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Wavelet analysis of quantum fields that self interact

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Shannon theory has been a very useful tool for studying quantum field theories with an ultraviolet cutoff as simultaneously continuous and discrete on a lattice. Recently this has been extended to fields without a cutoff using wavelets, presenting free (continuous) quantum fields in n dimensions as equivalent discrete lattice theories in n+1 dimensions with potentially holographic properties. This work furthers this endeavor through the use of Shannon wavelets on quantum field theories that can self interact, answering the question of 'how can particles in a wavelet decomposition *jump* from one wavelet scale to the next?'
We also present a ruleset towards what types of interactions and correlations are allowed or disallowed in wavelet based quantum field theory.

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