1. In March 2020, a study by researchers from Imperial College made headlines around the world. Using an agent-based model, they painted a grim picture about the COVID-19 outbreak in the United Kingdom. Allegedly, this report was a major factor in deciding on a lock down in the UK as well as changing the perception of government leaders in other countries like the United States and France. Almost immediately, however, the study was also heavily criticized. The code of the model was not openly available, the model itself had been developed to study contagious diseases with characteristics quite different from COVID-19, and the degree of certainty with which the model results were presented was questioned.
   1. ( / 3 ) What can you say more theoretically about the strengths and weaknesses of using ABMs to study pandemic outbreaks like COVID at a country level? List 3 strengths and 3 weaknesses.

Strengths

* The bottom-up perspective is often relatively easy to understand
* Easy to encode heterogeneity across agents
* The detailed encoding of various spaces/environments that affect the behaviour of agents

Weaknesses:

* Detailed microdata
* Many uncertainties
* Computationally expensive

Key is to long these attributes in a clear way to the given case description

* 1. ( / 2 ) Imagine that you were asked to adapt the existing model from Imperial College (which was by then publicly available through GitHub thanks to researchers at Microsoft), and use it to advise on a vaccination strategy for the UK. How would you approach establishing the validity of your adapted model for this purpose?

Can be answered in various ways. Important to mention

* Validity as suitability for purpose (So link to what the purpose of the model is)
* Move from structural validity to behavioural validity. So right behaviour for the right reasons
* Mention some relevant tests you could use and how they would help in arguing for fitness for purpose.
* Avoid equating validity with historical replication.
  1. ( / 1 ) Given an extension to the Imperial College model for investigating vaccination strategies, how you would use this to advise on a vaccination strategy. In answering this question, pay particular attention to the critique regarding the degree of certainty in the predictions produced previously by the Imperial College model.

Can be answered in various ways. Key issue is to highlight the uncertainties that are there and how an experimental approach. (i.e., exploratory modelling) would be fitting, or in a similar vein, mention the use of scenarios to deal with these uncertainties.

1. The Suez traffic jam: In mid-March 2021, a mega container vessel got stuck in the Suez channel creating a massive traffic jam of vessels sailing to and from Europe. While the traffic jam was building up, some shipping companies decided to reroute their vessels sailing past Cape of Good Hope and up towards Europe. Many vessels, however, stayed put waiting for their turn to sail through the Suez channel once the ship blocking the Suez channel was freed. Agent-based models can be used to model international shipping and the rerouting dynamics of ships and goods due to the temporary blockage of the Suez channel.

Given the case description above, conceptualize the model by answering the questions below

* 1. ( / 1 ) What are the relevant (spatio-temporal) patterns from the case that your model should be able to generate?

Any answer, if well-motivated is fine here. Possible directions include

* Rerouting of vessels, in which case the pattern would be derived from shipping vessel radar data.
* The emergence of ‘traffic jam’ in front of the channel, again pattern would be based on the number of vessels that kept increasing in front of the channel.
* Supply chain responses with rerouting of goods via other modes of transport. The pattern would be likely to be specific to a supply chain and thus data needs to be derived from this. Part of this story might also cover the price spike in airline shipping for example.
  1. ( / 2 ) What types of agents does your model need?

Again anything goes. What matter is consistency with the previous answer and a clear motivation

* 1. ( / 1 ) Within what kind of space will these agents interact and how do you plan to deal with possible edge effects?

Again anything goes. What matter is consistency with the previous answer and a clear motivation

* 1. ( / 1 ) Given the stated policy issue and patterns specified, what would be the time horizon and timestep for the model?

Again anything goes. What matter is consistency with the previous answer and a clear motivation