Algorithms for decision making: Free book download from MIT

MIT press has provided a free book on Algorithms for decision making. You can download it from MIT Press here, or alternatively it is available from this site if the original link fails.

From the data science website:

The book takes an agent based approach
An *agent* is an entity that acts based on observations of its environment. Agents may be physical entities, like humans or robots, or they may be nonphysical entities,such as decision support systems that are implemented entirely in software. The interaction between the agent and the environment follows an *observe-act cycle* or *loop*.

- The agent at time t receives an *observation* of the environment
- Observations are often incomplete or noisy;
- Based in the inputs, the agent then chooses an action at through some decision process.
- This action, such as sounding an alert, may have a nondeterministic effect on the environment.
- The book focusses on agents that interact intelligently to achieve their objectives over time.
- Given the past sequence of observations and knowledge about the environment, the agent must choose an action at that best achieves its objectives in the presence of various sources of uncertainty including:

1. *outcome uncertainty*, where the effects of our actions are uncertain,
2. *model uncertainty*, where our model of the problem is uncertain,
3. 3. *state uncertainty*, where the true state of the environment is uncertain, and
4. *interaction uncertainty*, where the behavior of the other agents interacting in the environment is uncertain.

The book is organized around these four sources of uncertainty.

Making decisions in the presence of uncertainty is central to the field of *artificial intelligence*