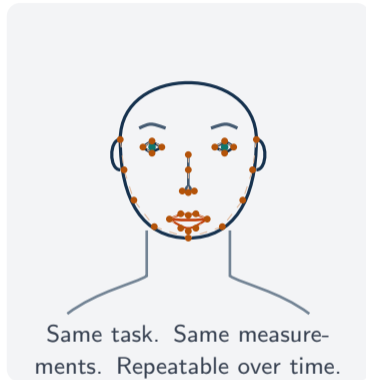


DeepNeura

Turning short facial videos into actionable neurological signals

PhD Thesis: *Applications of Artificial Intelligence in the Diagnosis and Prognosis of Neurodegenerative Diseases*

Presented by **Chiuzbăian Rareș**



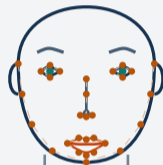
DeepNeura

Turning short facial videos into actionable neurological signals

Video in

Movement signal out

Explanation attached



Same task. Same measurements. Repeatable over time.

Not Medical Tables. Video.

Not lab-result tables

Not Precision ALS
/ PRO-ACT tables

Short guided facial videos

The signal is visible movement.

The screenshot shows a dark-themed web interface for 'DeepNeura ALS RESEARCH SCREENING PROTOTYPE'. At the top left is the logo, a blue circle with a white 'D'. Below the logo is the text '1. Research Submission'. Underneath is a paragraph: 'Upload a facial kinematics video session. The selected service-candidate model set is NoClinical and does not use demographics.' Below this is a dashed blue box labeled 'KINEMATIC SESSION VIDEO' containing a cloud upload icon and the text 'Drag & drop session video here or click to browse from files. Supports video uploads up to 200 MB.' To the right of this box is a large, empty dark grey area. Below the video upload section is a section titled 'How should the video be recorded?' with a list of instructions: 'Record one person performing one facial task in a continuous clip.', 'Keep the full face centered, mostly frontal, evenly lit, and unobstructed.', 'Start the task immediately; the sequential models use the first 50 decoded frames.', 'Use a task represented in the research data: repeat "pa" or "pa-ta-ka", or perform one mouth movement such as opening, smiling, puckering, or blowing.', 'Avoid multiple faces, profile views, camera movement, edits, and long pauses.', 'Upload an OpenCV-readable video such as AVI or MP4, no larger than 200 MB.' Below the list is a note: 'Different recording conditions or tasks may cause unmeasured distribution shift. This prototype does not validate video quality automatically.' At the bottom of the interface is a blue button labeled 'Analyze Kinematics'.

DeepNeura
ALS RESEARCH SCREENING PROTOTYPE

1. Research Submission

Upload a facial kinematics video session. The selected service-candidate model set is NoClinical and does not use demographics.

KINEMATIC SESSION VIDEO

Drag & drop session video here
or click to browse from files
Supports video uploads up to 200 MB

How should the video be recorded?

- Record one person performing one facial task in a continuous clip.
- Keep the full face centered, mostly frontal, evenly lit, and unobstructed.
- Start the task immediately; the sequential models use the first 50 decoded frames.
- Use a task represented in the research data: repeat "pa" or "pa-ta-ka", or perform one mouth movement such as opening, smiling, puckering, or blowing.
- Avoid multiple faces, profile views, camera movement, edits, and long pauses.
- Upload an OpenCV-readable video such as AVI or MP4, no larger than 200 MB.

Different recording conditions or tasks may cause unmeasured distribution shift. This prototype does not validate video quality automatically.

Analyze Kinematics

From Video To Signal

Video task → Track face → Measure motion → Clinical view

Lips. Jaw. Cheeks. Timing. Change over time.

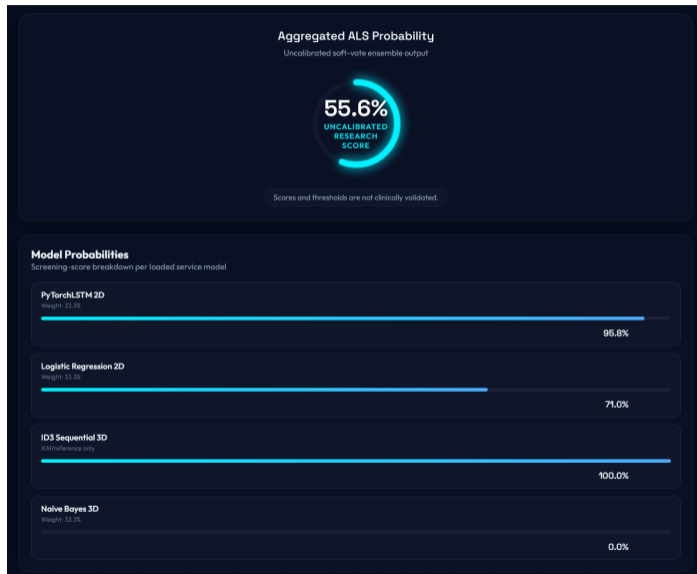
The Ensemble Vote

Model 1: timing

Model 2: simple patterns

Model 3: 3D geometry

Agreement builds confidence.



Why this score?

Which muscles moved differently?

Which moments mattered?

Does it match the exam?

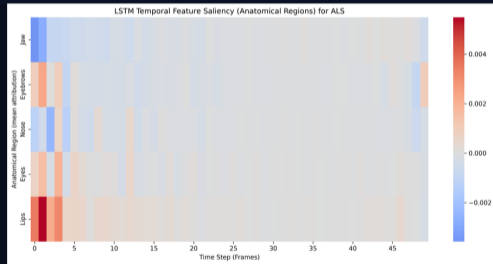
3. Explainable AI (XAI) Attributions

Cohort-level training reference vs. patient-specific kinematic explanation

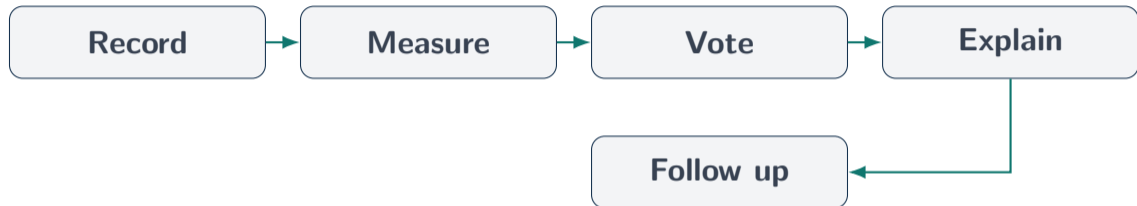
SHAP attributions (ID3 D3)

LSTM Saliency (PyTorchLSTM 2D)

Temporal saliency heatmap mapping feature attributions back to anatomical landmarks across sequence frames.



DeepNeuro research prototype. Not a clinical diagnostic system; scores and thresholds are not clinically validated.



Clinic visit today. Remote follow-up tomorrow. Research evidence over time.

Make subtle neurological change visible.

Measurable from video.

Balanced by an ensemble.

Explained for clinical review.

Research-screening support, not a standalone clinical diagnosis.

Thank You!

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