observed in 60% of the tested scenarios for the Linear kernel, 84% for the Gaussian kernel, and 80% for the Gaussian Cosine kernel. In light of these findings, it becomes clear that conformal transformations play a pivotal role in enhancing kernel performance, offering substantial benefits.

References

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