ICS - CA4

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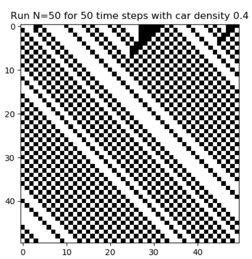
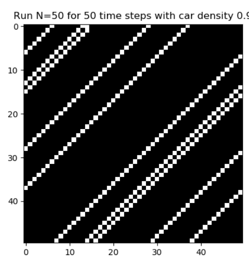
1. The 1's in the state symbolise cars. They can 'move' to the next spot if the one to the right is a 0; i.e. if a cell is 0 and its left neighbour is 1, it becomes a 1 and if a cell is 1 and its right neighbour is 0 it becomes a 0. It is bottleneck-free since no bottleneck exists along the path, the only thing stopping the cars is another car.

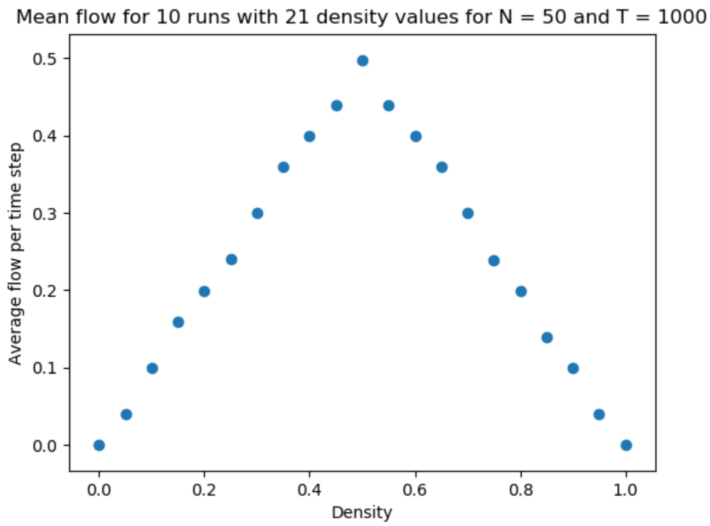
2. 



   With density 0.4 the cars spread out eventually and are able to move each step. With density 0.9 however, it's so crowded that the cars are barely able to move.

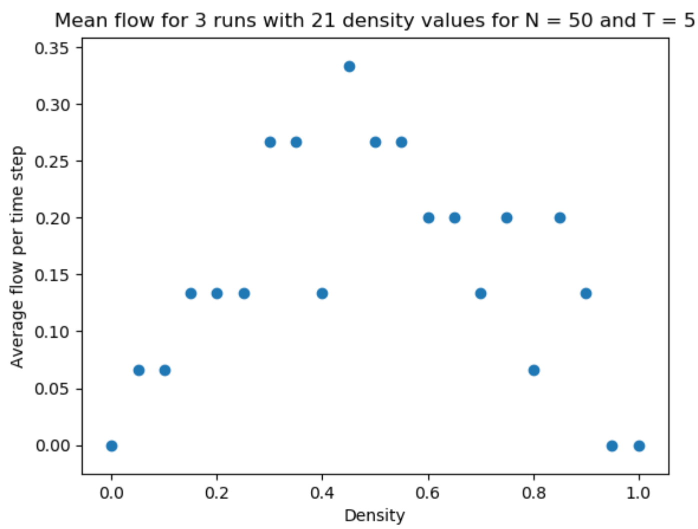
3. Real-life experiments cost money (fuel and vehicles for example), and time (since they can;t be sped up). Environmental factors might not always be controllable, which could influence the result. In this case, real-life experiments would require human drivers who won't always act the same way when faced with the same scenario. In a real experiment accidents could occur when testing with high car densities. Real roads might also introduce bottlenecks, like for example speed bumps or a damaged surface.

4.

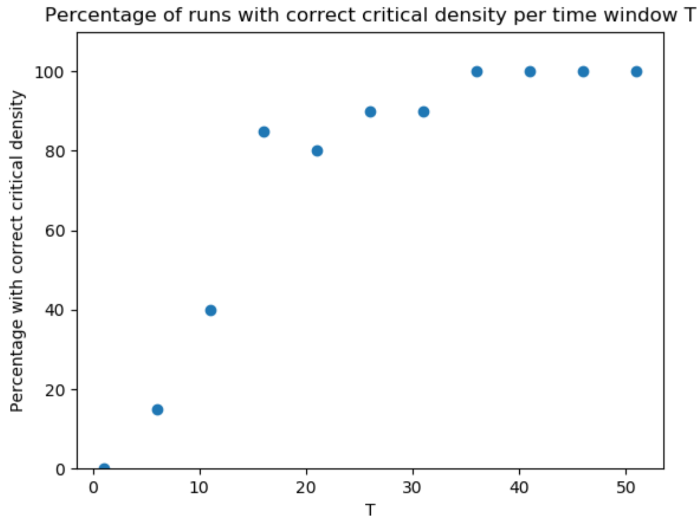


The flow increases with increasing densities, but with densities higher than 0.5 the flow starts to decrease

5.



Due to a low T cars might not be able to reach the right side before the end of the run, which results in a lower flow than could otherwise be achieved. A low R could result in inaccurate data, since the influence of the initial state will be higher when testing with fewer different random initial states.



6. I suppose this T_{min} lies somewhere between 20 and 30. The critical density was interpolated by interpolating the flow as a function of density using `scipy.interpolate.interp1d`, which returns a function. Afterwards the maximum of this function is calculated using `scipy.optimize.minimize_scalar`.

7. While this method does show the existence of a transition, the density at which this transition occurs in real life might be influenced by factors such as the gender of drivers or car sizes. Thus the results of this simulation might not always be applicable to the real world.