# 國立中山大學跨領域及數據科學研究中心
# 國立中山大學應用數學系
# 學術演講

講　者：王琪仁教授
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講　題：Spatial epidemic models: lattice differential equation analysis of wave and droplet-like behavior

時　間：2015/12/16（星期三）16：10 ~ 17：00

地　點：理學院四樓理 SC 4009-1 室

茶　會：15:30 於理 SC 4010 室（系辦公室）

## 摘要

Spatially discrete stochastic models have been implemented to analyze cooperative behavior in a variety of biological, ecological, sociological, physical, and chemical systems. In these models, species of different types, or individuals in different states, reside at the sites of a periodic spatial grid. These sites change or switch state according to specific rules (reflecting birth or death, migration, infection, etc.) In this talk, we consider a spatial epidemic model where a population of sick or healthy individual resides on an infinite square lattice. Sick individuals spontaneously recover at rate *p*, and healthy individual become infected at rate O(1) if they have two or more sick neighbors. As *p* increases, the model exhibits a discontinuous transition from an infected to an all healthy state. Relative stability of the two states is assessed by exploring the propagation of planar interfaces separating them (i.e., planar waves of infection or recovery). We find that the condition for equitability or coexistence of the two states (i.e., stationarity of the interface) depends on orientation of the interface. We also explore the evolution of droplet-like configurations (e.g., an infected region embedded in an all healthy state). We analyze this stochastic model by applying truncation approximations to the exact master equations describing the evolution of spatially non-uniform states. We thereby obtain a set of discrete (or lattice) reaction-diffusion type equations amenable to numerical analysis.

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