BrainBuilder: Pseudocolumn

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Human Brain Project

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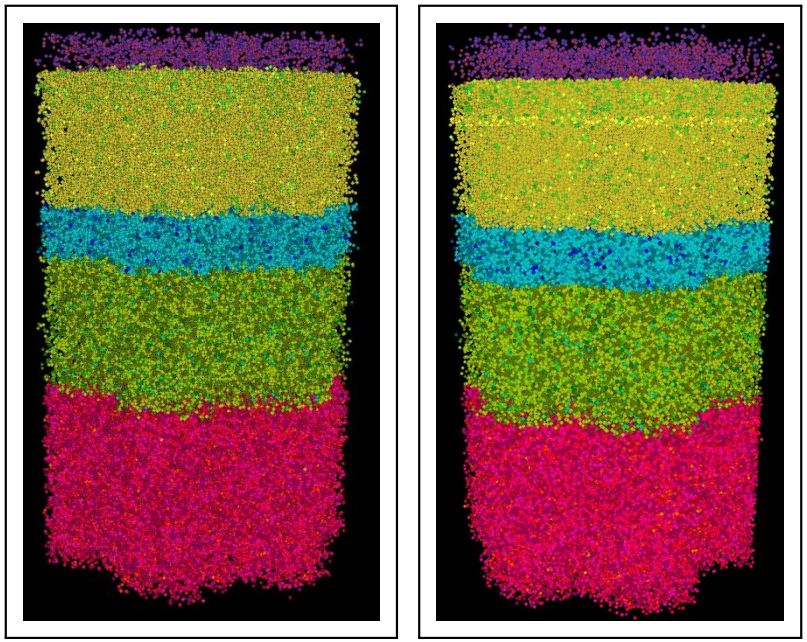
Replication the column using BrainBuilder

Which one is which?



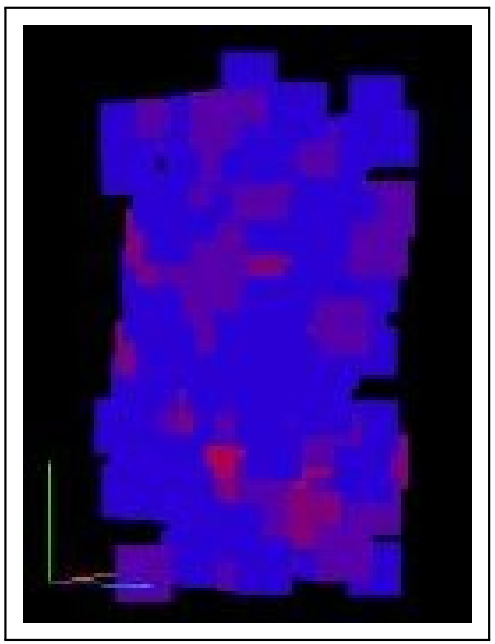
Purpose

- See how well we can replicate the current column
- Have for check validation
- Have to do a 'vertical' column, since the later stages of the toolchain don't support arbitrary transformations

Generate Densities

Take the original column, and 'voxel-ize' it to produce a cell density map

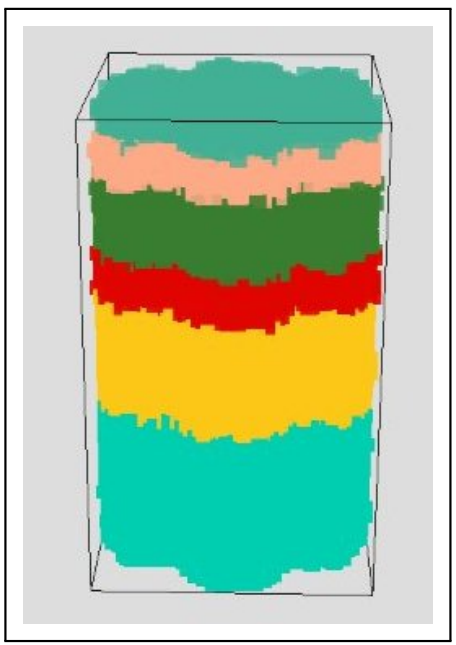
- Based only on soma positions
- Do not look at ME-Type or sClass



Generate Annotation Map

Take the original column, and 'voxel-ize' it to produce a cell annotation map

- Per voxel, gather all the cells, and the most popular layer label 'wins'



Generate Annotation Hierarchy

Take the original column, and 'voxel-ize' it to produce a cell density map

- Can't use the stock Allen Institute one: they use 1, 2/3, 4, 5, 6a, 6b, as SSCx layers
- Want to use our XML recipe, so have the same dimensions

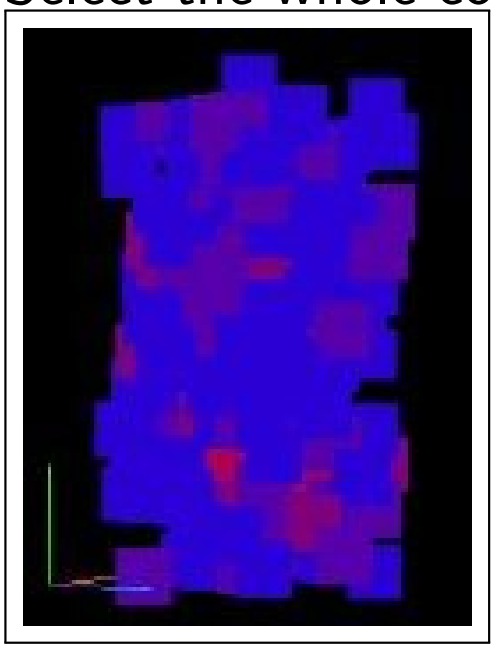
```
{
    "id": 21,
    "atlas_id": 977,
    "ontology_id": 1,
    "acronym": "SSp-ll1",
    "name": "Primary somatosensory area, lower limb,
        layer 1",
    "color_hex_triplet": "188064",
    "graph_order": 56,
    "st_level": null,
    "hemisphere_id": 3,
```

Write Modules for BBP recipes

- Create 'Spatial Distributions' using the recipe
  - Need placement hints from NeuronDB.dat
  - Need cell percentages from builderRecipeAllPathways.xml

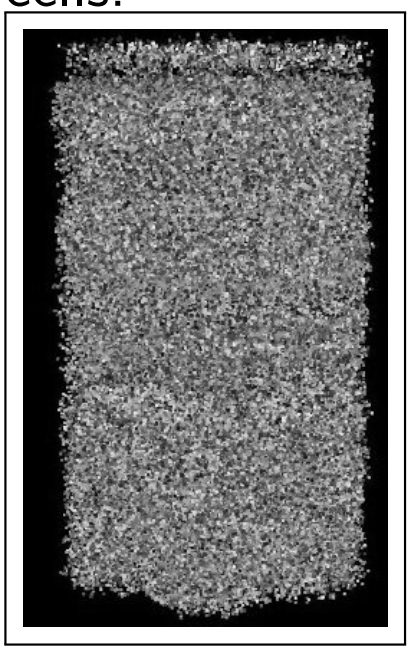
Select the Region

Select the whole column:



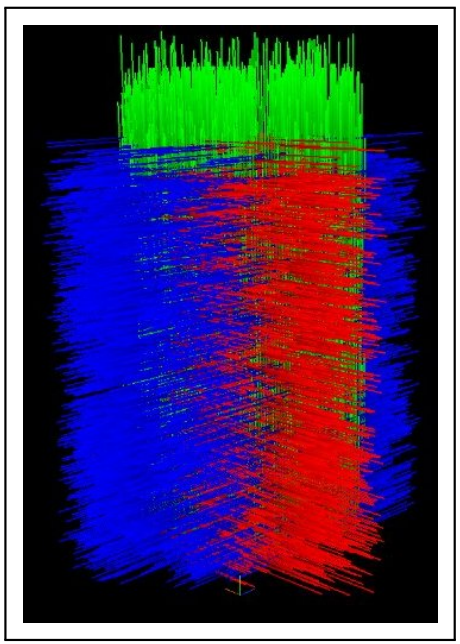
Place the cell bodies

Colour doesn't mean anything, just needed contrast from different cells:



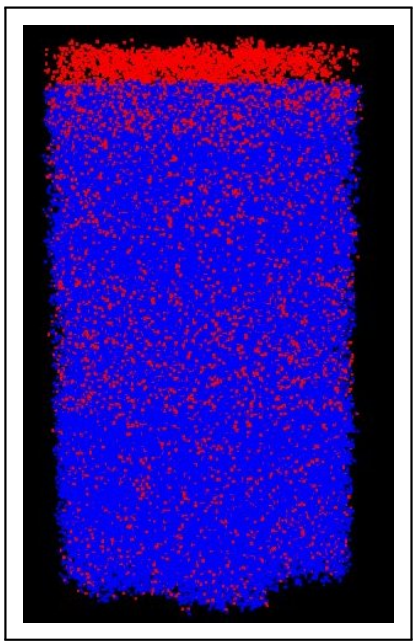
Aside: Vector Fields

- For each voxel, need the nearest voxel that isn't of the same annotation
- Green is 'Up', which is all we need for the SSCx at the moment
- Other colours are for more complicated modules, if necessary



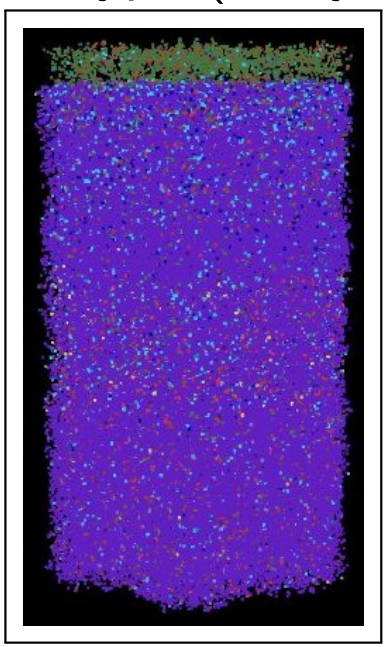
Assign E-I-ness

Assign 'sclass' to cell bodies (Blue is Inhibitory):



Assign ME-Types to cell bodies

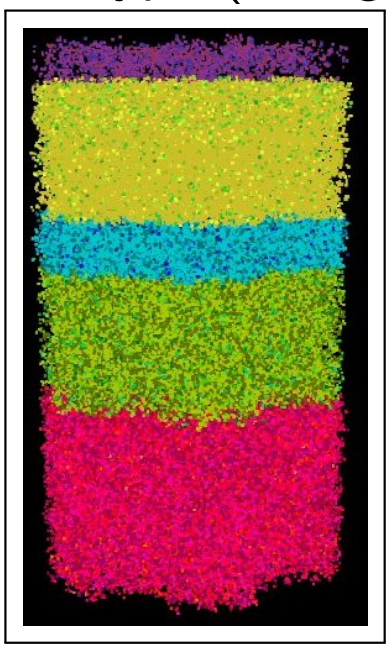
E-Type (Sorry about the colours):



Note: ME-Types are assigned in the same module

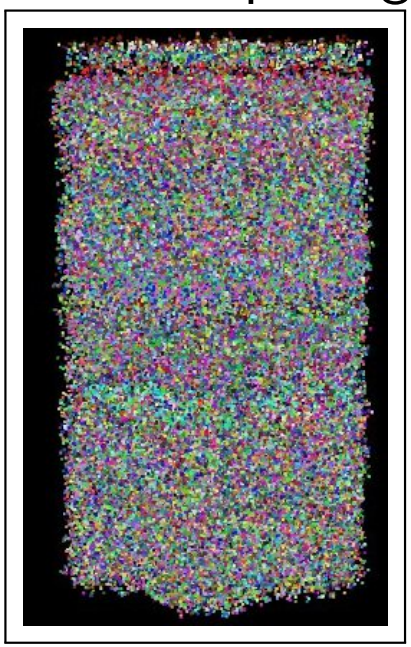
Assign ME-Types to cell bodies

M-Type (Using same colour scheme as Platform column viewer):



Assign morphologies to cell bodies

Each morphology is assigned a different colour:



Future work

- Can synthesize the 'whole' brain, including 3D orientations, need new format to describe this freedom
- The scale of this pseudo-column matches the old column, so rat morphologies work, however the Allen Institute map is mouse. We can scale the voxel sizes appropritately
- Currently not worrying about, but that should be addressed:
  - Colliding soma positions
  - Morphologies protruding out of bounds
  - Coarseness of Allen Institute annotations: causes weird artifacts. Csaba has ways around this.