TUTORIAL

METHODOLOGICAL PROPOSAL TO ESTIMATE A TAILORED TO THE PROBLEM SPECIFICITY MATHEMATICAL TRANSFORMATION. USE OF COMPUTER INTELLIGENCE TO OPTIMIZE ALGORITHM COMPLEXITY

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A methodological proposal to estimate a Tailored to the Problem Specificity mathematical transformation is developed. To begin, Linear Analysis is briefly visited because of its significant role providing a unified vision of mathematical transformations. Thereafter it is explored the possibilities of extending this approach when basis of vector spaces are built tailored to the specific knowledge on a problem; not only from the convenience or effectiveness of mathematical calculations. Basis becomes not necessarily orthogonal neither linear. Standardized Mathematical Transformations such as Fourier or polynomial Transforms, could be extended, towards these new transformations. This was previously done to model Auditory Brainstem Responses using Jewett Transform. The proper use of Computational Intelligence tools was critical in this extension. It allowed important Complexity Algorithm optimization, which encourages the search for generalizing the methodology. In previous works, Artificial Neural Networks trained with backpropagation performed Jewett Transform. Mean Square Error in fitting Auditory Brainstem Responses to a model built using this transform are acceptable (mean Îµ< 0.3%, n= 600). The complexity of the best trained neural network algorithm was reduced to evaluate 100 inner products on 65 dimension vectors, 20 inner products on 100 dimension vectors and to calculate 120 sigmoid functions. Finally, using the trained Artificial Neural Network to estimate the Transform was thousands of times faster than using numerical gradient descent methods.