

Extreme Value Theory applied to Multiscale Scan Statistics

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Abstract: Let X_1, X_2, \dots be i.i.d. random variables and let $S_k = X_1 + \dots + X_k$ be their partial sums. We will study the limiting distribution (after appropriate normalization) of the scan statistic

$$L_n := \max_{1 \leq i < j \leq n} \frac{S_j - S_i}{\sqrt{j - i}}$$

as $n \rightarrow \infty$. It will be shown how methods of extreme value theory and results on the tail behavior of sums of i.i.d. random variables can be used to prove that L_n (normalized in an appropriate way) has a limiting distribution.