Probability and spatial networks

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Network design and analysis have been studied in many different applied contexts, yet many simple-to-state abstracted mathematical problems have not been studied very systematically. For a road network on n cities, what is the trade-off between total network length and the efficiency of the network in providing short routes? For an airline network on n cities, requiring routes to have an average of no more that 3 hops, how short can network length be? Such questions can involve probability in several ways. First, the "average case" model of randomly-distributed cities is a natural counterpart to worst-case analysis. Second, while upper bounds on performance are obtained by explicit construction, lower bounds need more mathematical arguments provided by classical integral geometry. Third, the Poisson line process turns out to be very useful!

In addition to the concrete questions above, I will briefly discuss more abstract questions concerning methodology for proving existence of n-to-∞ limit constants associated with optimal flows in complex problems.

Part is joint work with Wilfrid Kendall.

`List of invited speakers` `Schedule for December 12`