DEEP LEARNING-BASED INFANT MOTION TRACKING FACILITATING EARLY DETECTION OF CEREBRAL PALSY

Daniel Groos1,2, Kristian Aurlien2, Heri Ramampiaro2, Espen Ihlen1, Raye-Ann deRegnier3, Colleen Peyton4, Inger Elisabeth Silberg5, Nils Thomas Songstad6, Thomas Niranjan7, Lars Adde8,9

1Department of Neuromedicine and Movement Science, NTNU, Trondheim, Norway, 2Department of Computer Science, NTNU, Trondheim, Norway, 3Ann & Robert H. Lurie Children’s Hospital of Chicago, Chicago, USA, 4Department of Pediatrics, University of Chicago Comer Children’s Hospital, Chicago, USA, 5Division of Paediatric and Adolescent Medicine, Department of Neonatology, Oslo University Hospital, Rikshospitalet, Oslo, Norway, 6Department of Paediatric and Adolescent Medicine, University Hospital of North Norway, Tromsø, Norway, 7Christian Medical College, Vellore, India, 8Department of Clinical and Molecular Medicine, NTNU, Trondheim, Norway, 9Clinic of Clinical Service, St. Olavs Hospital, Trondheim University Hospital, Trondheim, Norway

Automated early detection of cerebral palsy (CP) by video analysis of infants’ spontaneous movements is a rapidly growing avenue of research.

The precision of automated detection depends on accurate methods for motion tracking of infant body parts.

Videos of infant spontaneous movements between 9 to 15 weeks post-term age were used.

To assess a Deep Learning-based method for automatic motion tracking of infant spontaneous movements in video recordings.

We hypothesized that the method would be accurate and time effective.

Videos

Participants
• The sample comprised single videos of 201 high-risk infants (103 [51%] boys, 73 [36%] extremely preterm infants (<1000g/<28w), 12 [9-15] weeks median post-term age) from hospitals in USA (n = 67), India (n = 67), and Norway (n = 67).

Tracking performance
• The Deep Learning model achieved an average error of 9.5 mm [SD = 8.4 mm] compared to annotated body part placements.

Time efficiency
• The model spends 45 seconds localizing all seven body parts of an infant across a 3 minute video recording.

Conclusion
• The motion tracker delivers high precision and efficiency in automatically localizing infant body parts from video recordings.
• The finding facilitates further development of an accurate computer-based system for early detection of CP.