
Condensation transition in joint large deviations of linear statistics

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Abstract

For sums of independent random variables it is well known that condensation may occur when the sum is constrained to be much greater than its expected value i.e. a large deviation effect. Condensation implies that one random variable carries a finite fraction of the sum and for this to occur the underlying probability should be distribution heavy-tailed, i.e. decaying slower than exponential. Such real space condensation is known to occur in stochastic models of mass transport in the regime in which the globally conserved mass density is greater than a critical value. Here we show how a similar condensation phenomenon is exhibited for non-heavy-tailed distributions, provided the random variables are additionally constrained, for example by fixing the sample variance in addition to the sum. Our results suggest that the condensation is a generic phenomenon for all underlying distributions. —

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