Cranium

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Abstract

Collaborated with the Barresi Lab, we continued Δ SCOPE by extending functionalities in R package–Cranium. We modified existed functions in Cranium, built new functions and optimized parameters so that evaluating sample alignments is no longer vulnerable to subjective biases. Additionally, alignments will be able to run automatically without labor-intensive manual correction that would introduce more researcher biases.

Author summary

This is our first draft.

Abstract 1

Introduction 2

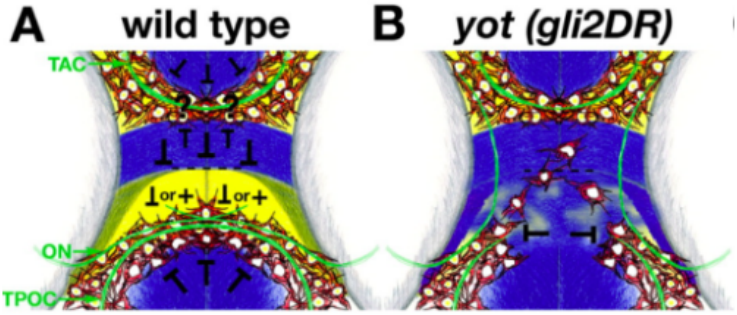
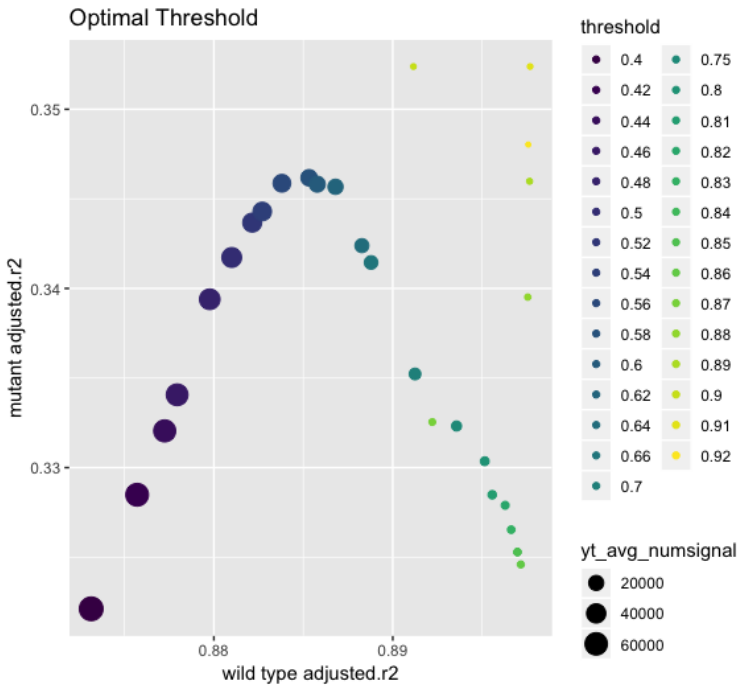


Fig 1. Wild Type and Mutant Commissure

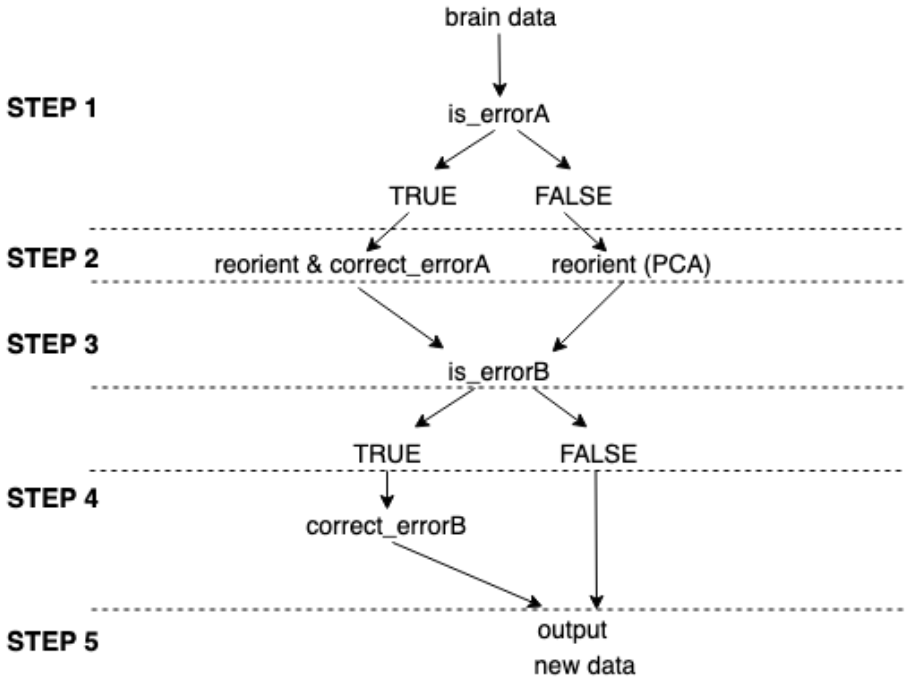
Data

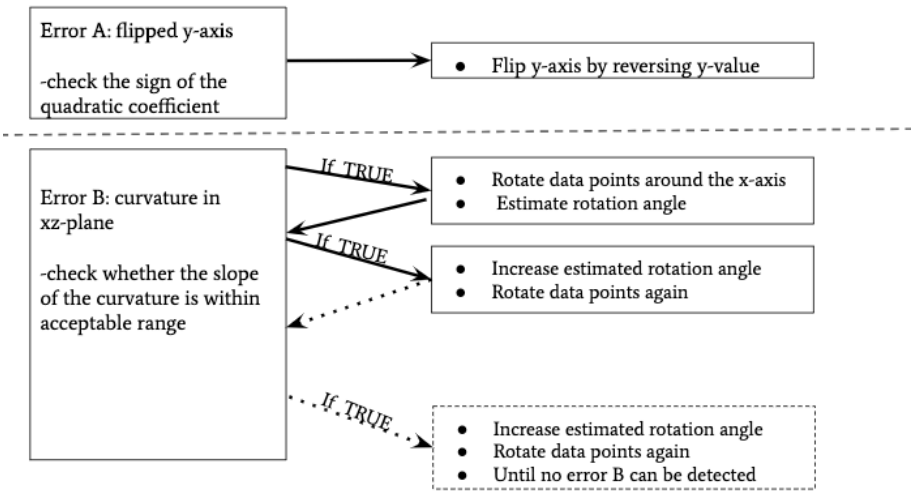
Programming Languages

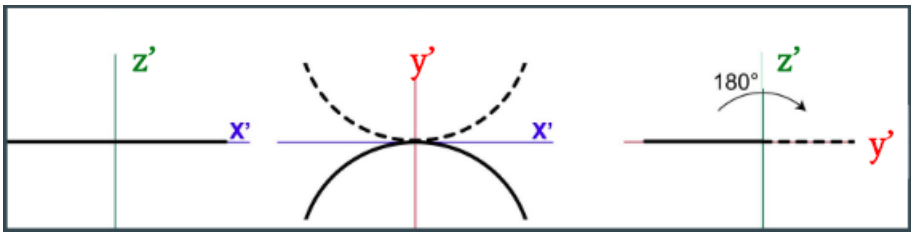
Pre-Correction

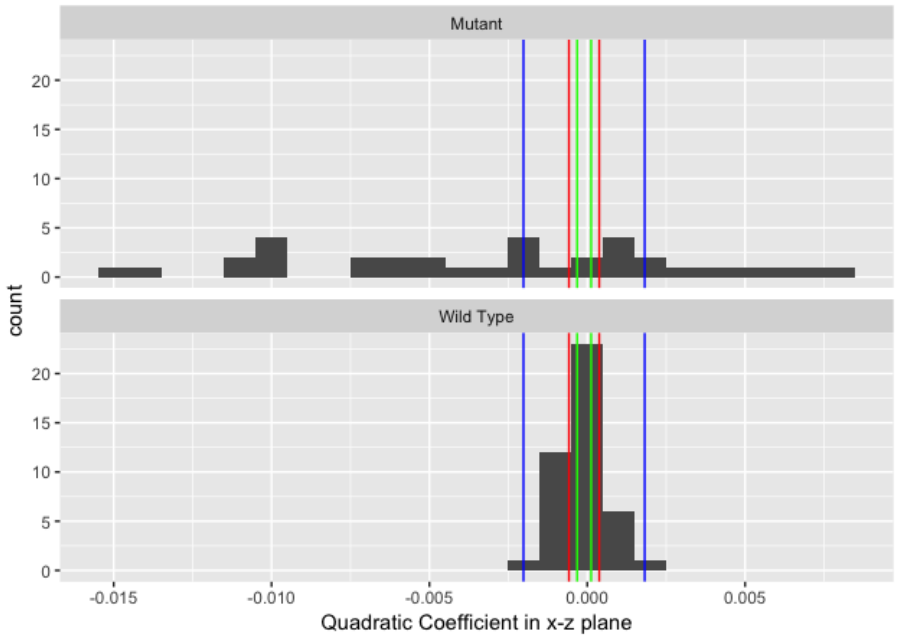


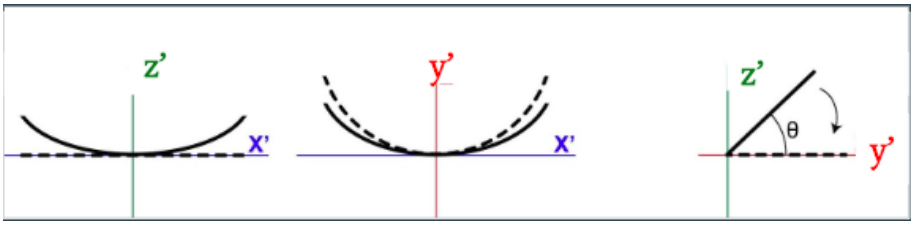
Correction

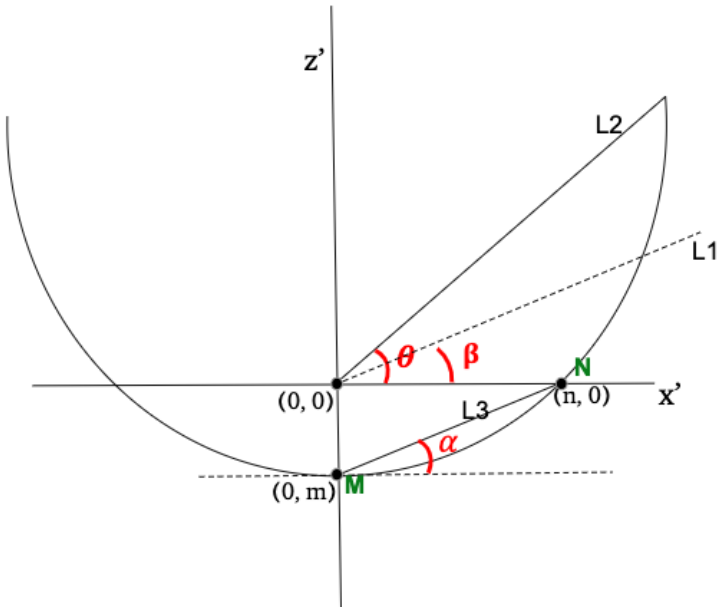

brain data
STEP 1
is_errorA
TRUE
FALSE
STEP 2
reorient & correct_errorA
reorient (PCA)
STEP 3
is_errorB
TRUE
FALSE
STEP 4
correct_errorB
STEP 5
output
new data


Error A: flipped y-axis
-check the sign of the quadratic coefficient
Flip y-axis by reversing y-value
Error B: curvature in xz-plane
-check whether the slope of the curvature is within acceptable range
If TRUE
Rotate data points around the x-axis
Estimate rotation angle
If TRUE
Increase estimated rotation angle
Rotate data points again
If TRUE
Increase estimated rotation angle
Rotate data points again
Until no error B can be detected


z'
x'
y'
x'
180°
z'
y'


Mutant
Wild Type
count
20
15
10
5
0
-0.015
-0.010
-0.005
0.000
0.005
Quadratic Coefficient in x-z plane

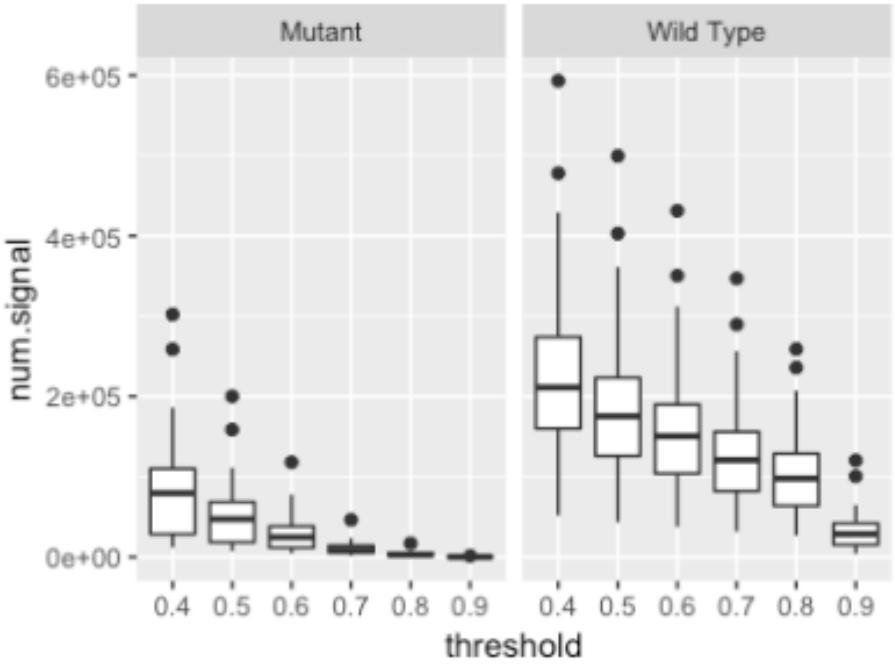

z'
x'
y'
x'
z'
θ
y'

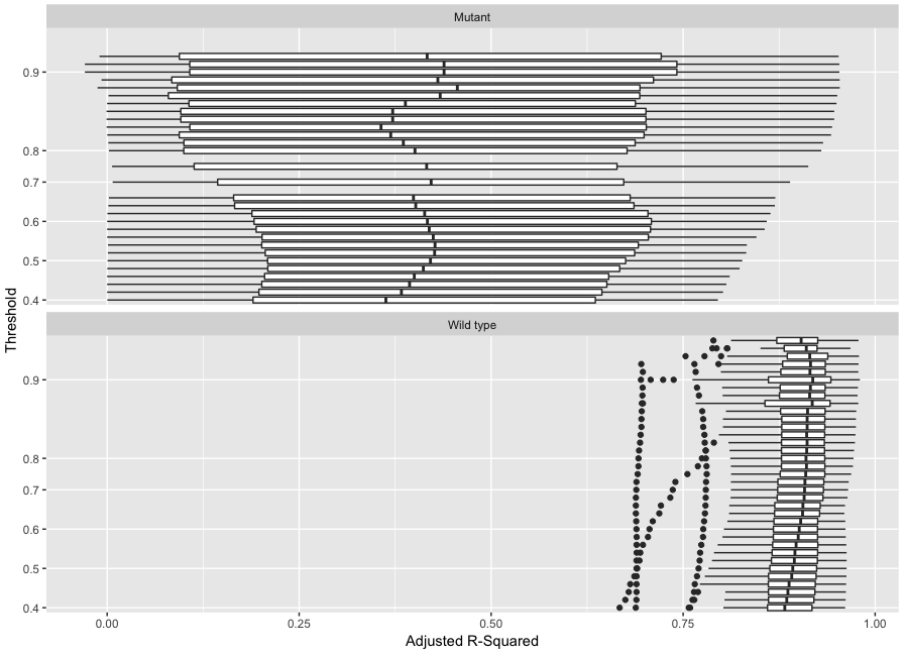

z'
L2
L1
θ
β
N
(0, 0)
(n, 0)
x'
L3
α
(0, m)
M

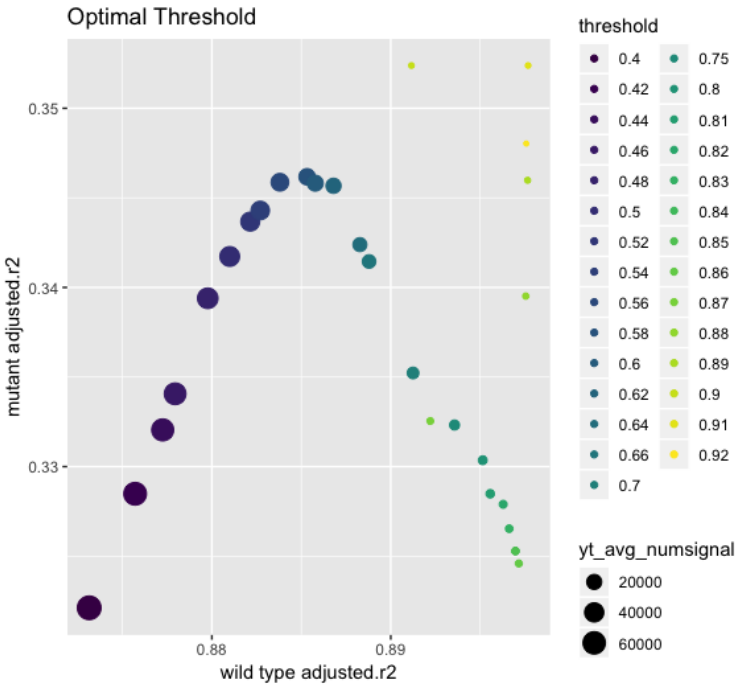
$$R_x(\theta) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\theta & -\sin\theta \\ 0 & \sin\theta & \cos\theta \end{bmatrix}$$

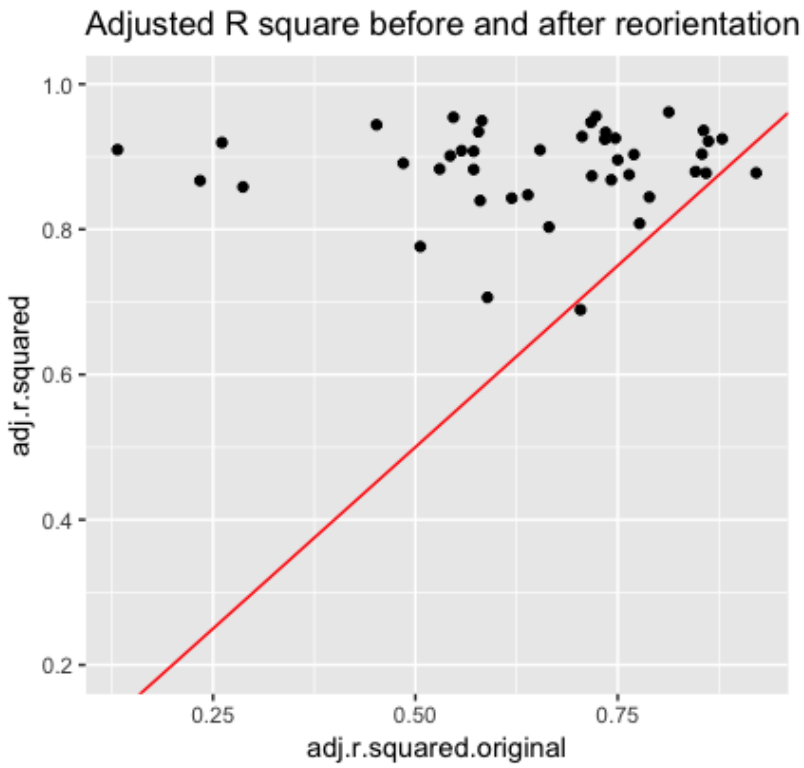
Results

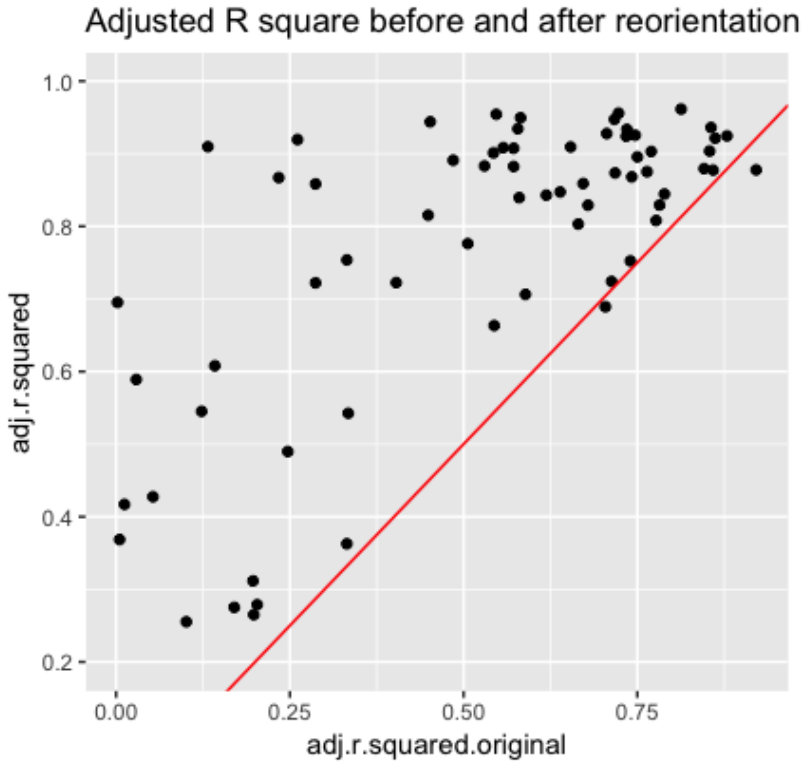
[7]




Mutant
Wild type
Threshold
0.9
0.8
0.7
0.6
0.5
0.4
0.00
0.25
0.50
0.75
1.00
Adjusted R-Squared


Optimal Threshold
mutant adjusted.r2
0.35
0.34
0.33
0.88
0.89
wild type adjusted.r2
threshold
0.4
0.42
0.44
0.46
0.48
0.5
0.52
0.54
0.56
0.58
0.6
0.62
0.64
0.66
0.7
0.75
0.8
0.81
0.82
0.83
0.84
0.85
0.86
0.87
0.88
0.89
0.9
0.91
0.92
yt_avg_numsignal
20000
40000
60000


Adjusted R square before and after reorientation
adj.r.squared
1.0
0.8
0.6
0.4
0.2
0.25
0.50
0.75
adj.r.squared.original


Adjusted R square before and after reorientation
adj.r.squared
1.0
0.8
0.6
0.4
0.2
0.00
0.25
0.50
0.75
adj.r.squared.original

Conclusion

8

Future Research

9