**Agent-based Model Annotated Bibliography and Notes**

Williams PA, Cook ER, Smerdon JE, Cook BI, Abatzoglou JT, Bolles K, Baek SH, Badger AM, Livneh B. 2020. Large contribution from anthropogenic warming to an emerging North American megadrought. Science. (368):314–318.

* ABM has three elements
  + a set of agents, their attributes and behaviors
  + a set of agent relationships and methods of interaction
    - an underling topology of connectedness defines how and with whom agents interact
  + The agent’s environment: agents interact with their environment in addition to other agents
* Essential characteristics of an agent:
  + self-contained
  + autonomous and self-directed, has behaviors that relate info sensed by the agent to its decisions and actions
  + has a state that varies over time
  + is social having dynamic interactions with other agents that influence its beahvior
* Developing an agent-based model, ask a series of questions:
  + What specific problem should be solved by the model?
    - What specific questions should the model answer?
    - What value-added would agent-based modelling bring to the problem that other modelling approaches cannot bring?
  + What should the agents be in the model?
    - Who are the decision makers in the system?
    - What are the entities that have behaviours
    - What data on agents are simply descriptive (static attributes)? What agent attributes would be calculated endogenously by the model and updated in the agents (dynamic attributes)?
  + What is the agents’ environment?
    - How do the agents interact with the environment?
    - Is an agent’s mobility through space an important consideration?
  + What agent behaviors are of interest?
    - What decisions do the agents make?
    - What behaviors are being acted upon?
    - What actions are being taken by the agents?
  + How do the agents interact with each other?
    - With the environment?
    - How expansive or focused are agent interactions?
  + Where might the data come from, especially on agent behaviors, for such a model?
  + How might you validate the model, especially the agent behaviors
* bottom-up, highly iterative design methodologies seem to be the most effective for practical model development