The Use of Computer Vision for Keystroke Detection for an Adaptive Assessment of Individual with Disability Capacity in Using a Smartphone

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Background & Objectives

- Current keystroke assessment tools require environmental modifications within their smartphone that create barriers for users with disabilities
- Standardize “one-size-fits-all” solutions don’t measure actual smartphone capacity in personalized environments
- Traditional methods rely on keyboard APIs from custom built virtual keyboard with limited data granularity

Goal

- Develop a computer vision system that captures keystrokes during natural smartphone interaction without environmental modifications

0.999
Recall Score

0.995
Precision Score

DTW Result		
Test #	DTW Distance	DTW F1 Score
1	3.0	83.77%
2	5.0	89.25%
3	5.0	93.46%

Conclusions

- Key Achievement: Proof of concept demonstrates viability of non-invasive keystroke detection
- Universal accessibility tool for smartphone requiring no device modification
- Preserve users’ existing smartphone configurations

Methodology

1. Synthetically generated 24,000 images evenly distributed across training, testing, and validation
2. Trained a YOLOv8 model for non-invasive keystroke detection
3. Established evaluation metrics using precision and recall (85% success threshold) alongside dynamic time warping (DTW) analysis for sequential accuracy
4. Built a simple chat application that was used to record keystroke via API (ground truth) and use screen capture software to record video
5. Typed three increasingly difficult text sequence
6. Used DTW analysis to convert text inputs into keystroke
7. Calculate precision, recall, and DTW with cross-validation to evaluate model’s performance against ground truth

Evaluation Text	
1	I need help please
2	Can you come over? I need help with housework
3	Please email my doctor at drsmith@healthcare.org about my upcoming appointment

Future Work

- Expand training dataset
- Reduce false positive and undetected keys
- Explore multiple model architecture

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