

## **Geographic Surveillance and Hotspot Detection for Homeland Security: Surveillance Network and Early Warning**

Short Description Emerging hotspots for disease or biological agents are identified by modeling events at local hospitals. A time-dependent crisis index is determined for each hospital in a network. The crisis index is used for hotspot detection by scan statistic methods

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Full Description Emerging hotspots for disease, biological agents or medical effects of pollution are identified through modeling events at local hospitals. A time-dependent crisis index is determined for each hospital in a network spread over a city, state or the whole country. This index measures the behavior patterns at each hospital compared to crisis behavior. The behaviors are based on series of hospital admission records containing symptoms and diagnoses. The basic components of behaviors are events, which in our case are hospital admissions. The important attributes of admissions are the information on the admission records and how frequently admissions are occurring compared to normal, non-crisis behavior. The behavior stream is represented as probabilistic finite state automaton and by the corresponding formal stochastic language. The method of epsilon-machines (Crutchfield, 1989, 1994; Shalizi, 2002ab) is used to estimate the automaton from the current behavior stream. The variational distance between stochastic languages provides a quantitative measure of how close the current behavior is to that of a crisis. This distance is called the crisis index. The crisis index over the network of hospitals is used for hotspot detection by the upper level set scan statistic.

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Strategic Cycle Elements Prevention  
Crisis Management

Project URL <http://www.stat.psu.edu/~gpp/PDFfiles/Prospectus%2016%20overview.pdf>  
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