Student uses artificial intelligence to understand bee behaviour

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A University of Exeter PhD student has used artificial intelligence to shed new light on the behaviour of bumble bees.

Daniel Chalk developed the computer model to understand the potential for bees to cross-pollinate between GM and non-GM crops.

The first of its kind in the world, the study sheds new light on the foraging behaviour of bumble bees over a large area. It suggests that the potential for bees to affect crops through cross-pollination is very limited. There has been concern over cross-pollination from GM crops and because there is very little evidence of how bumble bees move between fields, policy-makers have not been able to properly address the issue.

A PhD student in the School of Biosciences and School of Engineering, Mathematics and Physical Sciences, Daniel hopes his research will help shape future policies around GM crops in the UK and Europe. He also believes his model could help with bee conservation, which is becoming an increasingly important issue because of bumble bee decline.

We now have a good understanding of the ways in which bees move between plants but researching the movement of bees between fields has proved very difficult. This is the first study to successfully simulate the foraging behaviour of bees across a large area.

Daniel Chalk said: “By creating a kind of ‘virtual bee’ I have been able to show for the first time how bees move over large areas, across and between fields. My research has shown that bumble bees are very efficient foragers and will only travel long distances if they really need to. We showed that containment strategies could be put in place - creating a shield of ‘sacrificial crops’ for example - as bees tend to favour moves to neighbouring sites.”

He continued: “While the purpose of this study was to look at the potential for cross-pollination from GM crops, the findings may also help with the massive bee conservation effort now underway. The model I used could help identify landscapes that promote bee activity.”

Daniel based his study on oil seed rape, a very high-yield crop that is extremely popular with bees. He has called his model HARVEST (Harvesting Animals with Reinforced Values and ESTimates). It is based on the principle that bees learn from trial and error and quickly learn which areas are worth returning to for nectar and which are not.

Daniel is now planning to publish his findings so they can be shared by the scientific community and also by those responsible for setting guidelines around GM crops.