

# Collaboration and reuse as a result of sharing data

A case study of Janelia Research Campus's Carsen Stringer

## Key Points

- Carsen Stringer, Marius Pachitariu and her colleagues at University College London shared the processed data from experiments where they developed tools for large-scale recordings of tens of thousands of mice neurons to better understand how the visual cortex works so others can reproduce and reuse their data.
- This data has driven statistical tool development and enabled cross-species interrogation of neural activity. For instance, other researchers have developed statistical techniques for parsing large-scale neural activity, and compared zebrafish neural activity to the mouse visual cortex data collected by Carsen and her colleagues.
- Her data has also been used in The Neuroscience Data Challenge at the University of Bristol where researchers apply modelling and data approaches to neuroscience using data publicly available.

Carsen Stringer is a Postdoctoral Associate at Janelia Research Campus studying visual processing and behavior in mice. You can see her research on [janelia.figshare.com](https://janelia.figshare.com) through [her profile page](#). You can also find her on Twitter at [@computingnature](#).

Carsen's primary work at Janelia is to develop tools for large-scale recordings of tens of thousands of mice neurons to better understand how the visual cortex works. To collect these samples, Carsen and her colleagues do two-photon imaging in which they inject calcium indicator proteins into the neurons, causing these neurons to light up when they fire. They then take pictures of the brain across time to see which neurons are firing.

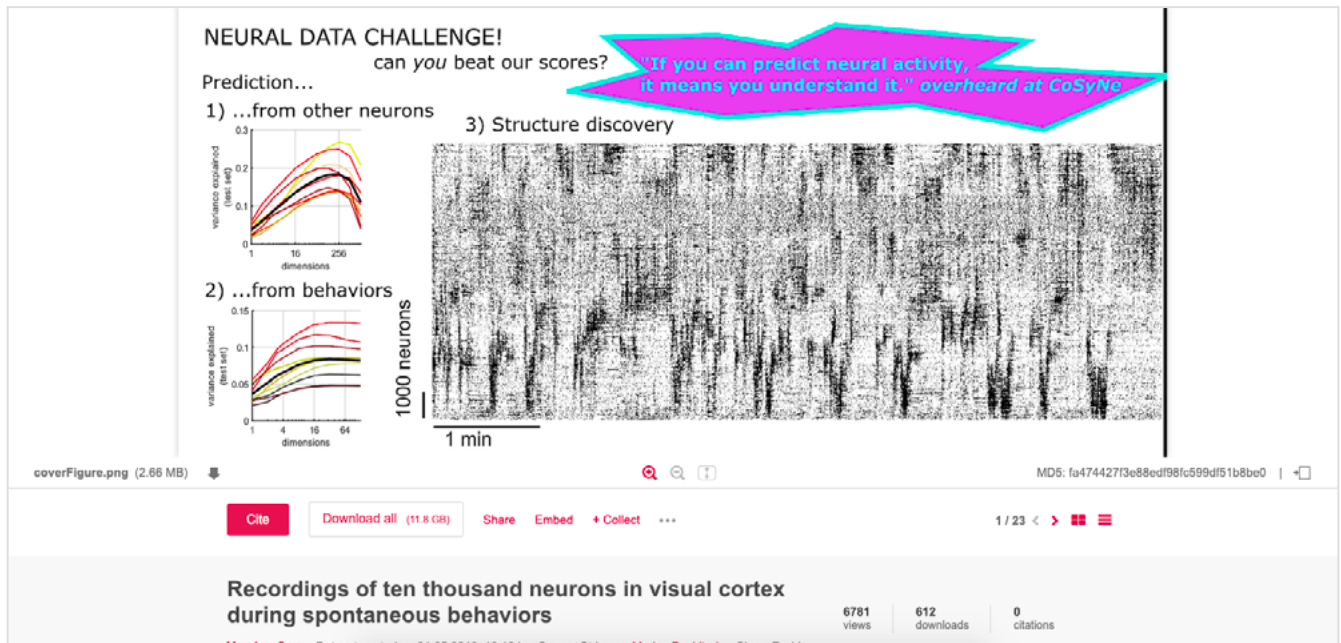
One of the results of the experiment was the discovery of high-dimensional behavioural representations in visual cortex. This means that when an action is committed, it sends signals to neurons all over the brain, including the visual cortex. This was an unexpected result; when running or sniffing, for example, it's expected that the motor cortex would be active, but not necessarily the visual cortex.

**This dataset**, has been the most used dataset Carsen and her colleagues have shared on Janelia's Figshare.

Prior to this research, Carsen focussed primarily on theoretical research. This data was the first she collected herself and she found the process of sharing it on [janelia.figshare.com](https://janelia.figshare.com) easy and straightforward. When deciding what to share, Carsen and her colleagues opted to share the minimal amount of processed data needed for reproducibility and to build on their analyses.

They have also referenced a link to their GitHub repository in each of their shared datasets available at <https://github.com/MouseLand>.

This data has been reused in at least two papers written by other researchers who have tried to separate two classes of signals: signals coming from the eyes and signals of the behavioural state. They have developed techniques for large-scale data analysis and applied the methods to the data collected by Carsen and her colleagues and to zebrafish data.



Stringer, Carsten; Pachitariu, Marius; Reddy, Charu; Carandini, Matteo; Harris, Kenneth D. (2018): Recordings of ten thousand neurons in visual cortex during spontaneous behaviors. figshare. Dataset. <https://doi.org/10.25378/janelia.6163622.v6>

"This has now opened up possibilities for further research; I have a new-found interest in zebrafish," said Carsten. "I also develop techniques for trying to understand high-dimensional data, and I have been applying my techniques to zebrafish data now that I know there are some similarities between zebrafish and mice in terms of their organization."

Another collaboration has formed after a researcher in Estonia found Carsten's data and got in touch wanting to work together on further experiments. They're currently working on a new statistical analysis technique that may be useful for a variety of large-scale datasets. This collaboration would not have happened if the data were not publicly available.

Not only has Carsten been able to collaborate with other researchers doing other experiments as a result of sharing her data, but her data has been used in The Neuroscience Data Challenge at the University of Bristol where researchers apply modelling and data approaches to neuroscience using data publicly available. They investigated Carsten's dataset in which mice were shown thousands of

images. The researchers explored how different types of images drove different types of neural activity. They did not see statistical differences between the responses of neurons to images in the "bird" category versus images in the "cat" category for instance. However, they did observe quantitative differences between the neural responses to natural images and the responses to unnatural whitened versions of these images (in which edges are over-emphasized) - the neural responses were less distinguishable from each other in the second case. More information on the data challenge is available at [www.bristol.ac.uk/neural-dynamics/information/neuroscience-data-challenge/](http://www.bristol.ac.uk/neural-dynamics/information/neuroscience-data-challenge/).