# Dealing with Markov decision processes with uncertain transition functions

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**Résumé** : Aedes albopictus is a worldwide invasive mosquito that vectors debilitating diseases to humans. It has invaded the Torres Straits Islands, at the doorstep of the Australian mainland. The problem consists in preventing the mosquito from colonising the Australian mainland. A limited budget allows for actions on some islands, with a certain probability of eradication of the mosquitoes. The transition function captures the effectiveness of actions and the dispersal of the mosquitoes. Since decisions are sequential, Markov decision processes (MDP) seem to be an appropriate model to address this problem. However, the transitions between states are not known perfectly.

My research focuses on MDPs where the transition function is uncertain. We make the assumption that it belongs to a fixed finite set of possible transition functions. It is possible to learn about the ?true ? transition function over time by analysing the evolution of the system. One of the challenges in these types of problem is the exploration/exploitation trade-off, i.e. choosing between informative and rewarding decisions. Powerful tools such as partially observable MDPs (POMDPs) can solve this trade-off optimally but are very demanding computationally. However, simple insights gained from the study of the problem structure can lead to significant computational gains. We are currently looking at the performance guarantees of this new approach.

**Mots-clés** : Markov decision process, Uncertain transition functions, Structural uncertainty, Invasive species.