PART IV:

STATE UNCERTAINTY

Previous chapters have included uncertainty in the transition function, both in terms of the uncertainty in the resulting state as well as in the model. In this part, we extend uncertainty to include the state. Instead of observing the state exactly, we receive observations that have only a probabilistic relationship with the state. Such problems can be modeled as a *partially observable Markov decision process* (POMDP). A common approach to solving POMDPs involves inferring a belief distribution over the underlying state at the current time step and then applying a policy that maps beliefs to actions. Chapter 19 shows how to update our belief distribution given a past sequence of observations and actions. Chapter 20 outlines exact methods for optimizing policies. Chapter 21 reviews a variety of offline approximation methods that tend to scale much better than exact methods to larger problems. Chapter 22 extends some of the online approximation discussed earlier in this book to accommodate partial observability. Chapter 23 introduces finite state controllers to represent policies and methods for optimizing them.