

Towards Automated Integration of Neuron Morphologies into Circuit Building Pipeline

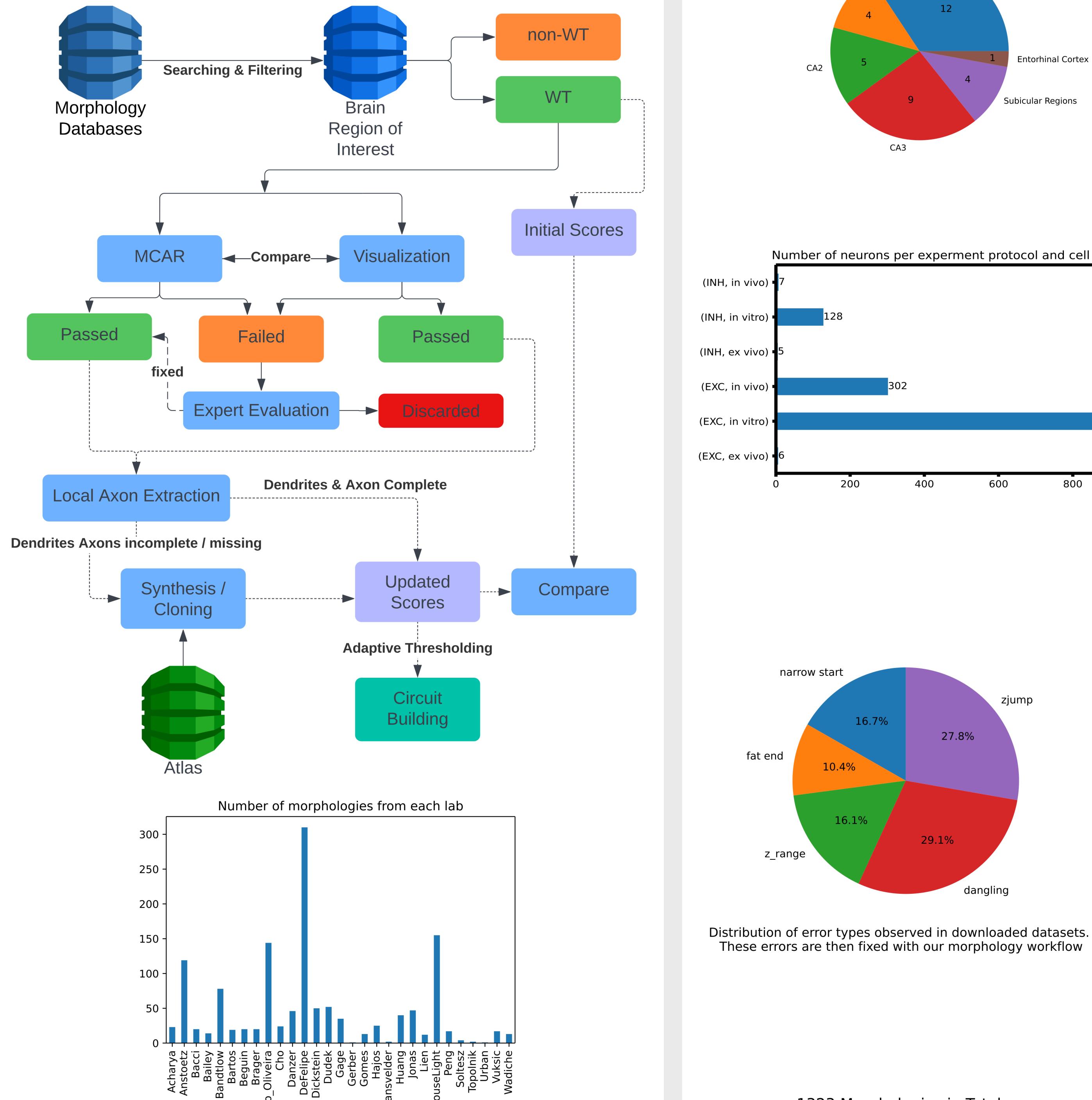
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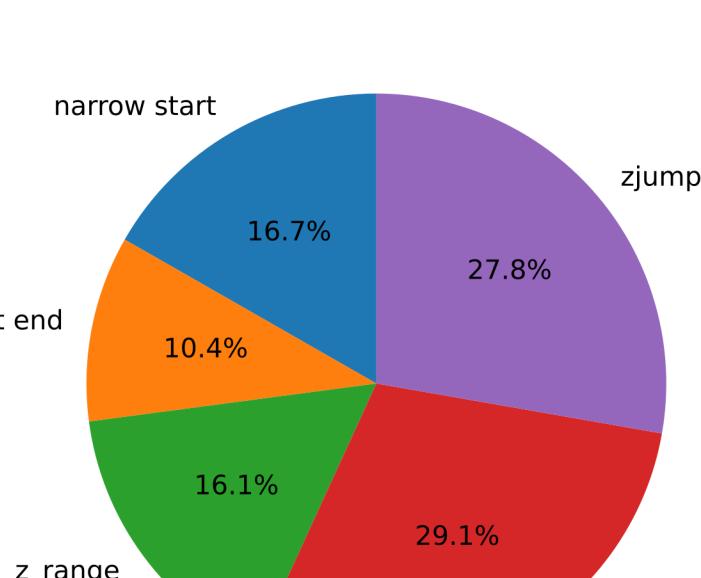
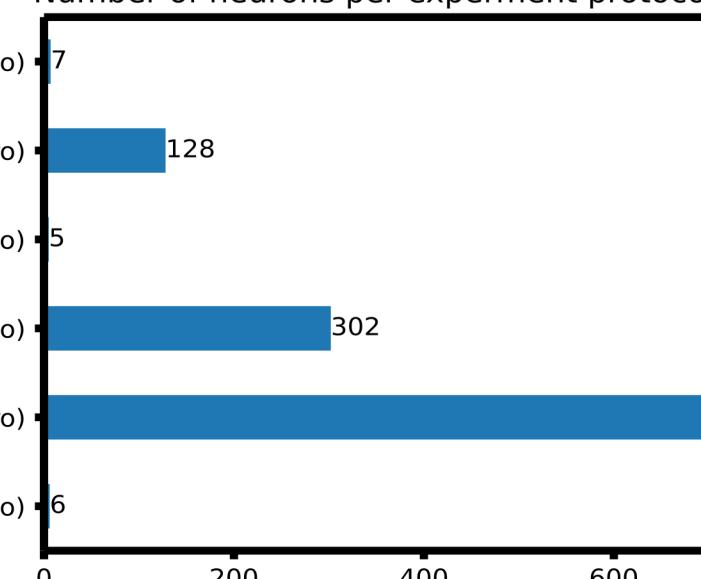
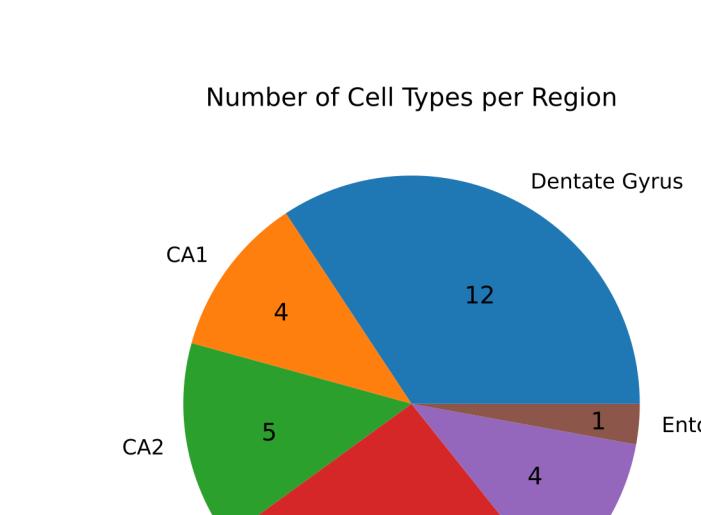
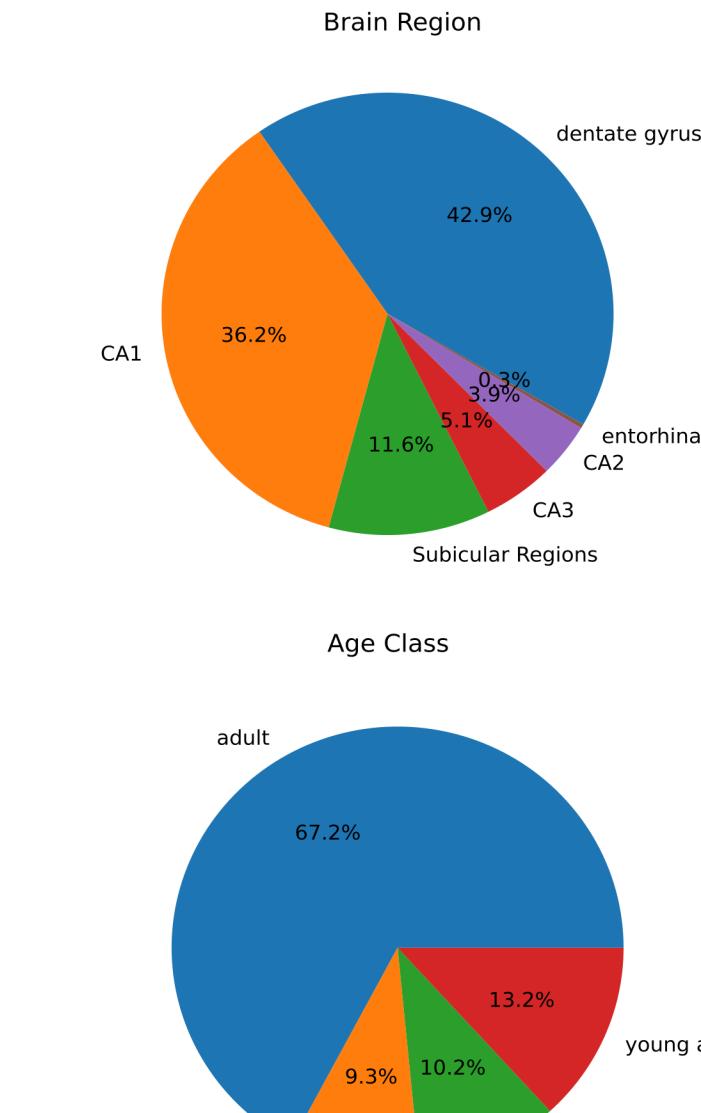
Introduction

In this poster, we report progress on developing an automated and generic workflow for integrating neuronal morphologies reconstructed by the neuroscience community into the BBP Multiscale Mouse Brain (MMB). Here we used the hippocampal formation as a use-case to show the integration workflow, metadata extraction and quality scoring prior to neuronal synthesis and circuit building pipelines.

Generic Workflow



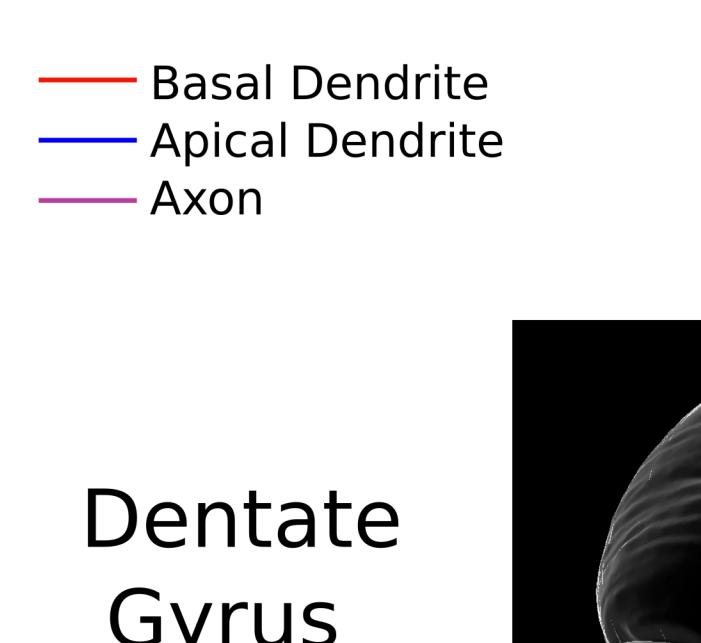
Metadata



Distribution of error types observed in downloaded datasets.
These errors are then fixed with our morphology workflow

1323 Morphologies in Total

Morphologies



Age Class: adult (67.2%), young (13.2%), not reported (9.3%), young adult (10.2%).



Entorhinal Cortex: 1

PC: Pyramidal Cell
GC: Granule Cell
PVBC: Parvalbumin-positive Basket Cell
NPY+: Neuropeptide Y positive Cell

Discussion

- ✓ Databases do not have a unified morphological type ontology.
- ✓ Some labs present only the positive markers whereas the others indicate the destination points or electrical type along with a EI class.
- ✓ There are cells with biased dendrites which may be following the curvature of the brain region or the dendrites could be stained incompletely.
- ✓ For Allen v3 atlas registered morphologies, some cells are located in the borders which are mistakenly classified as cells from a different brain region. The regional annotation and the inferred region from the cell position contradicts.
- ✓ Some cells have contralaterally projecting axons which raises a problem during cloning and synthesis procedure. We are working on extracting topographical properties to safely use these neurons as a substrate for synthesis.

References

- Ascoli et al. (2007) NeuroMorpho.Org: a central resource for neuronal morphologies. *J Neurosci.*, 27(35):9247-51
- Frö et al. (2018) A Cell Atlas for the Mouse Brain. *Frontiers in Neuroinformatics* 12, 84. DOI: 10.3389/fninf.2018.00084
- Lein et al. Genome-wide atlas of gene expression in the adult mouse brain. *Nature* 445, 168-176 (2007). https://doi.org/10.1038/nature05453
- https://github.com/BlueBrain/morphology-workflows

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