

A Scalable System for Social Neural Imaging: Integrating Multi-animal 3D Pose Tracking and Ca₂₊ Imaging in Freely Interacting Animals

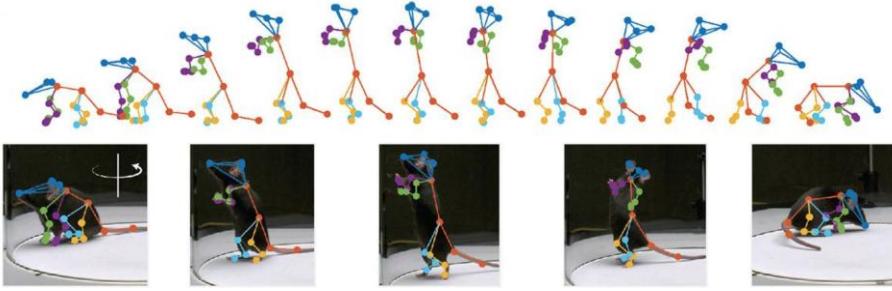
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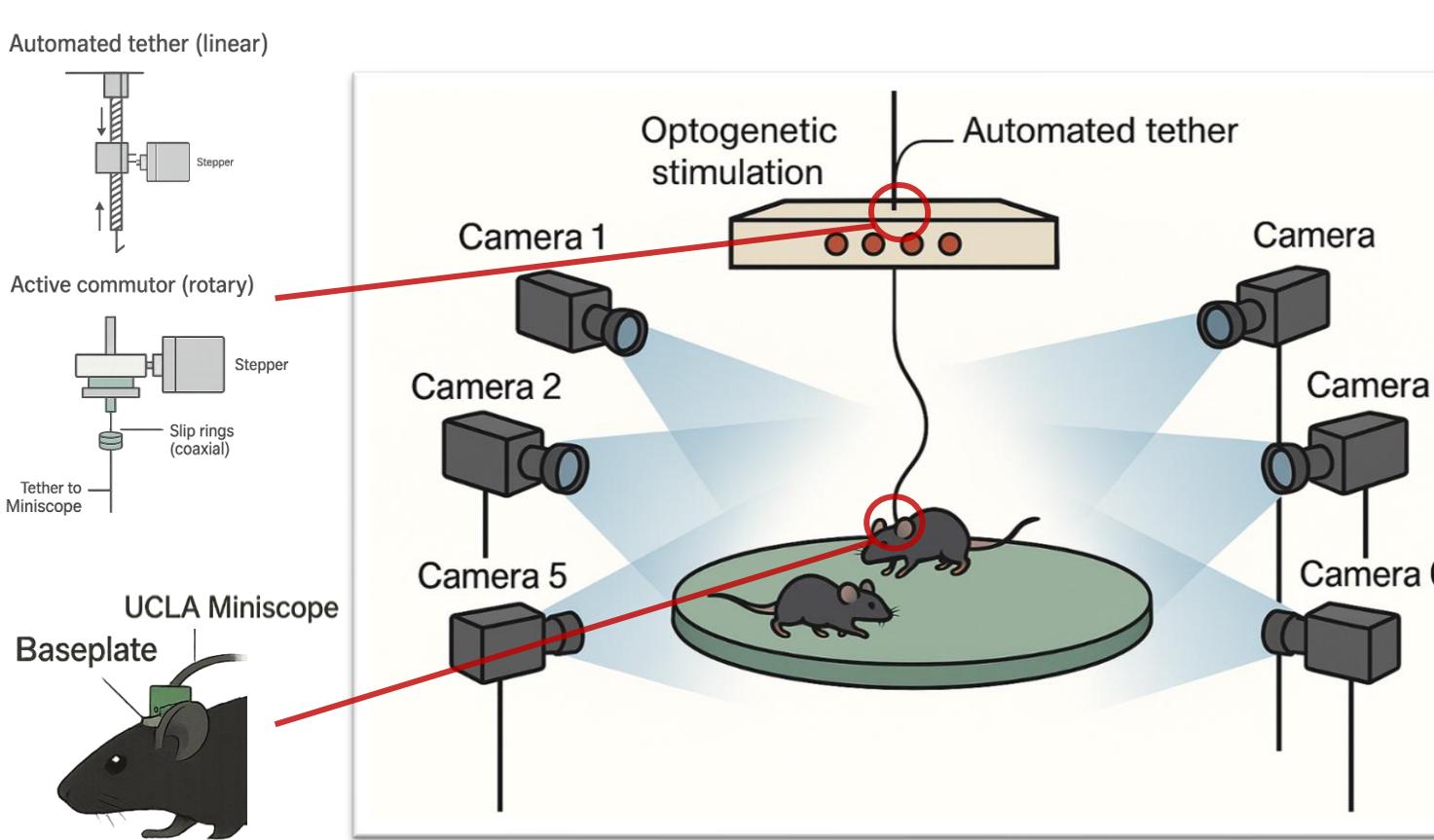
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Background & Purposes

- Prior:** social-DANNCE (sDANNCE) has mapped rich social behavior in rats [1].
- Gap:** Mice add scale/occlusion/identity + head-mount imaging challenges. Cortical-surface level Calcium imaging remains challenging in freely moving animals.
- This work:** Six-camera s-DANNCE-style tracking + Miniscope V4 (1p) using cranial windows.
- Payoff:** Quantitative 3D kinematics + stable ΔF/F (V1, PMC/M1) → naturalistic social neurobehavior studies.



System Schematic

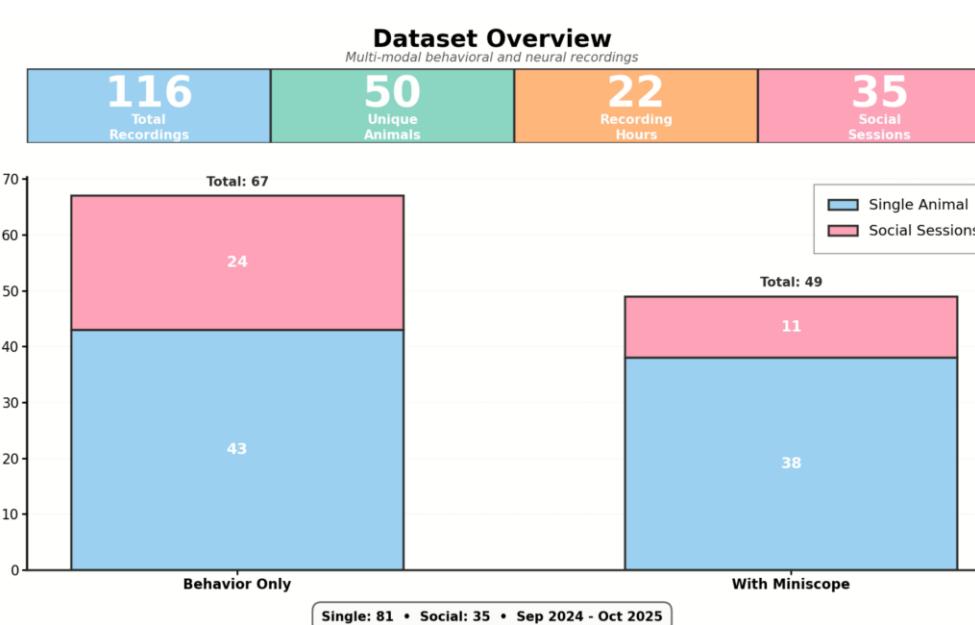


Pipeline & Alignments: BBOP

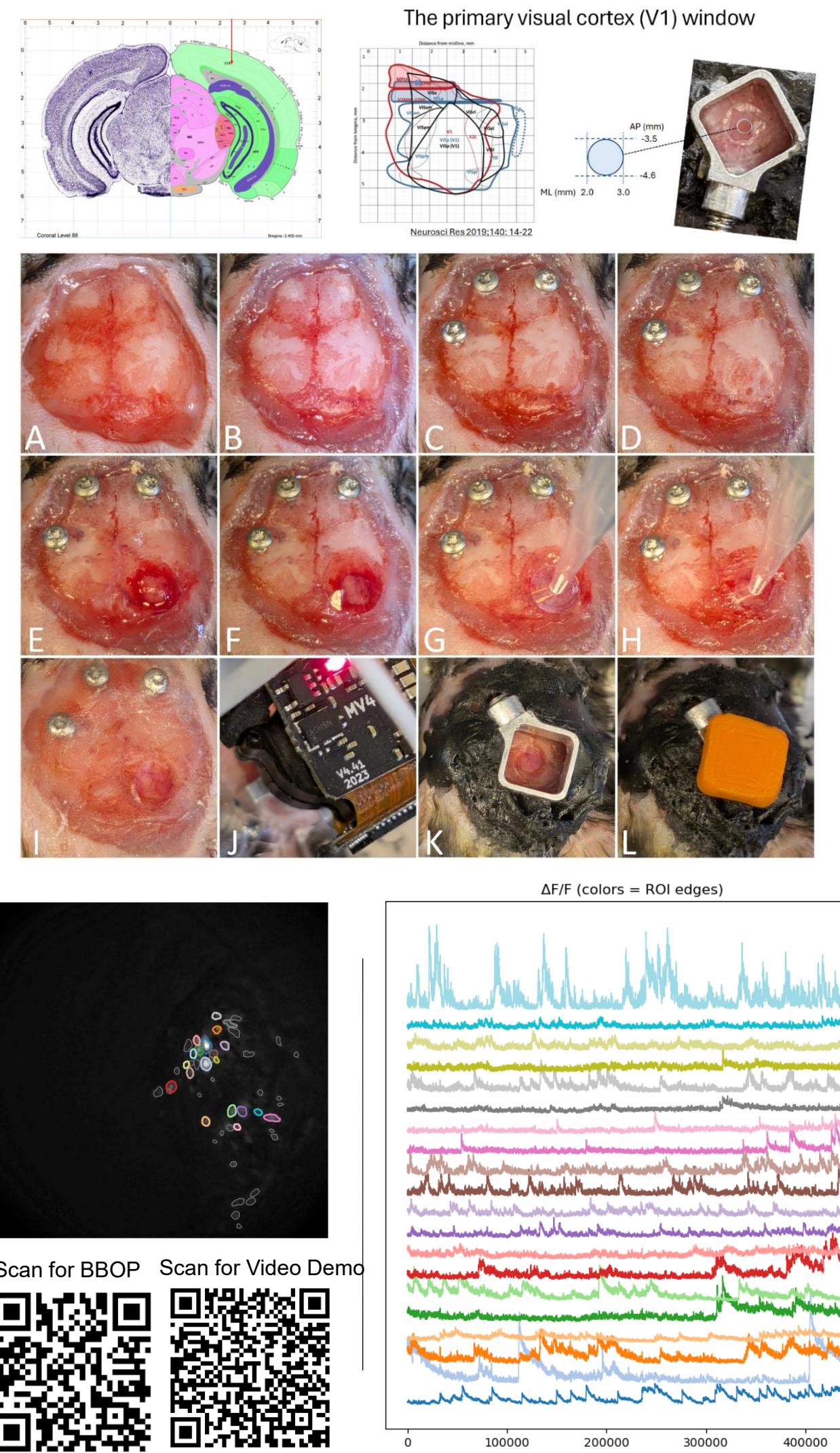
BBOP Pipeline Highlights

- Scan:** Flag Processing Status
- Filter:** For executions of any stages
- Execute:** Sync → Predict → Align

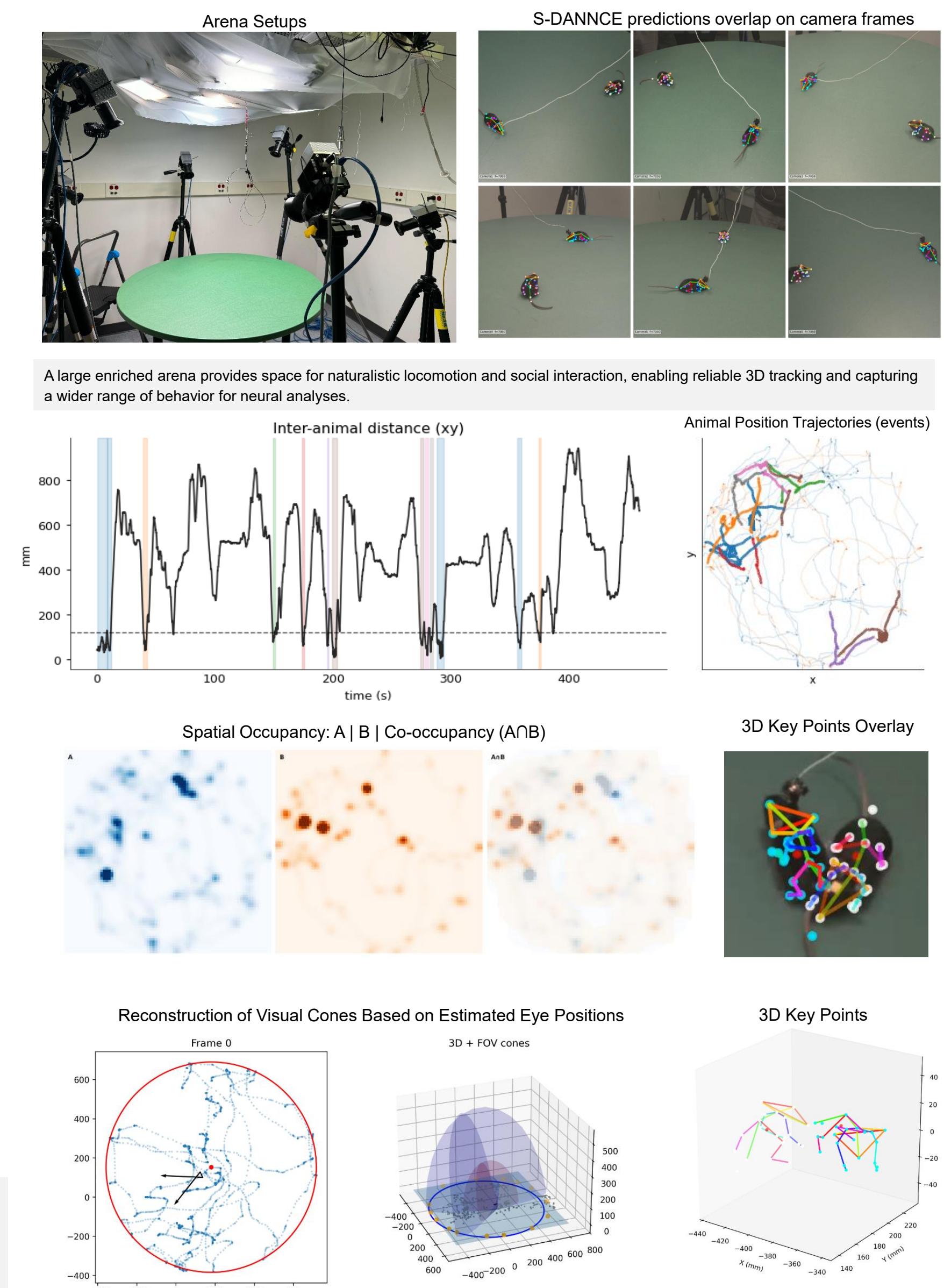
| rec_file | sync | COM | social | post-oxy |
|----------|------|-----|--------|----------|
| mice1 | ✓ | ✓ | | |
| mice2 | ✓ | ✓ | ✓ | ✓ |



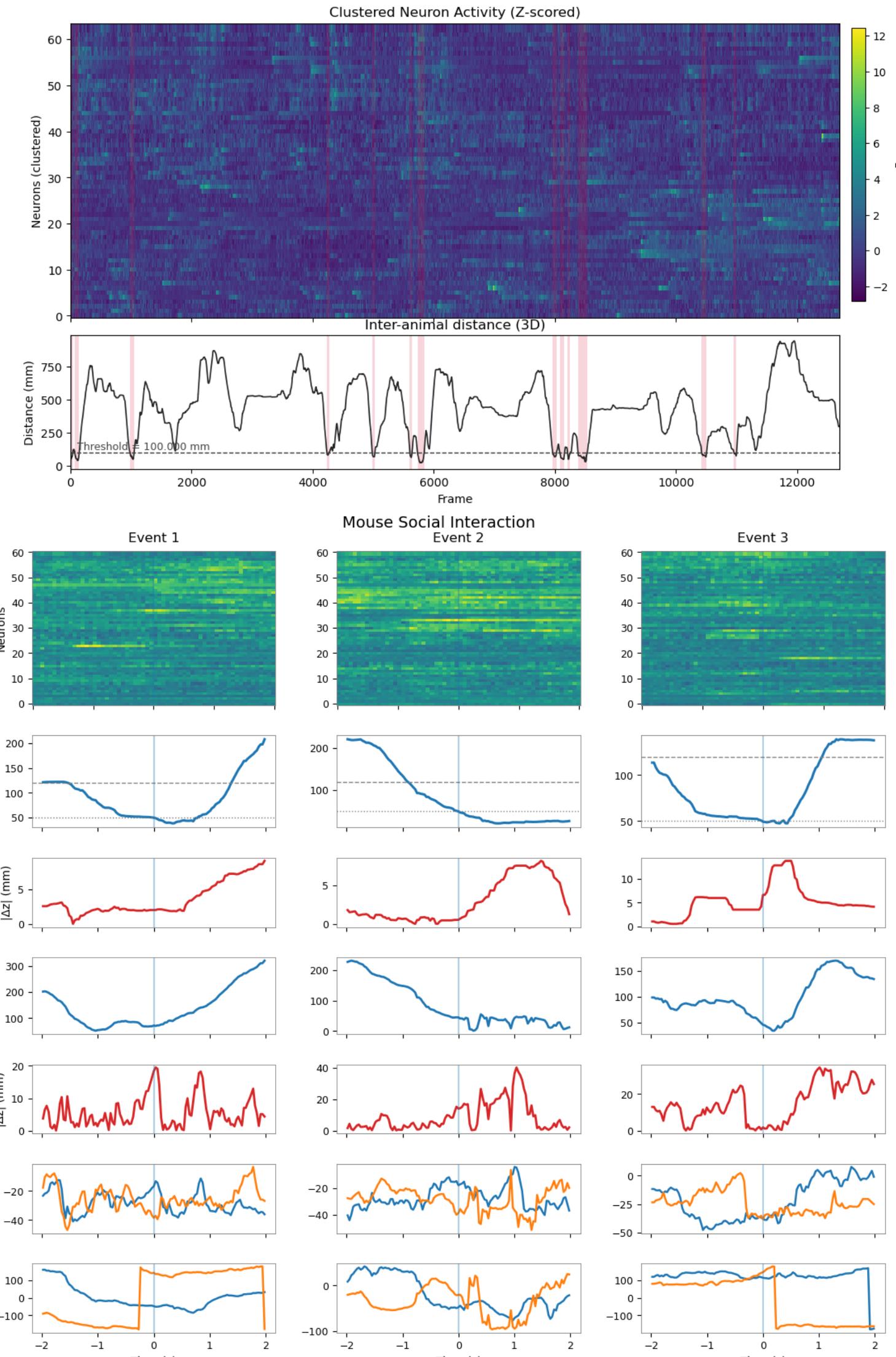
Neural Data Pipeline



Behavior Data Pipeline



Aligned Data For Social Interactions



Summary

We have built a system that can be used for decoding neural activity in mice during both solitary and social natural behaviors. This setup makes it possible to ask how visual and motor circuits encode key spatial variables—edge distance, partner proximity, and approach/escape structure—and how neural activity predicts future movement and social trajectories.

References

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Unsupervised Behaviors Clusters

