

Tidlig deteksjon av cerebral parese: Nye muligheter med bruk av maskinlæring og kunstig intelligens



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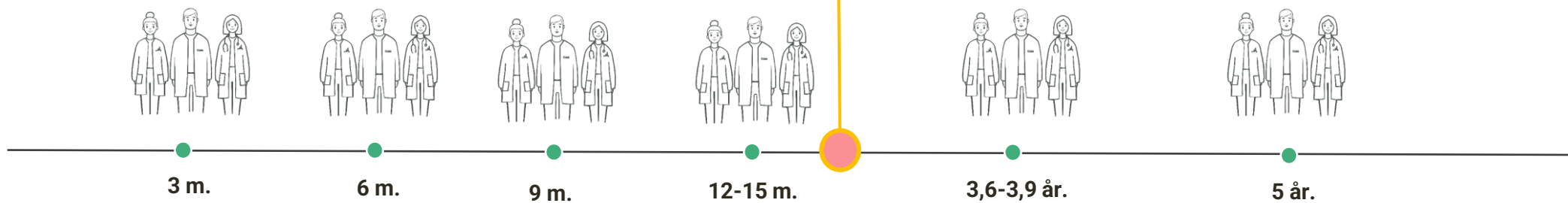
Nyfødte som har medisinske risikofaktorer for cerebral parese (CP):

- Prematur fødsel
- Pustebesvær
- Infeksjoner

Tradisjonelle oppfølgingsprogram for risikopasienter



1/10 får diagnosen CP mellom 1-2 års alder



Tradisjonelle oppfølgingsprogram for risikopasienter

Tidlig diagnose er viktig:

- for de med CP
- for de uten CP
- for helsetjenesten

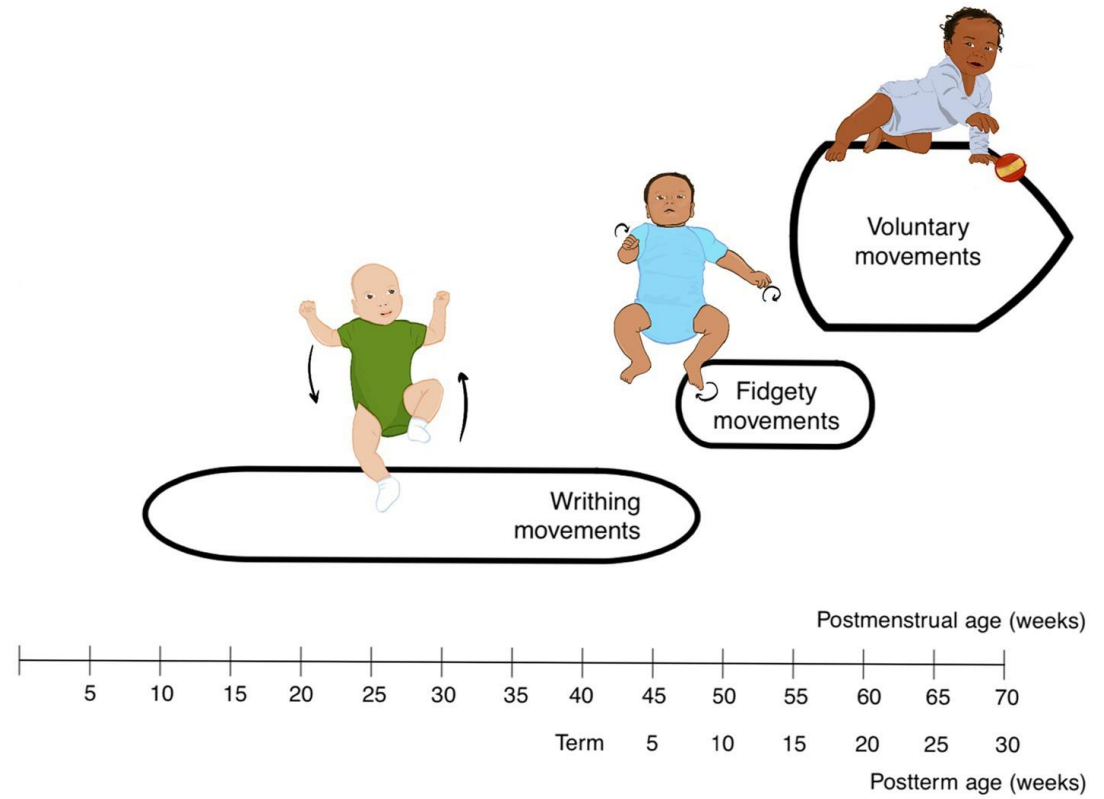


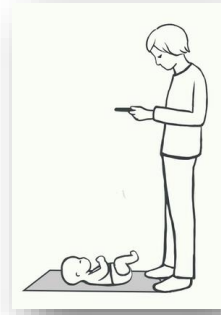


Er tidlig diagnose mulig?

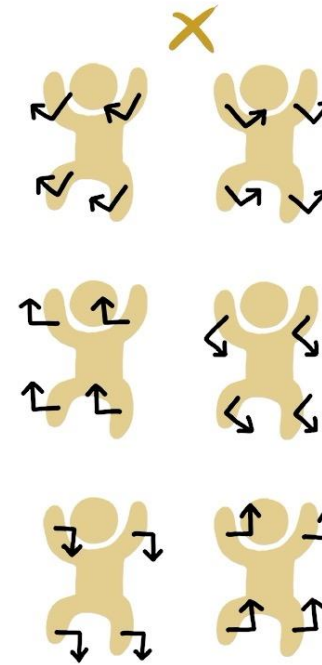
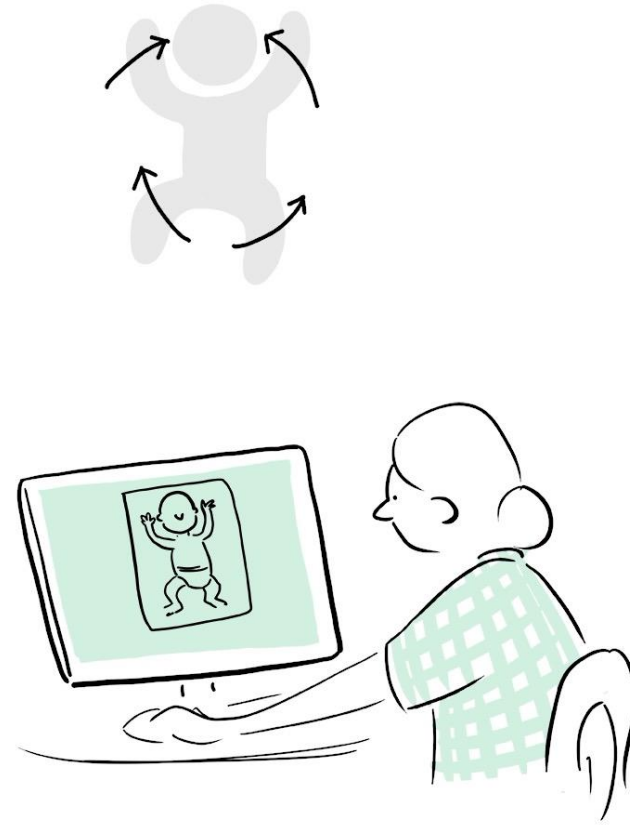
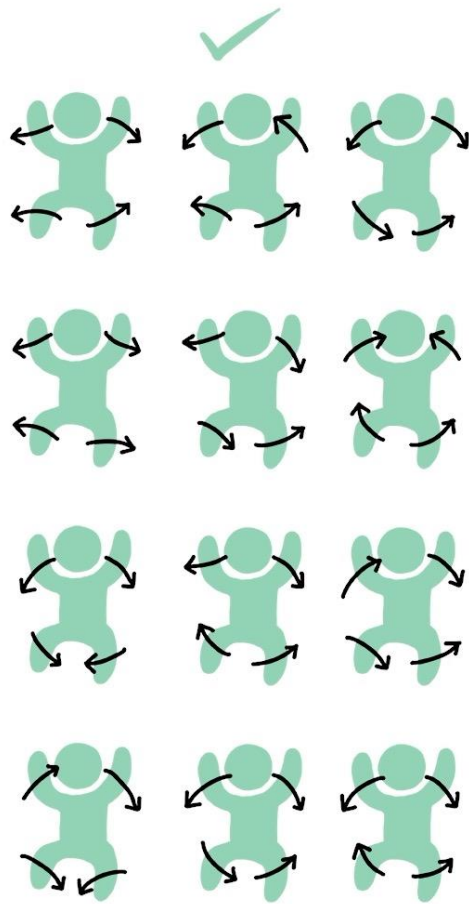


Heinz Prechtel (1927-2014)





Video opptak utført hjemme
eller på sykehus ved 3 til 5
måneders korrigert alder



Trenede observatører:

- Normale og avvikende bevegelsesmønstre
- Høy – og lav risiko for CP



The Lancet

Volume 349, Issue 9062, 10 May 1997, Pages 1361-1363



Early Report

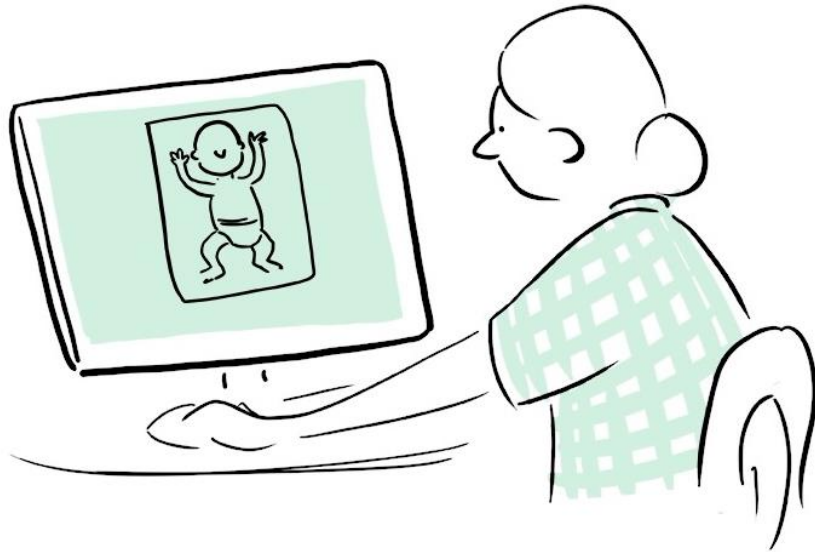
An early marker for neurological deficits after perinatal brain lesions

[Heinz FR Prechtl](#)^a, [Christa Einspieler](#)^a, [Giovanni Cioni](#)^b, [Arend F Bos](#)^c, [Fabrizi Ferrari](#)^d,
[Dieter Sontheimer](#)^e

JAMA Pediatrics | Review

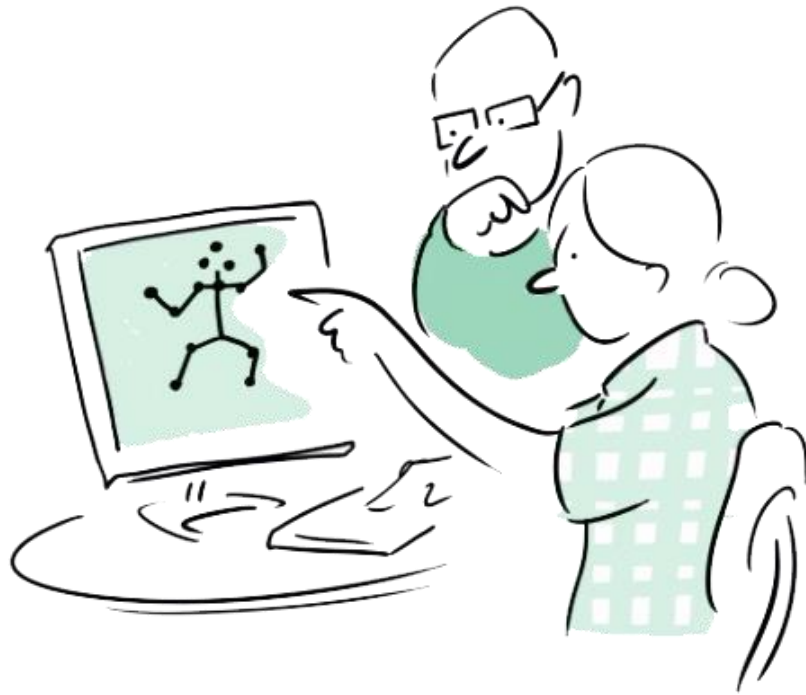
Early, Accurate Diagnosis and Early Intervention in Cerebral Palsy Advances in Diagnosis and Treatment

Iona Novak, PhD; Cathy Morgan, PhD; Lars Adde, PhD; James Blackman, PhD; Roslyn N. Boyd, PhD; Janice Brunstrom-Hernandez, MD; Giovanni Cioni, MD; Diane Damiano, PhD; Johanna Darrah, PhD; Ann-Christin Eliasson, PhD; Linda S. de Vries, PhD; Christa Einspieler, PhD; Michael Fahey, PhD; Darcy Fehlings, PhD; Donna M. Ferriero, MD; Linda Fetters, PhD; Simona Fiori, PhD; Hans Forssberg, PhD; Andrew M. Gordon, PhD; Susan Greaves, PhD; Andrea Guzzetta, PhD; Mijna Hadders-Algra, PhD; Regina Harbourne, PhD; Angelina Kakooza-Mwesige, PhD; Petra Karlsson, PhD; Lena Krumlind-Sundholm, PhD; Beatrice Latal, MD; Alison Loughran-Fowlds, PhD; Nathalie Maitre, PhD; Sarah McIntyre, PhD; Garey Noritz, MD; Lindsay Pennington, PhD; Domenico M. Romeo, PhD; Roberta Shepherd, PhD; Alicia J. Spittle, PhD; Marelle Thornton, DipEd; Jane Valentine, MRCP; Karen Walker, PhD; Robert White, MBA; Nadia Badawi, PhD



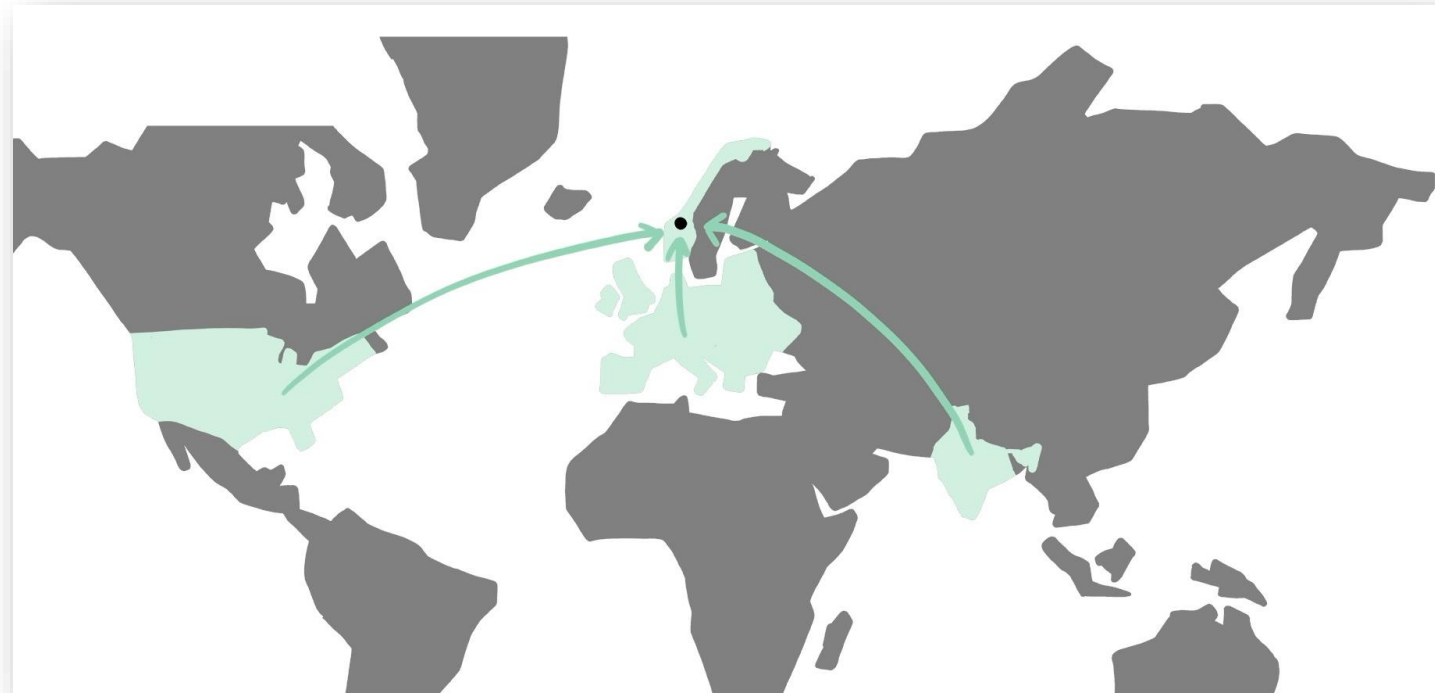
GMA og kliniske eksperter:

- Mye trening
- Kan ikke tilbys overalt



Nye metoder basert på kunstig intelligens for tidlig identifisering av barn med CP

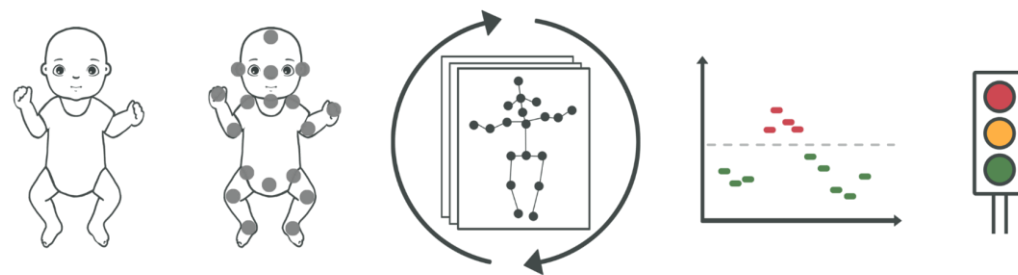
Filmer samlet i
kliniske studier
(2004-2024)



557 spedbarn: 84 (15%) med CP, 473 (85%) uten CP

Bevegelses- tracker

Steg II: Resultat



JAMA Network | **Open**™ 🔒

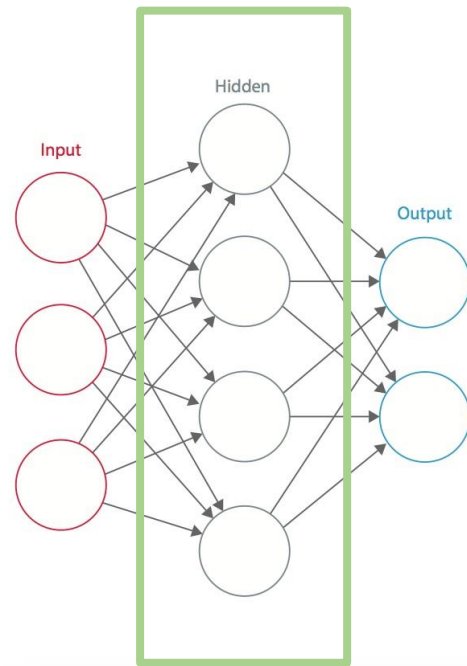
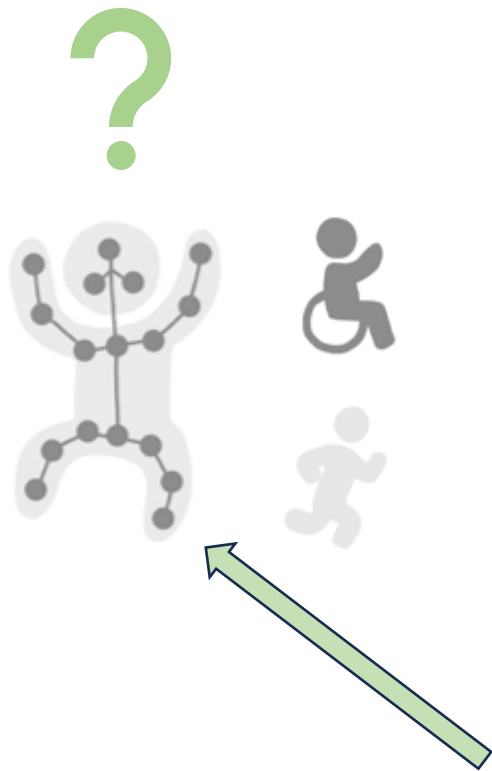
Original Investigation | Pediatrics

Development and Validation of a Deep Learning Method to Predict Cerebral Palsy From Spontaneous Movements in Infants at High Risk

Daniel Groos, MS; Lars Adde, PT, PhD; Sindre Aubert, MS; Lynn Boswell, PT, MS; Raye-Ann de Regnier, MD; Toril Fjørtoft, PT, PhD; Deborah Gaebler-Spira, MD; Andreas Haukeland, MS; Marianne Loennecken, PT; Michael Msall, MD; Unn Inger Møinichen, PT, MS; Aurelie Pascal, PT, PhD; Colleen Peyton, PT, DPT; Heri Ramampiaro, PhD; Michael D. Schreiber, MD; Inger Elisabeth Silberg, MD; Nils Thomas Songstad, MD, PhD; Niranjan Thomas, MD, PhD; Christine Van den Broeck, PT, PhD; Gunn Kristin Øberg, PT, PhD; Espen A.F. Ihlen, PhD; Ragnhild Støen, MD, PhD

Oppsummert: Dette fungerer svært godt. Denne har forstått noe som ikke jeg (og andre medisinske eksperter) har forstått fullt ut!

AI og "black box" vs "white box"

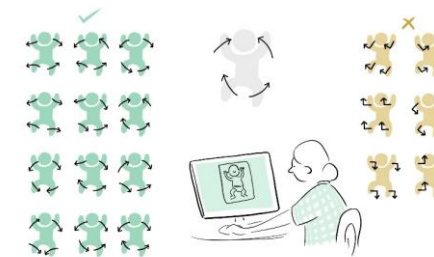
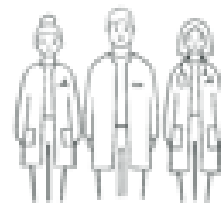


Forklarbar KI (XAI)

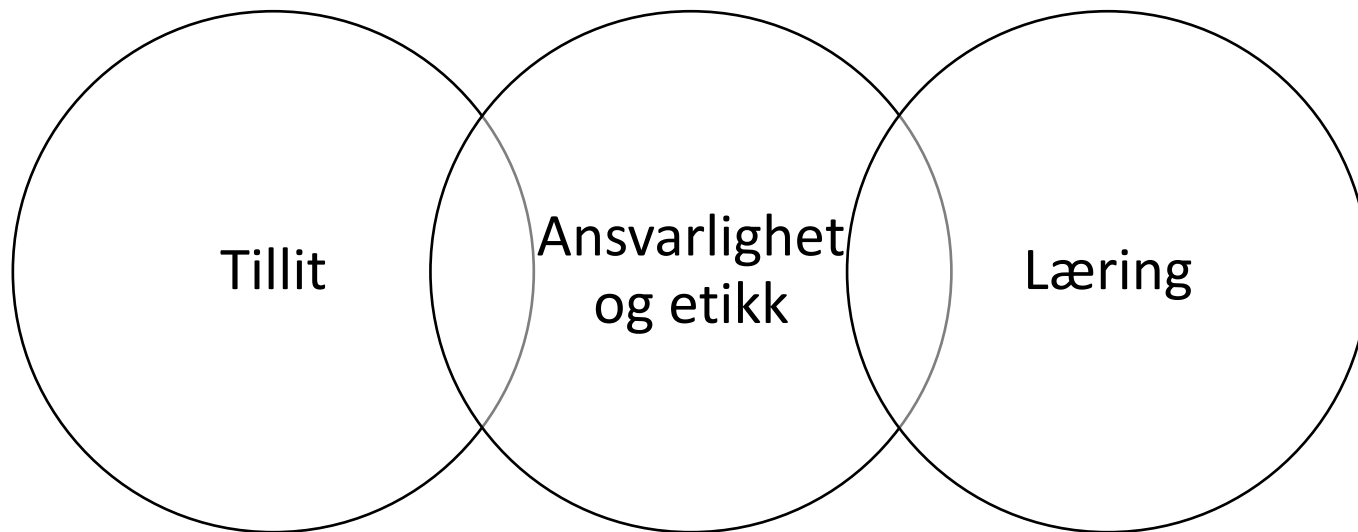
Pågående NFR og Helse Midt-Norge finansiert prosjekt (2021-2026), Norwegian Open AI-Lab og IKOM, NTNU

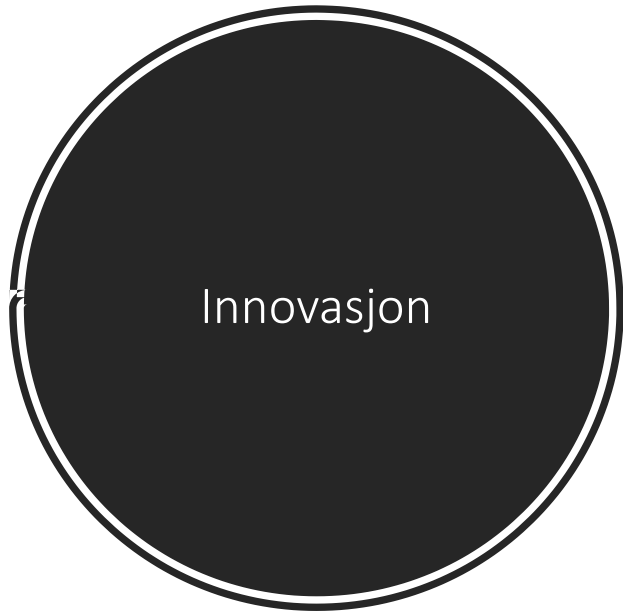


EU Artificial Intelligence Act



Hvorfor er forklarbarhet så viktig?

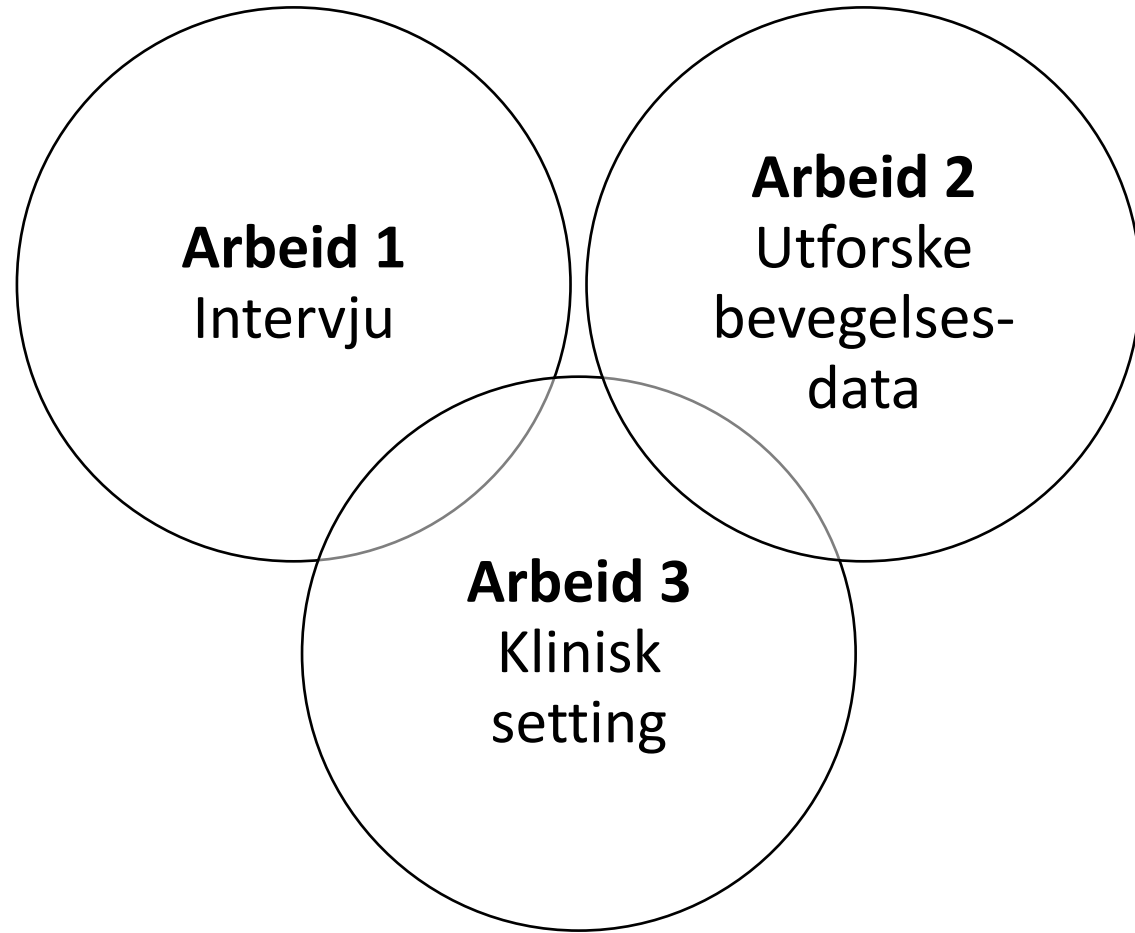




Nytt

Nyttig

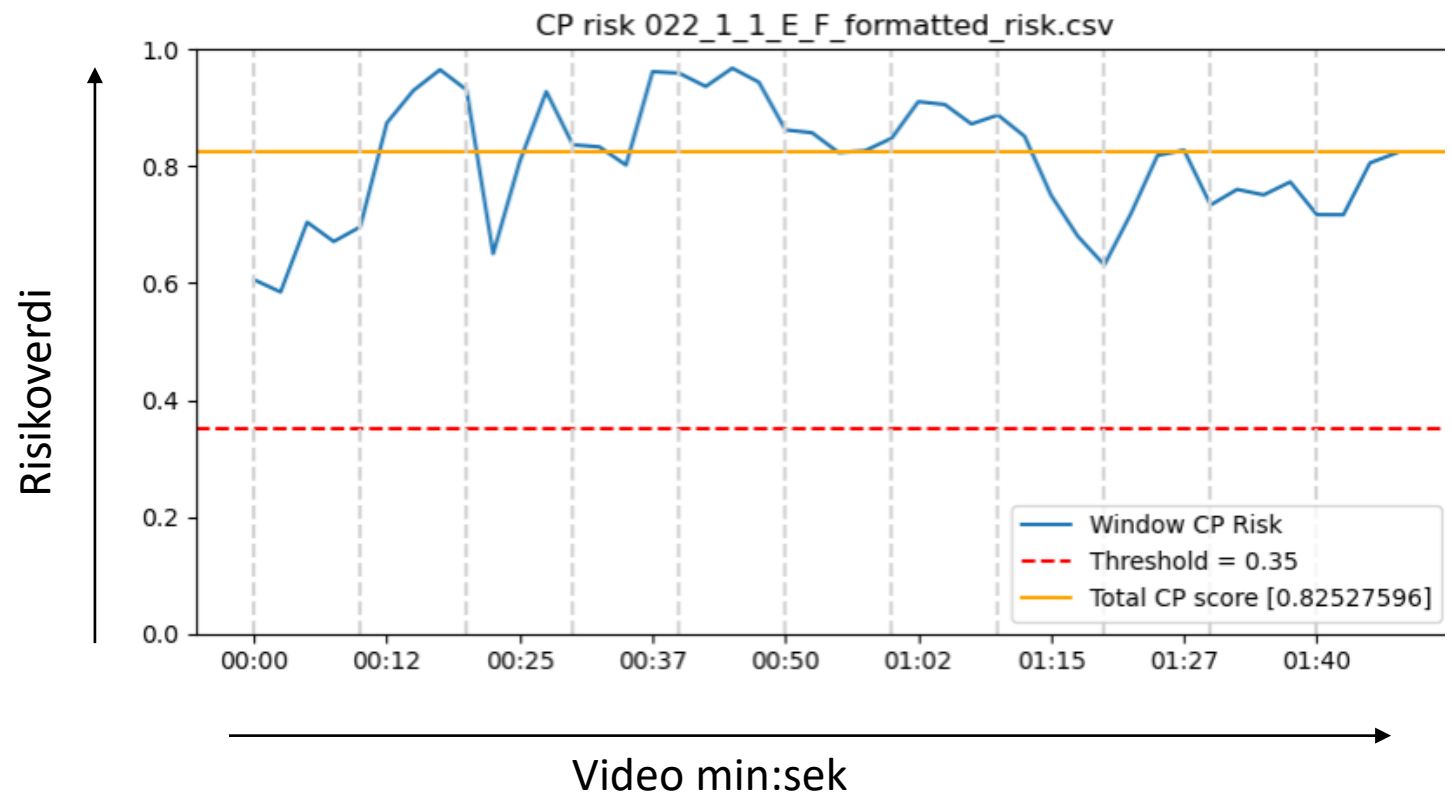
Nyttiggjort



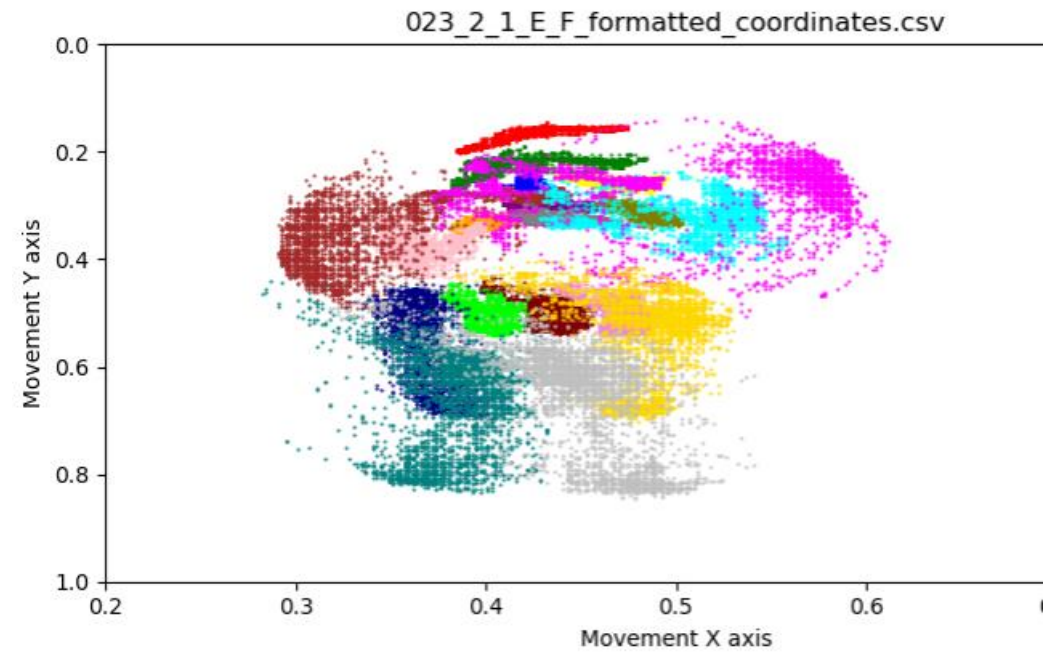
Arbeid 1 Intervju

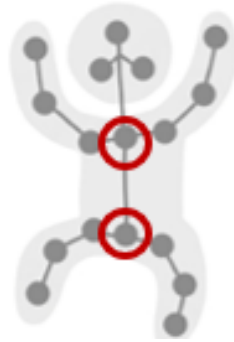


Arbeid 2
Utforske
bevegelsesdata



Arbeid 2 Utforske bevegelsesdata





Arbeid 2 Utforske bevegelsesdata

Choose CP score file 2
Browse... 002_1
Upload complete

Select coordinate files ^

Choose coordinates file 1
Browse... 014_1
Upload complete

Choose coordinates file 2
Browse... 002_1
Upload complete

Select body points ^

Select points

- head_top
- nose
- right_ear
- left_ear
- upper_neck
- right_shoulder
- right_elbow
- right_wrist
- thorax
- left_shoulder
- left_elbow
- left_wrist
- pelvis
- right_hip
- right_knee
- right_ankle
- left_hip
- left_knee
- left_ankle

Coordinates from movements

014_1_1_E_F_formatted_coordinates.csv

0 days 00:00:00.041126

002_1_1_E_F_formatted_coordinates.csv

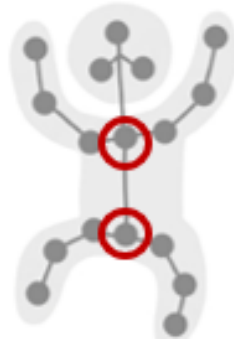
CP risk scores over time

CP risk 014_1_1_E_F_formatted_risk.csv

Select Date and Time
00:02:00 - 00:03:00 00:10:00

CP risk 002_1_1_E_F_formatted_risk.csv

Select Date and Time
00:02:00 - 00:03:00 00:10:00



Arbeid 2 Utforske bevegelsesdata

Choose CP score file 2
Browse... 002_1
Upload complete

Select coordinate files ^

Choose coordinates file 1
Browse... 014_1
Upload complete

Choose coordinates file 2
Browse... 002_1
Upload complete

Select body points ^

Select points

- head_top
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- left_knee
- left_ankle

Coordinates from movements

014_1_1_E_F_formatted_coordinates.csv

0 days 00:00:00.041126

002_1_1_E_F_formatted_coordinates.csv

?

CP risk scores over time

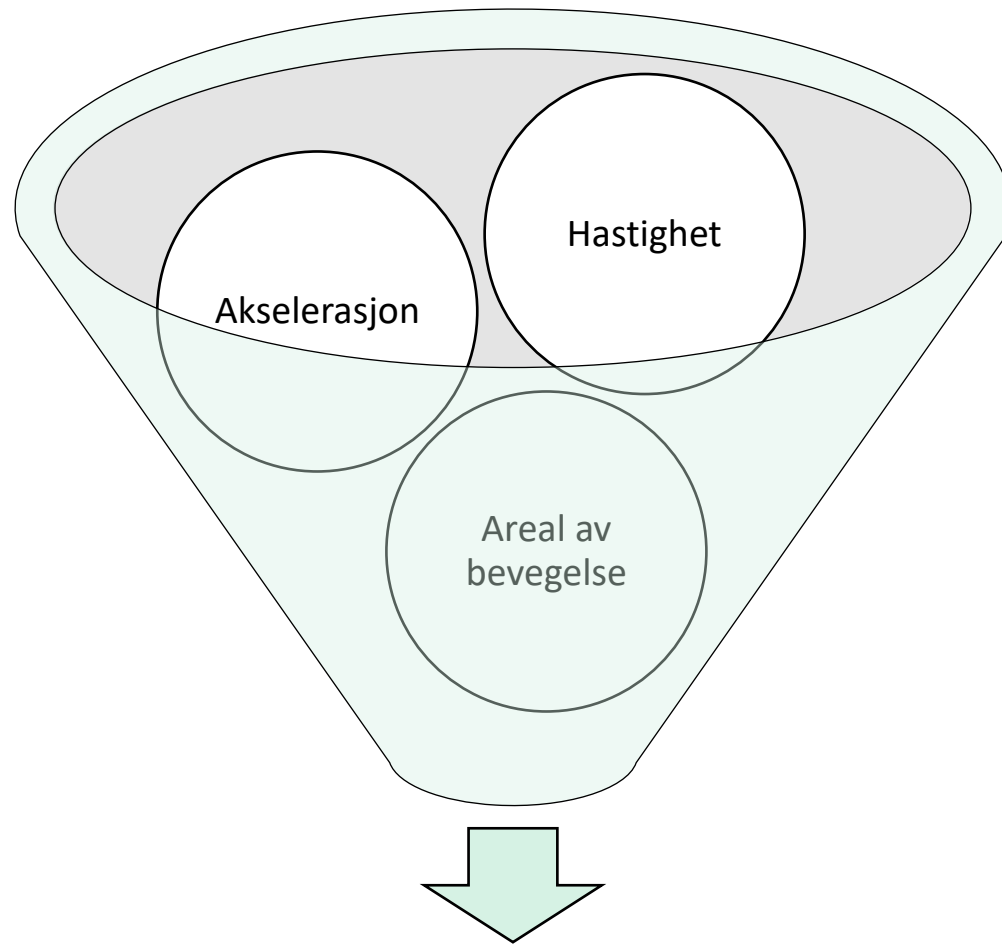
CP risk 014_1_1_E_F_formatted_risk.csv

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CP risk 002_1_1_E_F_formatted_risk.csv

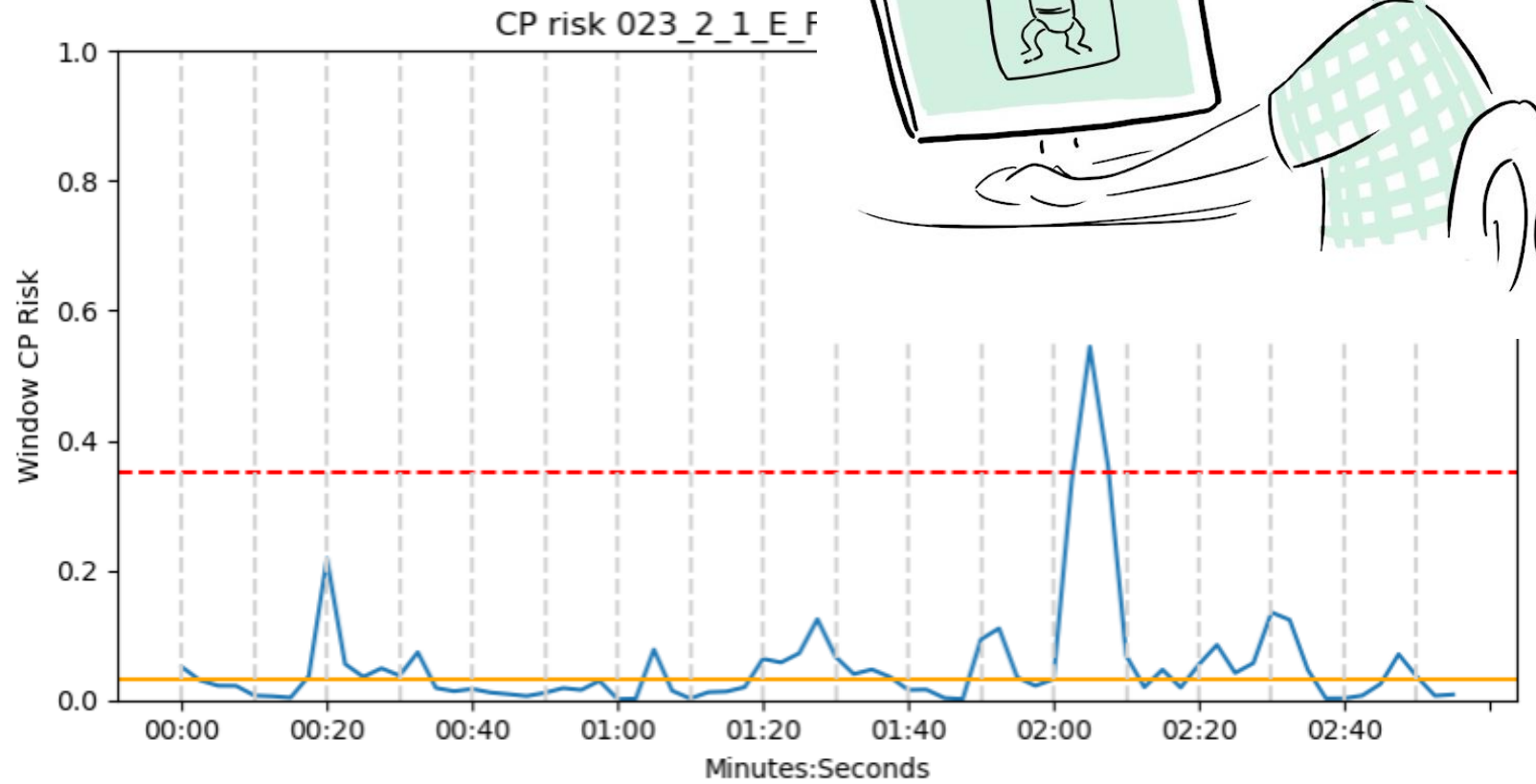
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Arbeid 2
Utforske
bevegelsesdata

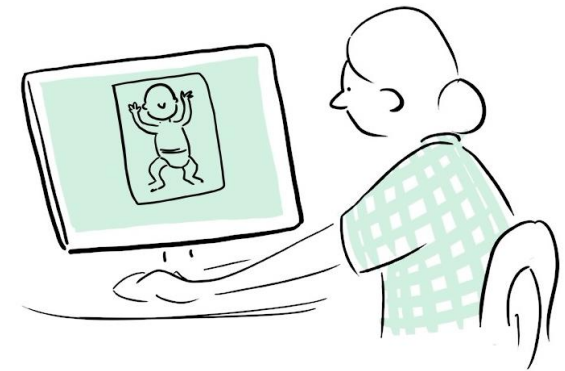
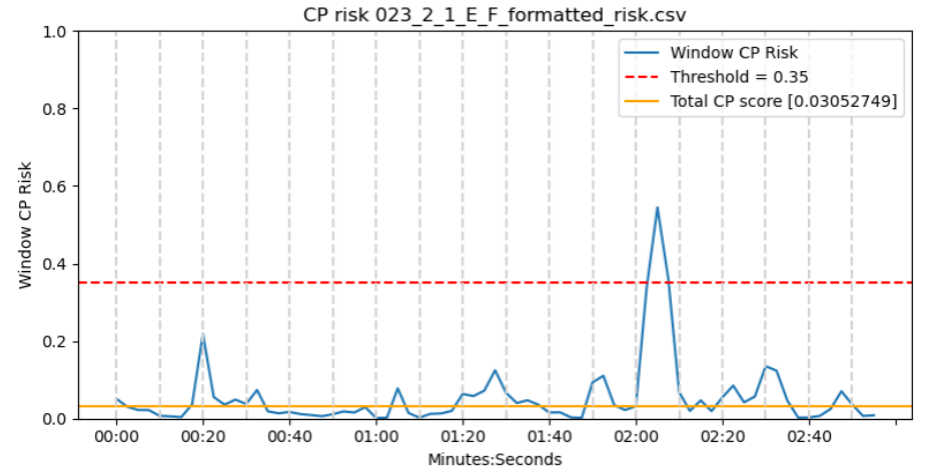
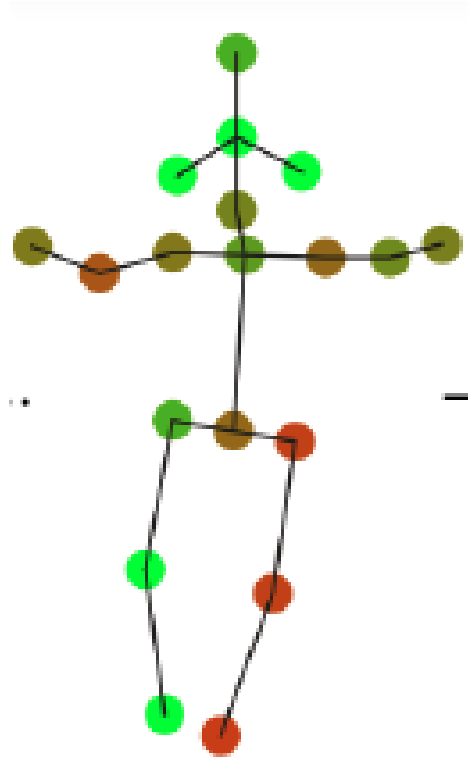


CP risiko?

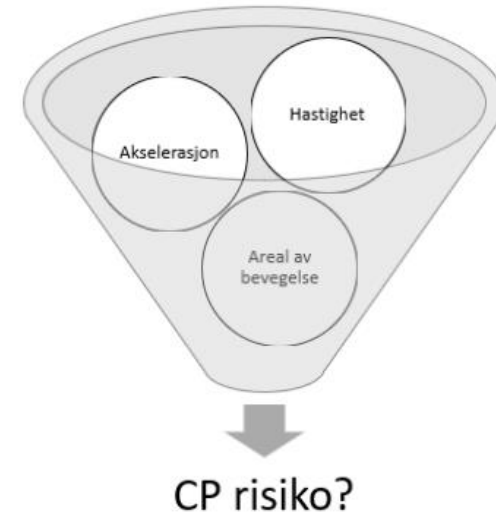
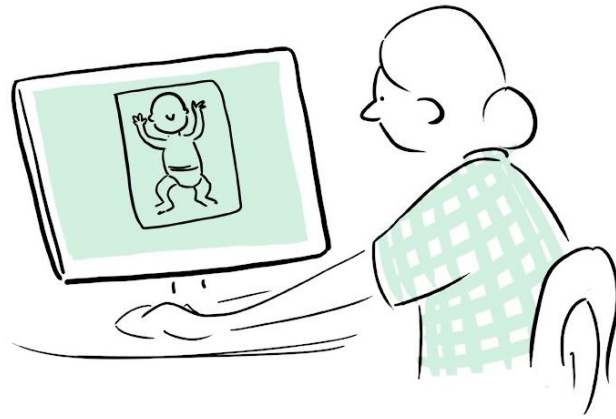
Arbeid 2
Utforske
bevegelsesdata



Arbeid 2
Utforske
bevegelsesdata



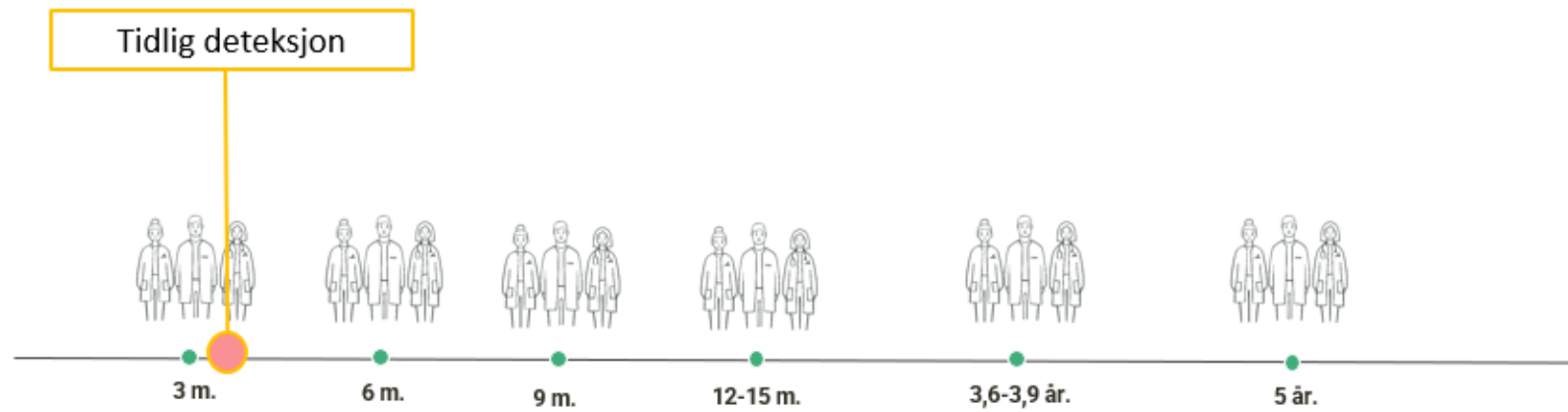
Arbeid 3 Klinisk setting



Arbeid 3
Klinisk setting



Arbeid 3 Klinisk setting



Arbeid 3
Klinisk setting



Team



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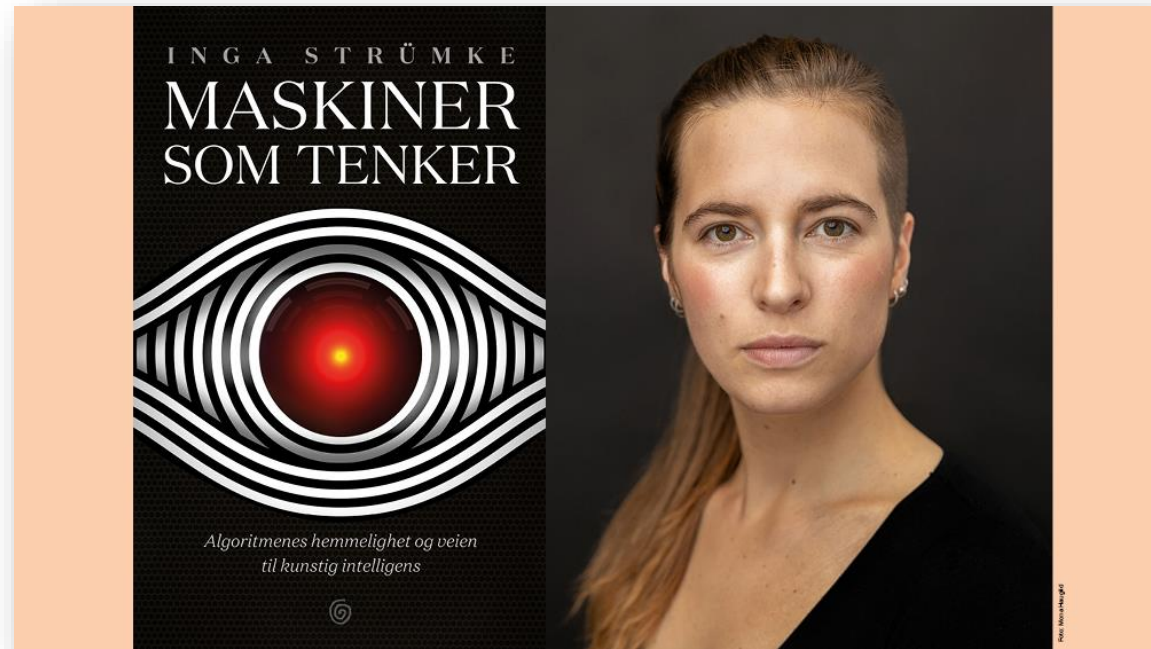
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Felix Temple,
stipendiat, NTNU



**Inga Strømke, førsteamanuensis, Norwegian Open AI-Lab, NTNU,
prosjektleder DeepInMotion**

Sentrale samarbeidspartnere



Takk!



In-Motion
INFANT MOVEMENT ANALYSIS

