

NeuroLight Workbench



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Client and Sponsor

Dr. Doerry, NAU
Dr. Allen, OHSU

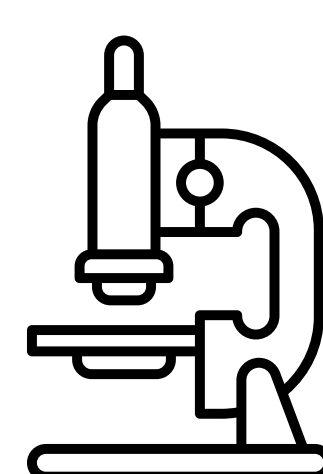


Team Mentor

Ogonna Eli

Problem Overview

Circadian rhythm research involves analyzing hundreds of microscopy images to identify active neurons. Manual analysis is time-consuming and inconsistent. Our sponsors want to automate areas of analysis to accelerate neuroscience research, while maintaining a modular application



Circadian rhythm research requires complex **neuronal activity analysis** that is time consuming and delicate.

NeuroLight streamlines the process of neuron detection and activity tracking, making neuroscience research **faster and more accessible**.

Key Features

NeuroLight streamlines neuronal activity analysis through:

- Robust image alignment correcting drift
- Adaptive neuron detection
- Intuitive interface for result validation

By automating labor-intensive manual analysis, the system enables consistent, reproducible analysis of neuronal activity patterns.

Technologies



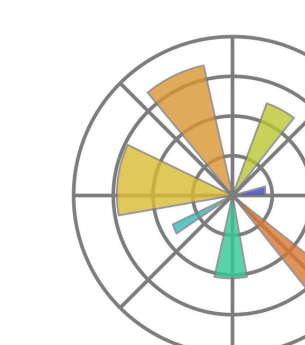
Main Framework:
Python



Image Alignment:
PyStackReg



Frontend:
PySide6



Data Visualization:
Matplotlib



Image Analysis:
OpenCV

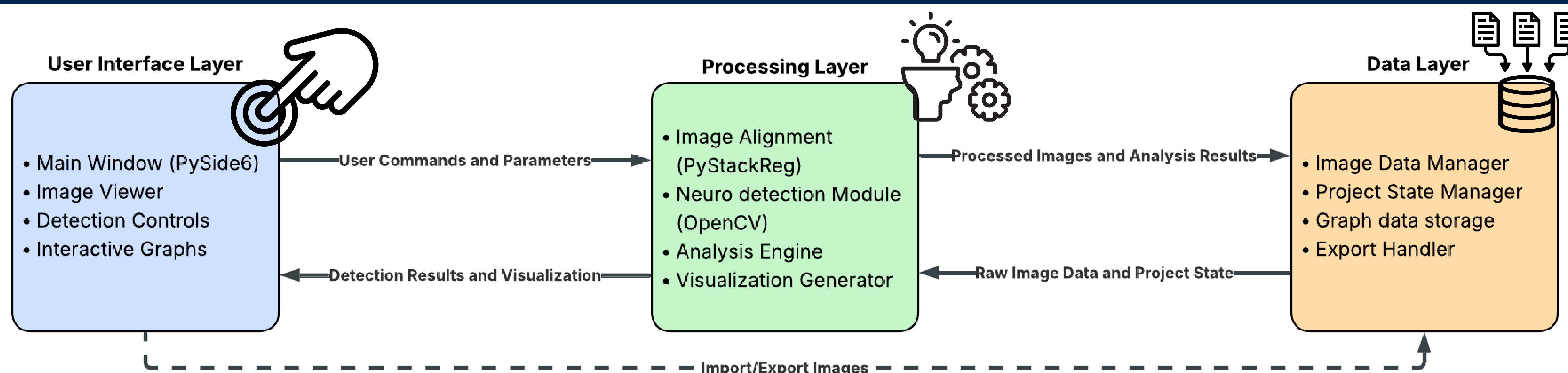


Numerical Analysis:
NumPy + SciPy

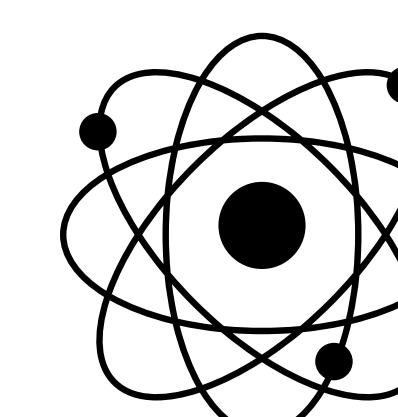
Current Status

We have completed requirements gathering and implemented core functionality including image alignment, automated neuron detection via adaptive thresholding, and interactive visualization. Current work focuses on refining detection accuracy. Next steps include validation against manual work, and performance optimization for larger datasets.

System Architecture and Implementation



Future Work



Complete the statistical verification and comprehensive testings, then implement data import/export, ROI selection, fluorescent trace extraction, and visualization dashboard. Then we will implement circadian rhythm analysis modules, followed by intense software optimization and client deployment preparation.