最后一个问题：How should e-scooters be distributed among parking bays to maximise utility or revenue? 这个问题的核心是比较不同的分布模式所带来的收益。我们选择使用Agent Based Model去对这个问题进行模拟。这个模型的设计思路是：生成一系列节点作为停车区域，并储存一定数量的e-scooters在这些节点中，通过随机生成的link代表道路，使得e-scooters能够在模型中流动并创造价值。为此，我们设计了一个交互式的模型界面。在这个界面中，停车场的数量通过矩阵的方式生成，link chance作为全局变量来随机产生道路，diffusion rate用来控制e-scooter的移动，price per hour则是调节定价模型。

我们以上文中分析过的Chester数据为例，来设计模型的参数。首先，根据Ginger目前的公司定价设置price per hour为6。第二，根据目前Chester投入运营的车辆总数设置每个节点的车辆数为5。第三，根据切斯特目前存在的停车区域数量设置模型的节点数为25。最后，根据在切斯特近三个月的车辆使用频率，基于模型的模拟情况计算出diffusion rate为6%。

模型的运行过程如视频所示，每一次对go button的点击代表着时间过去了一个小时，模型的车辆数以及道路的繁忙情况能够在world界面中被实时观察到。同时，车辆的使用数量将会带来收入的增长。在24个ticks，即24小时以后，一天的运营将结束。模型需要进行重新的set up，以观察第二个周期的收入情况。"Centralized placement" button的使用将改变原有的车辆平均分配模式。这个按钮的作用是随机选择地图中的某些节点，使其储存更多的车辆，同时，随机减少等量的停在其他节点的车辆以保证车辆总数不变。节点的大小代表当前节点储存的车辆数。Link的颜色对的深浅代表当前正在使用的车辆数。

实验的模拟采用了三种情境：在情境A中，每个节点的车辆数平均分配5个e-scooters，在24个ticks之后，记录income的值将其作为当日的总收入。在情境B中，有四个节点的初始车辆数增长至11，相应的8个节点的初始车辆数减少至2。在情境C中，出现一个“超级节点”，包含29辆车，同样也有8个节点的初始车辆数减少至2。对于每个情境进行10次模拟，最后计算结果的期望值和方差。

模型最后模拟的结果肯定的“超级节点”的设置能够带来最大的期望收益。“超级节点”的模拟中同时出现了所有值中的最大值（1070）和最小值（785），这表明“超级节点”的位置将极大程度决定最终的收益。同时,“超级节点”的设置应保证节点附近有良好的交通可达性，这种分配模式所带来的收益提升是巨大的。

The last question: How should e-scooters be distributed among parking bays to maximise utility or revenue? The core of this question is to compare the benefits of different distribution models. We choose to use Agent Based Model to simulate this problem. The design idea of this model is: generate a series of nodes as parking areas, and store a certain number of e-scooters in these nodes, and use randomly generated links to represent roads, so that e-scooters can flow in the model and create value. To this end, we designed an interactive model interface. In this interface, the number of parking lots is generated by a matrix, link chance is used as a global variable to randomly generate roads, diffusion rate is used to control the movement of e-scooter, and price per hour is an adjustment pricing model.

The Chester data we have analyzed in the above article is used as an example to design the parameters of the model. First, set the price per hour to 6 according to Ginger's current company pricing. Second, set the number of vehicles at each node to 5 based on the total number of vehicles currently in operation at Chester. Third, set the number of nodes in the model to 25 according to the number of parking areas currently existing in Chester. Finally, according to the frequency of vehicle usage in the past three months in Chester, the model-based simulations calculate the diffusion rate to be 6%.

The running process of the model is shown in the video. Each click on the go button means that one hour has passed. The number of vehicles in the model and the busyness of the road can be observed in real time on the world interface. At the same time, the number of vehicles used will increase revenue. After 24 ticks, that is, 24 hours, the day's operation will end. The model needs to be reset to observe the income in the second cycle. The use of the "Centralized placement" button will change the original vehicle even distribution mode. The function of this button is to randomly select certain nodes in the map to store more vehicles, and at the same time, randomly reduce the number of vehicles parked at other nodes to ensure that the total number of vehicles remains unchanged. The size of the node represents the number of vehicles stored in the current node. The shades of the color pairs of Link represent the number of vehicles currently in use.

The simulation of the experiment uses three scenarios: In scenario A, the number of vehicles at each node is evenly allocated to 5 e-scooters, and after 24 ticks, the value of income is recorded as the total income of the day. In scenario B, the initial number of vehicles with four nodes increases to 11, and the initial number of vehicles at the corresponding 8 nodes decreases to 2. In Scenario C, there is a "super node" that contains 29 vehicles, and there are also 8 nodes with the initial number of vehicles reduced to 2. Perform 10 simulations for each situation, and finally calculate the expected value and variance of the result.

The final simulation result of the model confirms that the setting of "super nodes" can bring the greatest expected benefits. The maximum value (1070) and the minimum value (785) of all values appeared in the simulation of the "super node" simultaneously, which indicates that the position of the "super node" will greatly determine the final profit. At the same time, the setting of "super node" should ensure that there is good traffic accessibility near the node, and the income increase brought by this distribution mode is huge.