

# Learning with Volterra Series (VNNs)

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Machine Learning (ML) has reached an unprecedented performance in various inference problems arising in practice. The sample complexity and that of the model have, however, increasingly emerged as a serious limitation. Given the importance of a number of problems where these issues are central, we have revisited the Conv-net fundamental principle and have reformulated it from a Volterra Series perspective using a polynomial functional paradigm\*. We propose a computational Convolutional Network solution which requires no activation function and provides a very competitive inference performance (often better) at a fraction of the sample and model complexity of the most competitive CNN architecture.

\* Homogeneous Polynomial Functionals were first developed and formalized by Frechet

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