

Video Analysis and Artificial Intelligence for Early Detection of Handwriting Disorders in Children

Binbin Xu, Frédéric Puyjarinet, Lauren Sismeiro and Gérard Dray

EuroMov Digital Health in Motion, Université de Montpellier, IMT Mines Alès, Montpellier France

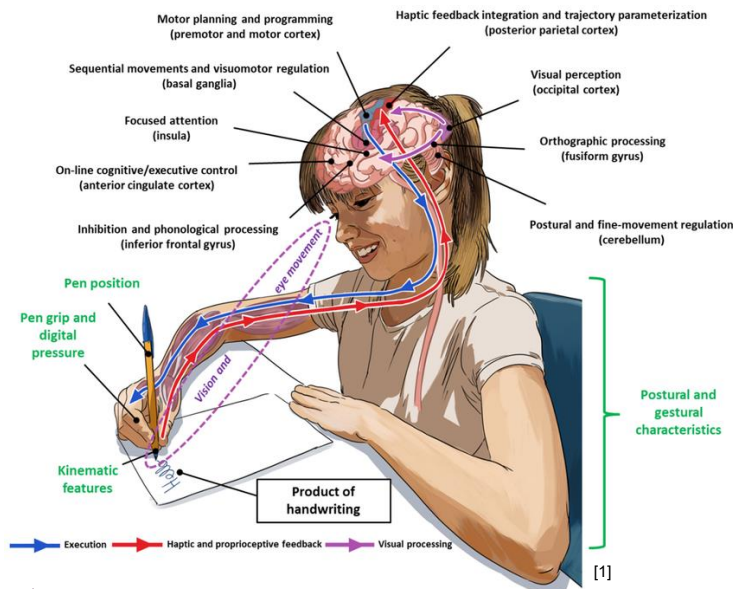
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INTRODUCTION – RESEARCH QUESTION

Handwriting is a highly complex task that mobilizes a wide range of cognitive, motor, sensory, and perceptual processes, as illustrated by the coordinated brain, eye, and limb activations involved in writing production. It requires the integration of visuomotor control, fine motor coordination, executive functioning, postural regulation, and haptic feedback processing. Detecting disruptions in these processes can reveal early signs of handwriting disorders, such as dysgraphia or Developmental Coordination Disorder (DCD), which can hinder learning and academic inclusion. Traditional assessment tools rely on instrumented technologies (e.g., tablets, stylus pressure sensors), but these can be intrusive and resource-intensive. Recent advances in markerless computer vision systems allow non-invasive tracking of hand, posture, and facial movements from simple video inputs. When combined with embedded and explainable AI, these tools offer privacy-preserving, scalable solutions for school-based screening.

The main research question of this internship is:

Can markerless video motion capture, combined with a local and interpretable AI system, reliably detect the early signs of handwriting disorders in educational settings?



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AIMS OF THE INTERNSHIP

The aim is to design a video analysis module based on markerless methods (e.g. MediaPipe, OpenPose) to capture hand, posture and facial movements. This data will be analyzed locally (Edge AI) by a supervised explicable AI model (e.g. SHAP, Grad-CAM). The model will produce interpretable information that can be used by teachers or clinicians to facilitate the early identification of handwriting disorders.

This project combines a non-invasive approach, embedded processing and explicability, in a natural (school) environment. The main challenges concern the accuracy of markerless estimates, multimodal fusion of motor/visual/affective signals, and interpretability for non-expert users.

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INTERNSHIP KEY POINTS

As part of the internship, the student will focus on the following tasks:

1. Bibliography
2. Benchmarking of handwriting video analysis algorithms
3. Video recordings of handwriting on a graphics tablet
4. Implementation of processing pipelines
5. Laboratory tests
6. Analysis of results

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ABOUT SUPERVISION

The internship will be supervised by members of the “Monitoring and Improvement of Behavior and Cognition” (MIB&Co) theme of the EuroMov DHM research unit.

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Contacts ✉

- binbin.xu@mines-ales.fr
- frederic.puyjarinet@umontpellier.fr
- gerard.dray@mines-ales.fr
- lauren.sismeiro@mines-ales.fr