Project and main ideas

Cell type classification is used in drug target discovery as well as drug discovery, but identifying cell types can prove to be difficult and time consuming. The way we define cell types is by using a combination of pharmacology, structural identification, and transcriptomics (a omniscient assay providing every gene expressed in each cell) to define these cell types. Here in our assay we define the cells mainly using two different assays. This is most easily explained in a [video](https://youtu.be/QHNU0AGOKHw), and for a more in depth discussion on the entire ramifications of this assay, see this [video](https://youtu.be/Ff1E0l2Zlhw?t=342).

1. Dynamic depiction: This is captured by filling the neurons with Fura2, a dye indicative of calcium. Calcium indicates when specific channels (targets of pharmacological intervention) open up. An image is captured every two seconds during these experiments.
2. Static depiction: neurons can be defined by structural and genetic labeling techniques to help define further what defines these neurons. In this assay we have 2 different markers of pain (see video 2), as well as size characteristics.

Automatically identifying these depictions to define the neurons cell class has been intensely worked on for the past three years, but a few questions still emerge from this work;

1. Can this process become completely automated.
2. Can we gain insight from the automation?

Often when using deep neural networks the interpretability is negligent. Although advances have been made with gradient ascent, obtaining information and structure from this type of work can be difficult. The approach made here is to design a structure of prediction from a compilation of multiclass neural networks to define which model performed the best.

Methods

Single experiment are R lists (equivalent to python dictionaries). With the list are time series data (what we will refer to as traces), and images.

1. Image prep: The images are dimension 2048 x 2048 with the images ~ > 2000 cells are captured in a single image.