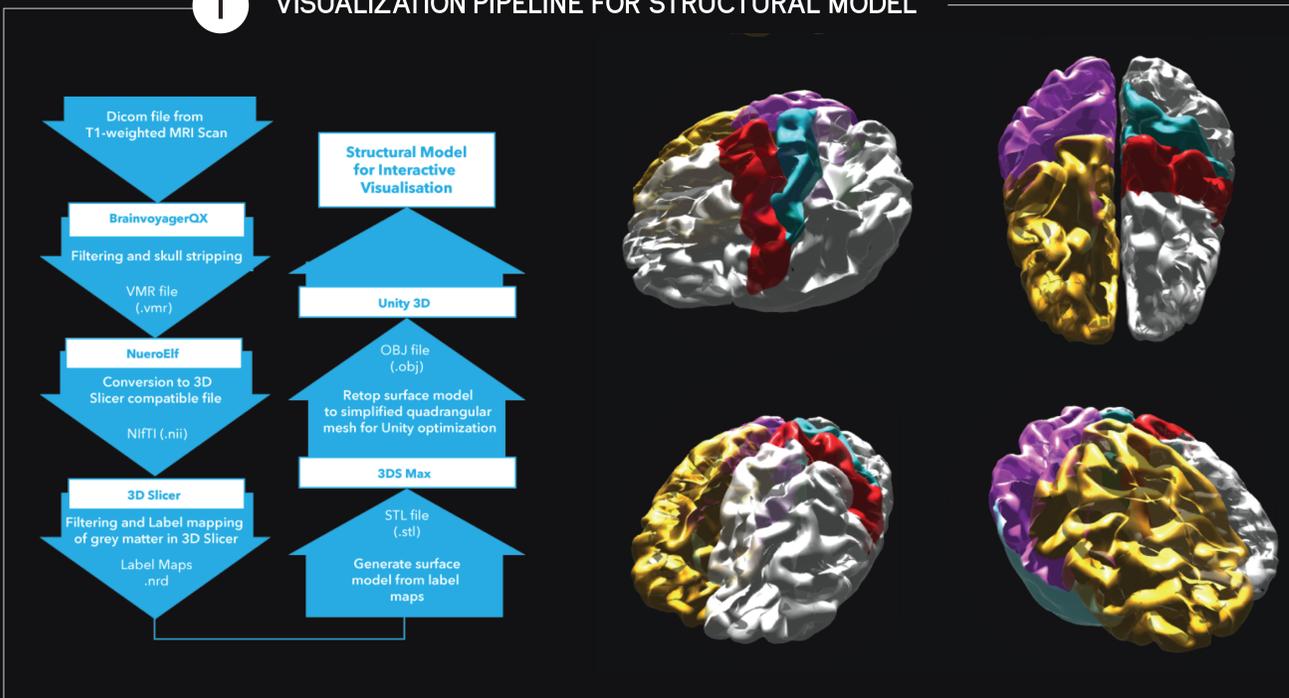# CONSTELLATIONS OF MOVEMENT:
An Interactive Visualization of Functional Mapping for Motor Imagery Decoding Research
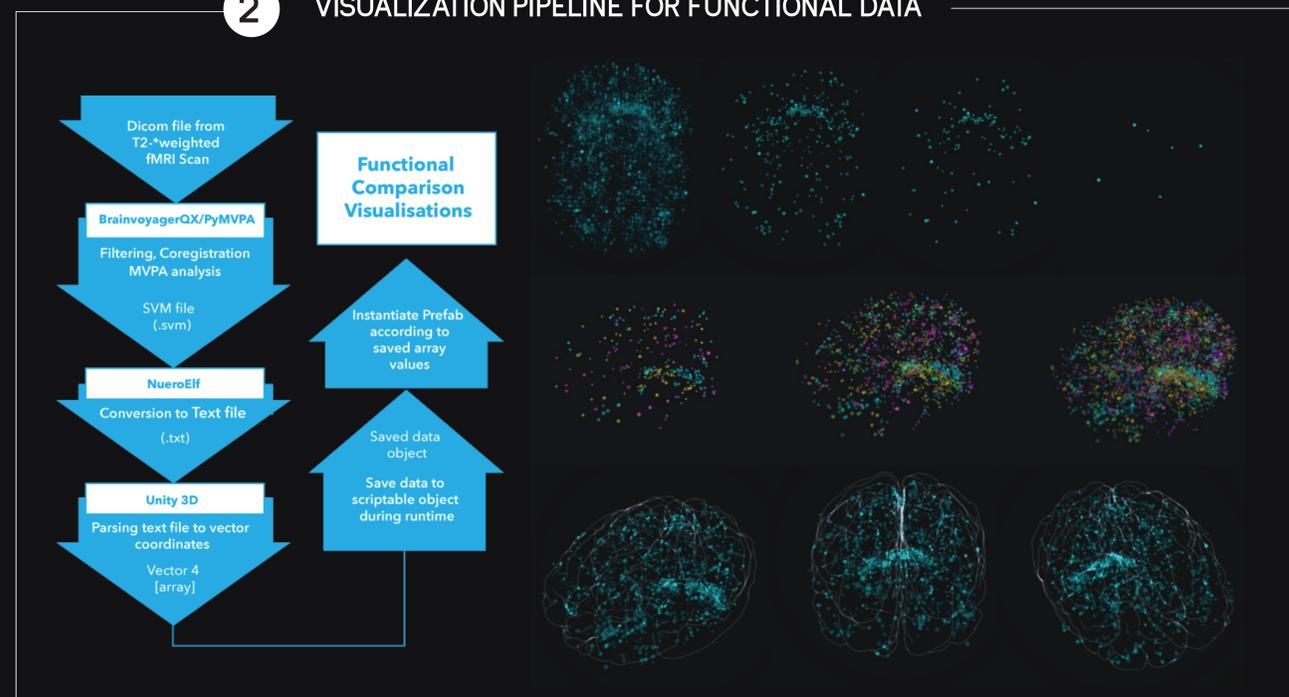
Jennifer Rogers, MSc & Matthieu Poyade. MSc, PhD, Glasgow School of Art. Frank Pollick, MSc, PhD, University of Glasgow

an interactive application visualizing multivariate functional mapping of fMRI data within a 3D structural model of the brain. The application is developed as a proof of concept for the efficacy of interactive 3D visualization for representing research in functional mapping, as well as the potential for Unity 3D game engine's use as a visualization tool for the complex data involved in the research of functional neural activity.
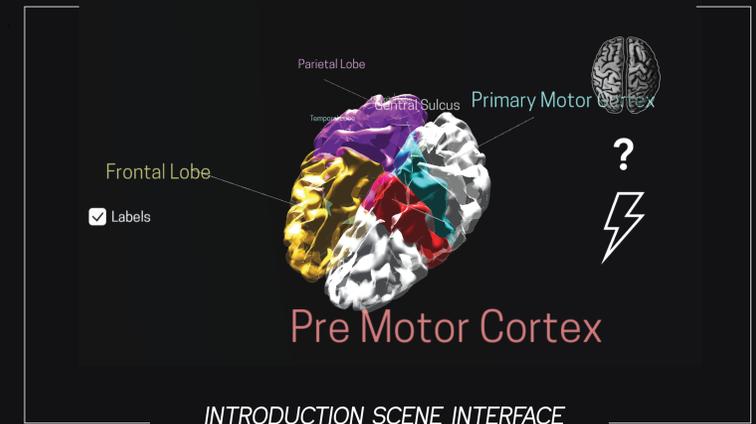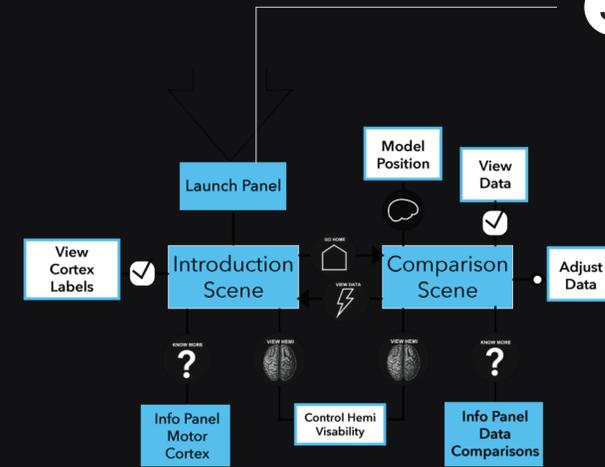
③ COMBINING DATA WITHIN AN INTERACTIVE INTERFACE

Parietal Lobe
Central Sulcus
Primary Motor Cortex
Temporal Lobe
Frontal Lobe
☑ Labels
Pre Motor Cortex

Launch Panel
Model Position
View Data
View Cortex Labels ☑
Introduction Scene
Comparison Scene ☑
Adjust Data
Info Panel Motor Cortex
Control Hemi Visability
Info Panel Data Comparisons

INTRODUCTION SCENE INTERFACE

① VISUALIZATION PIPELINE FOR STRUCTURAL MODEL

Dicom file from T1-weighted MRI Scan
BrainvoyagerQX
Filtering and skull stripping
VMR file (.vmr)
NueroElf
Conversion to 3D Slicer compatible file
NIfTI (.nii)
3D Slicer
Filtering and Label mapping of grey matter in 3D Slicer
Label Maps .nrd

Structural Model for Interactive Visualisation
Unity 3D
OBJ file (.obj)
Retop surface model to simplified quadrangular mesh for Unity optimization
3DS Max
STL file (.stl)
Generate surface model from label maps

TOGGLING THE VISIBILITY OF THE COMPARISONS

Lift-Throw
Knock-Throw
Lift-Knock

Lift-Throw GameObject — Lift-Throw data / Cube-Blue Prefab
Knock-Throw GameObject — Knock-Throw data / Cube-Green Prefab
Lift-Knock GameObject — Lift-Knock data / Cube-Pink Prefab

Data
☑ Lift-Throw
☑ Knock-Throw
☐ Lift-Knock

Accuracy Percentage of Classifier
60   75.63834   89
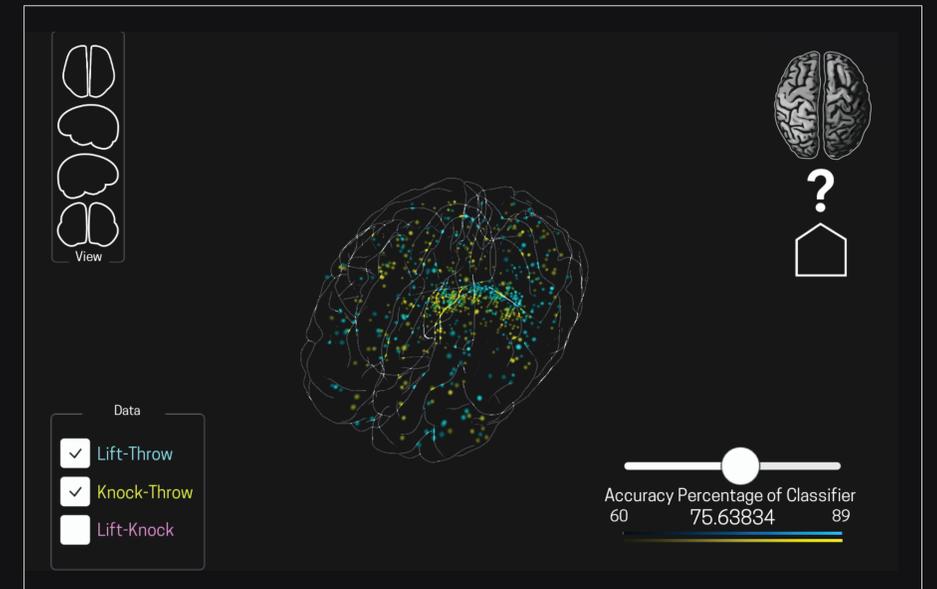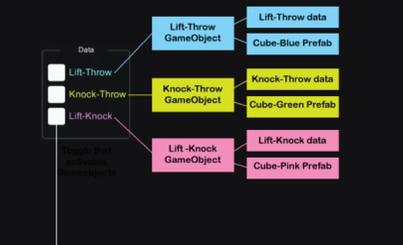
INTERFACE FOR COMPARISON SCENE FOR FUNCTIONAL DATA

② VISUALIZATION PIPELINE FOR FUNCTIONAL DATA

Dicom file from T2-*weighted fMRI Scan
BrainvoyagerQX/PyMVPA
Filtering, Coregistration MVPA analysis
SVM file (.svm)
NueroElf
Conversion to Text file (.txt)
Unity 3D
Parsing text file to vector coordinates
Vector 4 [array]

Functional Comparison Visualisations
Instantiate Prefab according to saved array values
Saved data object
Save data to scriptable object during runtime

FLOW OF OBJECT INSTANTIATION WITHIN UNITY

1 Slider begins to move
2 All cubes of activated Game-Objects Destroyed
Accuracy Percentage of Classifier
3 MinThreshold adjusted to new value
4 Prefab child cubes of active gameobjects instantiated at new Min Threshold Value
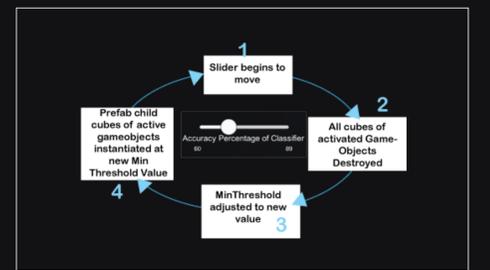
As the slider is moved along the threshold, all of the child prefab cubes of the activated datasets are destroyed and new cubes are instantiated from the specified minimum threshold value.
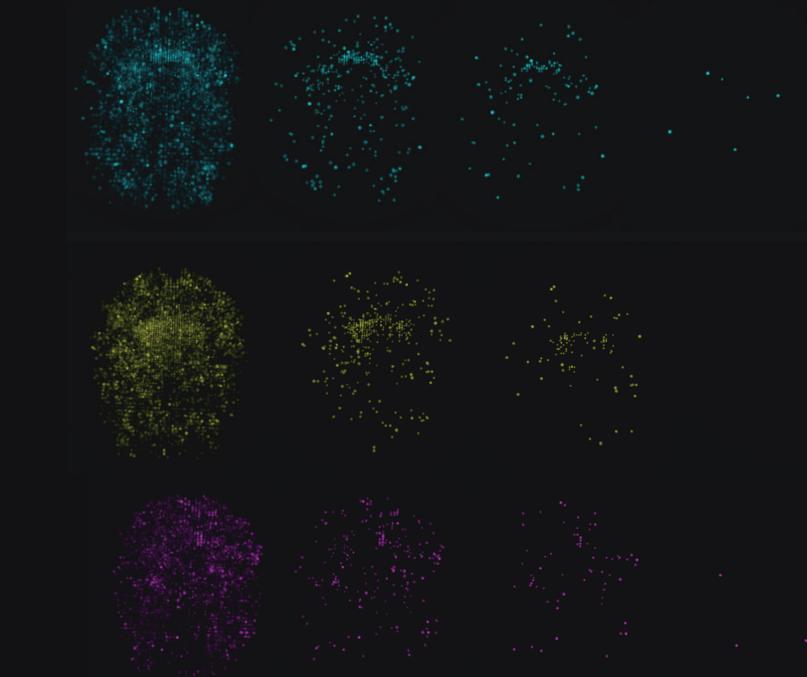
COMPARISON DATA AT 60, 70, 80 AND 89 ACCURACY

Accuracy percentage of the classifier is manipulated through the loop that is adjusted by the UI slider.