# AFIDs: a standardized framework for evaluating anatomical correspondence between primate brains

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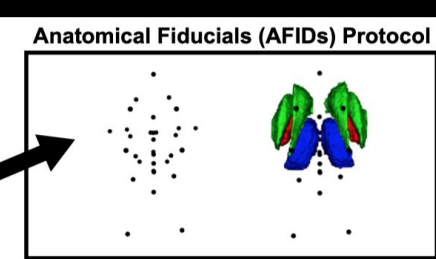
## Background & Previous Work

Evaluating correspondence between brain images

Region-Based
Voxel overlap
A ∩ B
A ∪ B

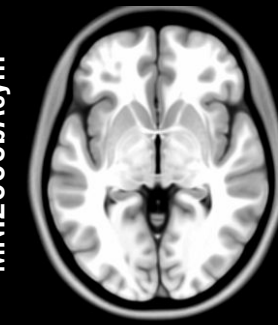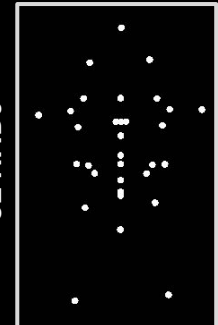Point-Based
Distance
? mm

Anatomical Fiducials (AFIDs) Protocol

Lau et al. (2019)

striatum    pallidum    thalamus

## Overview:
### Translation of Human Protocol to Macaque

MNI2009bAsym
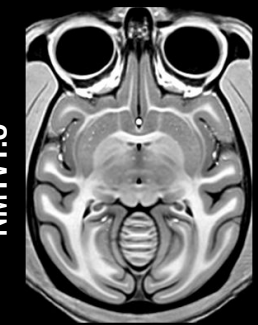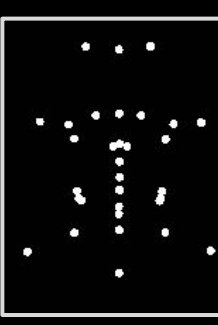
Locating homologous anatomical landmarks across species

NMTv1.3
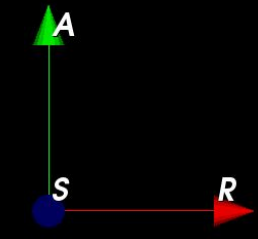
32 AFIDs

A
S    R

32 AFIDs

**AFIDs Protocol:**    🔗 **Human**    🔗 **Macaque**

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## Workflow

**Materials**

Templates scans (N=5)

D99    Yerkes19    INIA19

MNI macaque    NMTv1.3

Single subject scans (N=8)

(N = 8) ...

**Participants**

BrainWeb

8 raters recruited from the collaborative online neuroscience community

3DSlicer

Database

PRIMatE Resource Exchange

An open resource exchange platform for non-human primate neuroimaging
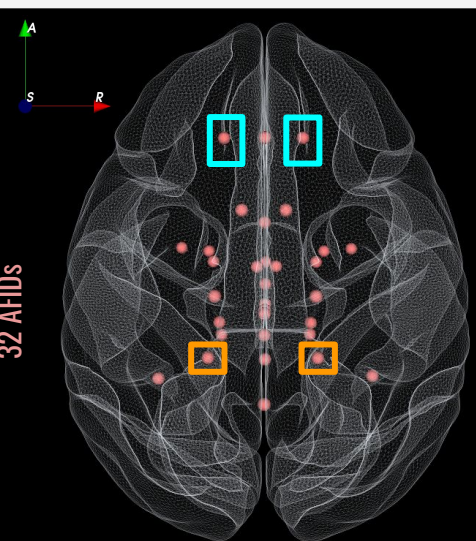
**32 AFIDs placed by each rater**
☐ Templates (x3 rounds)
☐ Single subjects (x2 rounds)
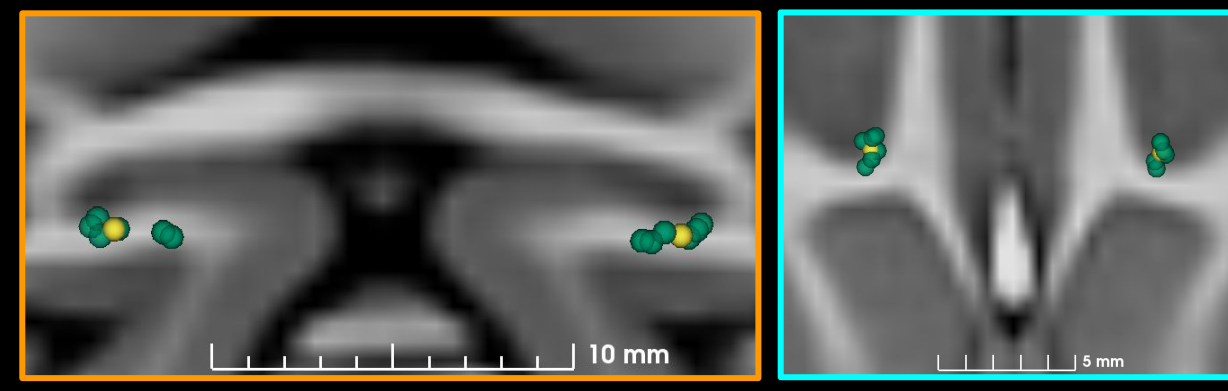
**Development**
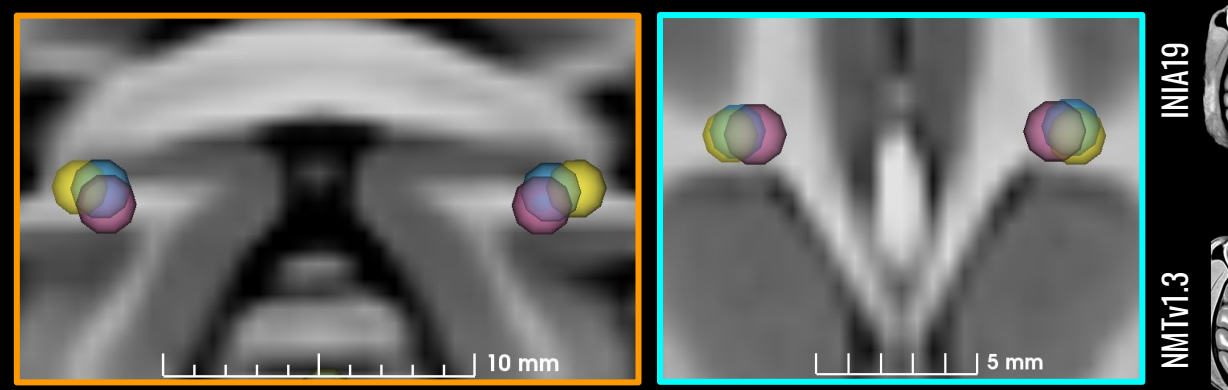
**1 Placement Protocol**
32 AFIDs

🔗 Web application

**AFIDs Validator**

Compares rater placements to protocol

**Validation**

**2 AFLE**
AFIDs localization error

Rater mean

Individual rater

10 mm    5 mm

**Application**

**3 AFRE**
AFIDs Registration Error

Linear

Linear + non-linear

INIA19

NMTv1.3

10 mm    5 mm

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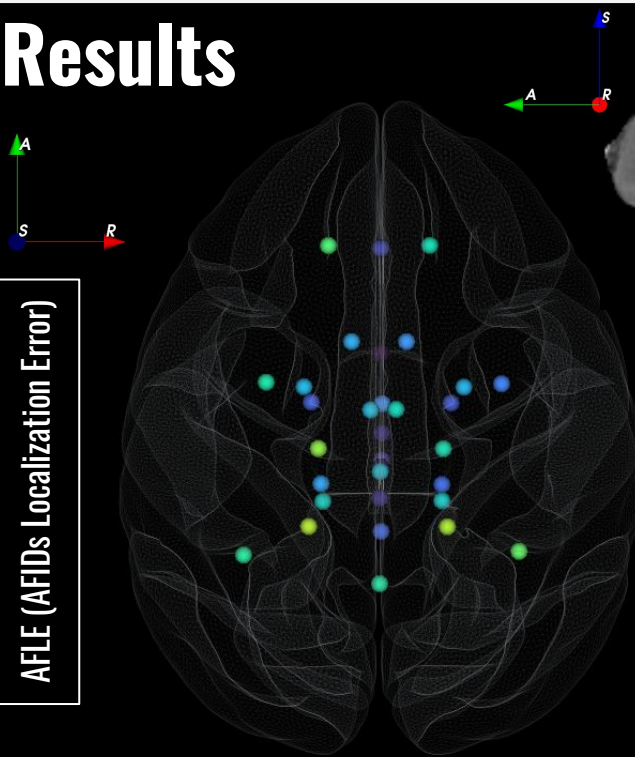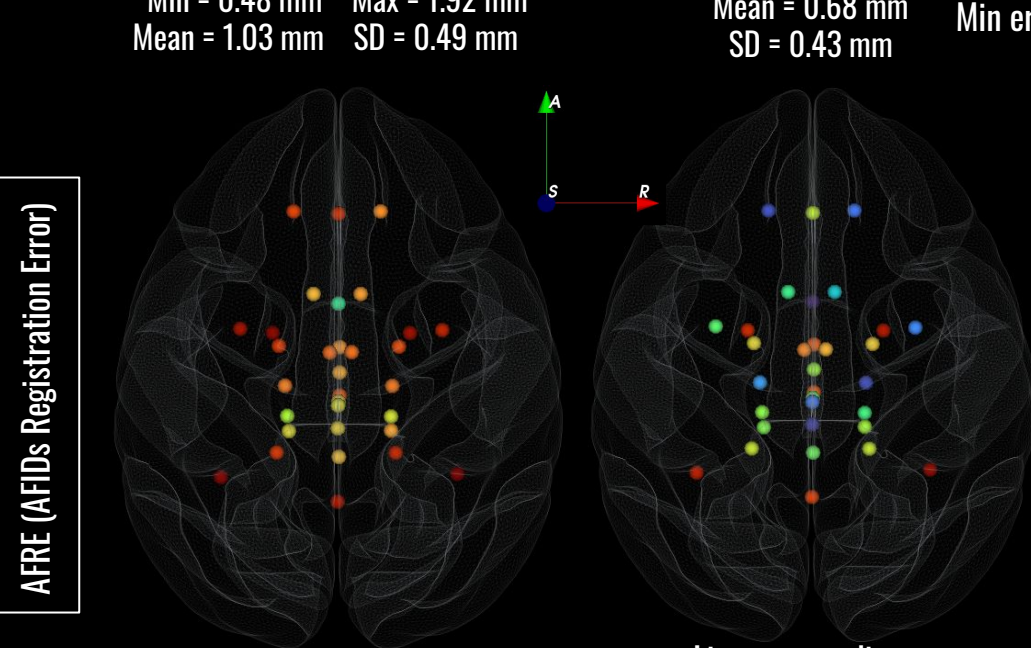
## Results

**AFLE (AFIDs Localization Error)**

Min = 0.2 mm
Max = 0.66 mm
Mean = 0.42 mm
SD = 0.25 mm

Min = 0.48 mm    Max = 1.92 mm
Mean = 1.03 mm    SD = 0.49 mm

Min = 0.23 mm
Max = 1.45 mm
Mean = 0.68 mm
SD = 0.43 mm

Max error

Min error

**AFRE (AFIDs Registration Error)**

Linear coregistration

Linear + non-linear coregistration

## Conclusions & future directions

- Human AFIDs protocol has been successfully extended to macaque brain images.
- Future directions will further extend this work into single subject scans, assess inter-rater AFLE, and compare distance metrics (AFIDs) with more conventional voxel overlap metrics in assessing brain correspondence accuracy of linear and non-linear coregistrations.