Agent-Based Simulations in Economics

The Fourth Herbert Simon Seminars Series

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Outline of Lectures

1. **Introduction: models and simulation.**

2. **Agent-based models: What is an agent? How to model agents?**

3. **Learning and evolutionary models: Genetic Algorithms, Reinforcement Learning, Artificial Neural Nets.**

4. **Market Design.**

5. **Applications: Designing electricity markets and other markets.**

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Who am I and what is my interest?

1. **Bob Axelrod's 1984 tournaments of the iterated Prisoner's Dilemma.**

2. **MIT's 1985/6 3-person computational strategy (differentiated Bertrand oligopoly) tournaments.**

3. **Axelrod's use of John Holland's Genetic Algorithm to replicate his 1984 Tit-for-Tat results.**

4. **My serendipitous connection with Michigan from Sydney.**

5. **My co-evolution model of oligopolists in 1988.**

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Herbert Simon

The late Herbert Simon is perhaps best known to economists (apart from his Nobel prize) as the man who coined the terms:

- **bounded rationality, and**
- **satisficing.**

As we shall see, both ideas have a rôle to play in agent-based modelling:

- **the agents must be boundedly rational, and**
- **reinforcement learning can model satisficing as a realistic response of agents.**

An anecdote.

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How we learn.

- **Five 3-hour lectures.**
- **Start from modelling, then simulation, in theory.**
- **Then some hands-on simulations: Life, segregation.**
- **Four lectures on ACE models, agent learning of various kinds, applications.**