

This is a review article on the computation of scattering amplitudes in planar $\mathcal{N} = 4$ super Yang-Mills theory at strong-coupling limit. Use of the AdS/CFT duality reduces the computation to that of the areas of minimal surfaces in AdS spaces. These recent results allow us to interpret the scattering amplitudes as certain geometric quantities at least in the strong-coupling limit. This is analogous to the previously known fact that such minimal areas correspond to the expectation values of supersymmetric Wilson loop operators.

This article first reviews technical aspects of how to use the AdS/CFT duality to calculate the planar $\mathcal{N} = 4$ amplitudes at strong coupling. It then focuses on mathematical aspects of the problem. Particularly, in section 4 the author reviews how the problem of the amplitude calculation can be viewed as the problem of integrable systems and shows that various techniques of integrable systems can properly be applied to the computation of the amplitudes. Reasons behind the integrability of the problem are not clarified yet but these results are expected to be useful for the computations of other types of amplitudes, including multi-loop and presumably non-planar ones.