

A Mathematical Theory of Computational Resolution Limit

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It is well-known that the resolution of optical imaging system is fundamentally limited by the optical wavelength. Based on this, Rayleigh proposed the Rayleigh criterion on the minimum resolvable distance between two point sources, the so called Rayleigh limit. Although widely used in the practice, this limit is not so useful for images that are subject to elaborated data processing. To remedy this, we develop a theory of computational resolution limit to characterize the fundamental resolution limit from the approximation theory point of view. The theory can be used to explain the phase transition phenomenon in the reconstruction problem. New efficient super-resolution algorithm is also developed following the theory.