Socially Situated Navigation

Social Rank and Sex Influence Spatial Navigation Strategies in Japanese Macaques

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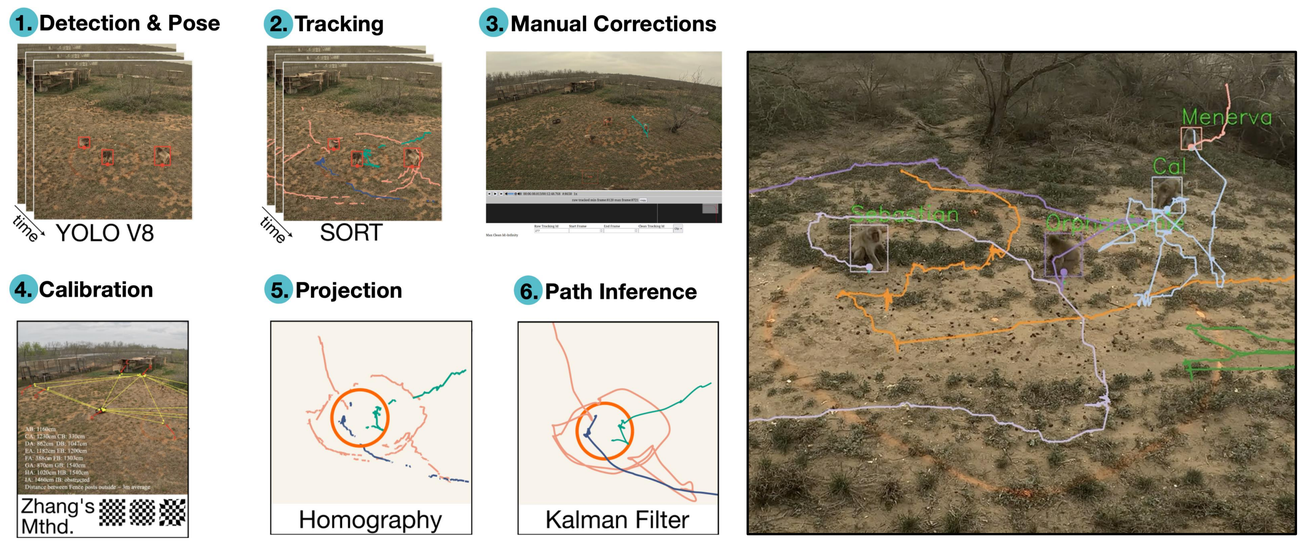
Social Proximity and Navigation in Macaques

- **Primate social interactions** are embedded in spatial relationships
- **Social proximity** strongly predicts affiliation, dominance, and tolerance[1]
- However, proximity is commonly coarsely estimated treated as a **static category**[2,3], neglecting its dynamics and context
  - ➢ We relate macaques' **social structure** to precisely measured **trajectories** in naturalistic settings as they compete for **access to a limited food resource**

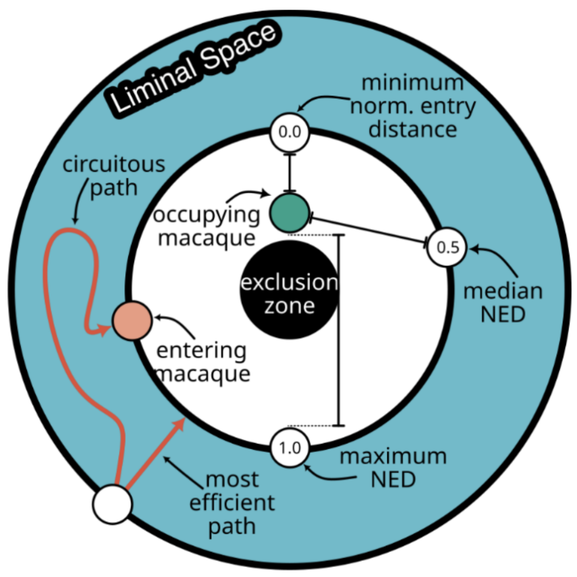
Field Experiment & Computer Vision

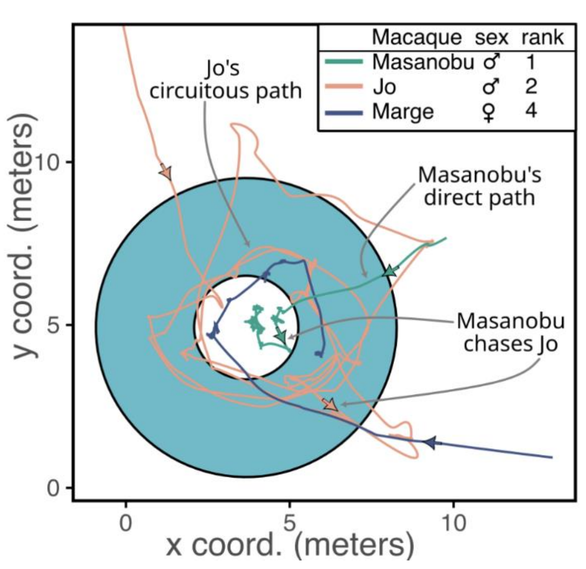
- **Subjects:** 2 groups of Japanese macaques (24 & 46 individuals) at Born Free USA Sanctuary, TX, USA
- **Setup:** 10 social tolerance test[4] sessions per group
  - ➢ food-baited circle → resource conflict & co-feeding
- **Computer Vision Tracking** with monocular cameras (GoPro)
  - ➢ Calibrated computer vision pipeline[5,6]
  - ➢ **Locations** and **trajectories** measured by projecting paths to **real-world coordinates** via homography



Computer Vision Pipeline

Macaque Path Tracking + IDs



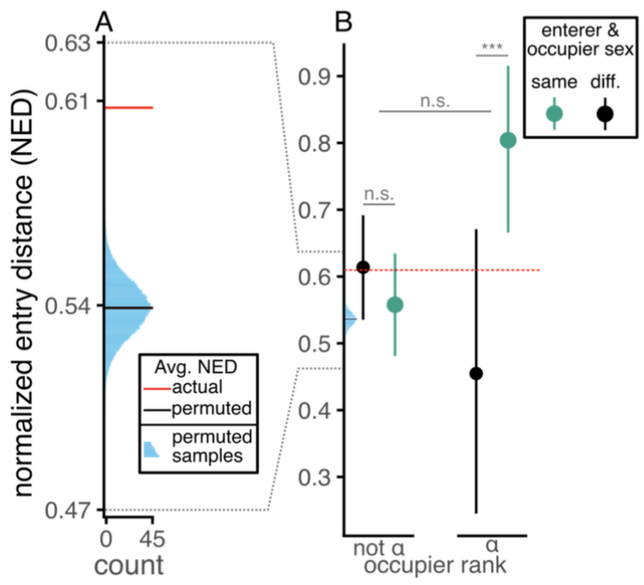


Circle Entry Point & Path Measurements

Tracking Projection Example

Results

- Food circle **entries reflect social rank & sex** (GLMM)
  - ➢ Macaques entered the circle farther away from others than chance
  - ➢ **Lower-ranking males** kept **greater distance** from **alpha males** (Normalized Entry Distance: males = 0.80 vs. females = 0.46)
- **Paths** into food circle **differ by rank** (LMM)
  - ➢ **High-ranking** macaques took **more direct paths**, lower ranks entered **more circuitous**
  - ➢ Paths were **longer** when **alpha** occupied the circle



Circle Entry Distance from Others

Path Into Circle Length

Discussion

- Macaques weigh **social risks** against **resource access** when navigating
  - Navigation is not just about **spatial reasoning**—it's shaped by **social knowledge** and **expectations**
    - ➢ ***Superimposing*** internal structure (social relations) onto the external experience (location of food & conspecifics)
- Our method of accurately measuring social distances opens avenues to study **social learning, tolerance & cultural transmission** in primates and beyond.

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PAPER PDF

VIDEO DEMO

References

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