Adaptive Forecasting of a Re-emerging Disease Chikungunya in Central and North Americas with the Online Social Media Input

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Chikungunya is a re-emerging viral disease transmitted by the bite of infected mosquitoes, similar to West Nile and dengue viruses. Chikungunya was first detected during an outbreak in 1952 in Tanzania and later it was reported in Europe, Southeast Asia, India, and islands in the Indian and Pacific Oceans, with a major outbreak in Reunion Island in 2006. The first occurrence of Chikungunya in the Americas was reported in St. Martin in December 2013 and afterwards it spread rapidly over Caribbean and into North, Central and South America. In this talk we propose a new adaptive and computationally efficient statistical approach for out-of-sample prediction of chikungunya dynamics (i.e. number of cases and peak incidence) that is applicable even under relatively limited epidemiological data availability. Our method is based on a combination of an ordinary differential equation model for simulating the transmission of infection between humans and mosquitoes, online social media input (Google Dengue Trend) and the Box-Jenkins time series methodology. We illustrate our approach by predicting chikungunya in Dominican Republic up to 6 months ahead starting October 1, 2014.