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Fast Explainable Fourier-ANOVA Methods for Machine Learning

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Trigonometric functions can be evaluated efficiently based on the Fast Fourier Transform and related techniques.
The computational cost is $\mathcal{O}(N \log N)$, where N is the number of given nodes. Feature maps based on such functions are therefore well suited for big data analysis, where the number of data points is typically very large.
However, the size of a full grid of Fourier coefficients grows
exponentially with the number of features d and, hence, classical FFT-based methods are only efficient for small dimensions.
Recently, the usage of truncated ANOVA (analysis of variance) decompostions has been proposed.
Using small superposition dimensions helps to circumvent the curse of dimensionality. The corresponding feature maps can be applied in various Machine Learning algorithms, such as least-squares regression or support vector machines.
The ANOVA-idea makes the obtained model interpretable and helps identifying relevant features and connections between them, since Sobol indices and Shapley values are easily determined.

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