New use for old statistical method

Valeria Bonapersona created a statistical tool that reduces the need for animal experiments. The tool is based on Bayesian statistics, using expectations based on prior research.

'For the past seven months, I have focused on reducing the use of experimental animals in medical research', says Valeria Bonapersona, PhD student in the UMC Utrecht Brain Center. 'This is something I am very passionate about. I developed a special application for an old mathematical method called Bayesian statistics.' Bonapersona started a PhD trajectory in September 2017, studying the effect of childhood stress on the brain – a project involving mouse experiments.

'The concept for an animal use reduction method struck me about one and a half years ago when I attended a presentation that mentioned Bayesian statistics. Something clicked in my mind and I knew I had a great idea.' Bayesian statistics is a mathematical approach that works with expectations and quantifies probabilities. The use is best explained by an example.

Old experiments

For instance, to investigate a drug that presumably improves memory in mice, researchers need a control group and a group that receives the experimental drug. In animal behaviour research, a widely used memory experiment is the object recognition task. Researchers place mice in a cage, where they get acquainted with objects A and B. The next day, they put the same mice in the same cage but now with objects A and C. The difference in time spent with object A (old) and C (new) is used as a proxy for memory. 'Due to the natural curiosity of mice, on average mice prefer object C', explains Bonapersona. 'From former experiments, we know that this preference is around sixty percent. We can use this information in a Bayesian statistical model. The statistical method gives a certain weight to prior expectations and researchers can use that information to reduce the number of mice in future control groups.'

Bonapersona's PhD supervisors understood the importance of her idea right away. ' They helped me with the math and the financial support so I could put my idea into effect.' This financial support comes from the Netherlands Organisation for Scientific Research (NWO) Gravitation programme 'Consortium on Individual Development'. This consortium encompasses four Dutch universities and three university medical centers with expertise in the field of developmental research.

Drug development

'My method is still under development but it can presumably be applied to any research question, for instance in drug development, as long as you have previous experimental data.' The current method is restricted to animal experiments in which it can be assumed that control animals are part of the same population.

'I find it very important to reduce the use of animal experiments, but for some experiments there is no alternative for animals yet', says Bonapersona. 'Although promising, the method we designed has some limitations: there is a degree of subjectivity because researchers have to quantify how similar the previous experiments are to the current one. However, I am confident of the potential of this method. The results are more reliable than in 'normal' experiments. And because I created a software tool this method is also very easy to use.' ●

'This is a project I am passionate about'

Valeria Bonapersona is participating in the PhD Student Competition at the FIGON Dutch Medicines Days.