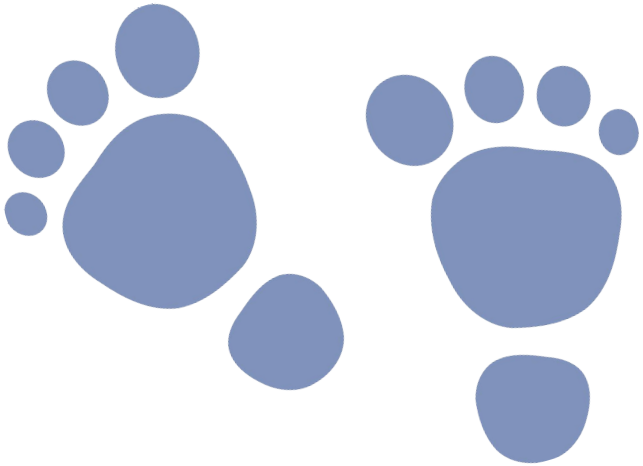
Physical Parameters for Image Learning in Pediatric

Examining PSF Blur and RGB Channel Weights for Learning Infant Poses Estimation

Sebi Gutierrez

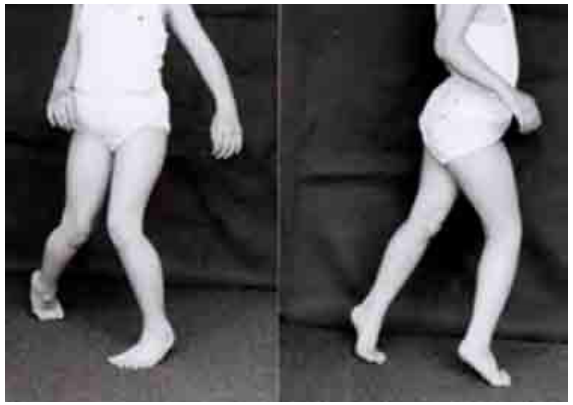
November 24th, 2020

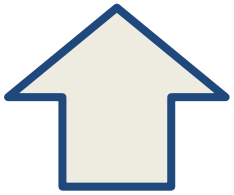


1. Problem and Background
2. PoseNet and SOTA
3. Methods
4. Results
5. Future Work

Pediatric NeuroMSK/Cog Disorders

- Cerebral Palsy
  - 2.1 in 2000; $1.5B lifetime
- Autism Spectrum Disorder



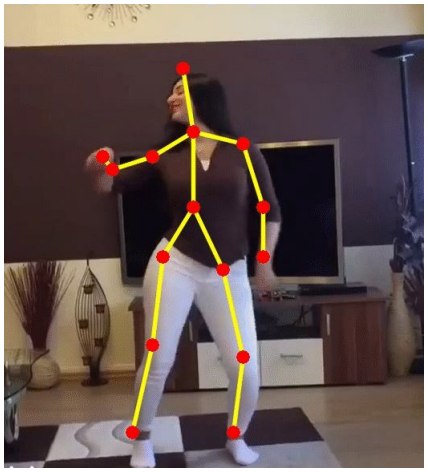


- General and Fidgety Mvt
  - weeks to 2 years

"Cramped Synchronized General .. for Cerebral Palsy". Ferrari et al. *Arch Pediatr Adolesc Med*. 2002;156(5):460-467

Pose Learning and Infants

- 20+ years in development
- Images and Video
- Detect anatomy landmark
  - pose estimation v tracking
- Limitations and assumptions



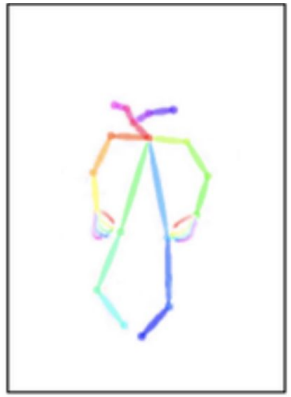


TABLE 1
The Typical Assumptions Made by Motion Capture Systems Listed in Ranked Order According to Frequency

Assumptions related to movements	Assumptions related to appearance
1. The subject remains inside the workspace	Environment
2. None or constant camera motion	1. Constant lighting
3. Only one person in the workspace at the time	2. Static background
4. The subject faces the camera at all time	3. Uniform background
5. Movements parallel to the camera-plane	4. Known camera parameters
6. No occlusion	5. Special hardware
7. Slow and continuous movements	
8. Only move one or a few limbs	Subject
9. The motion pattern of the subject is known	1. Known start pose
10. Subject moves on a flat ground plane	2. Known subject
	3. Markers placed on the subject
	4. Special coloured clothes
	5. Tight-fitting clothes

"Automated pose estimation ... from conventional videos" Marchi et al. *Acta Paediatrica.* 2019;108(10):1817-1824

"A Survey of Computer ... Motion Capture". Moselund and Granum. *Computer Vision and Image Understanding.* 2001; 81(3): 231-268

Expansion in Application

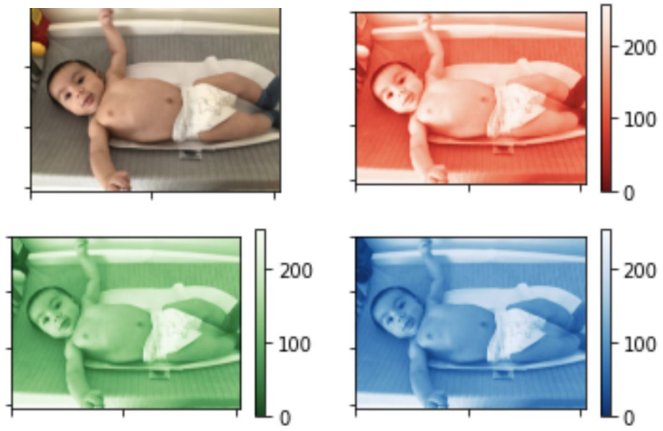
- Non clinical settings
  - non ideal conditions

- Outpt MDs, daycare, home?

Fine-tuned Domain-adapted Infant Pose (FiDIP) + More

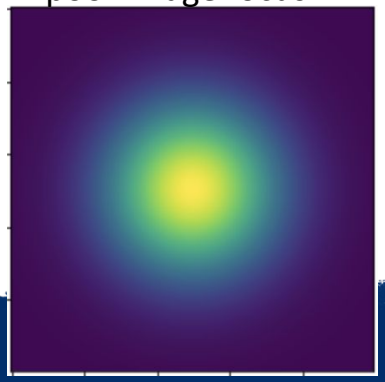
Augmented Cognition Laboratory

train = 1000
test = 100
jpeg + json



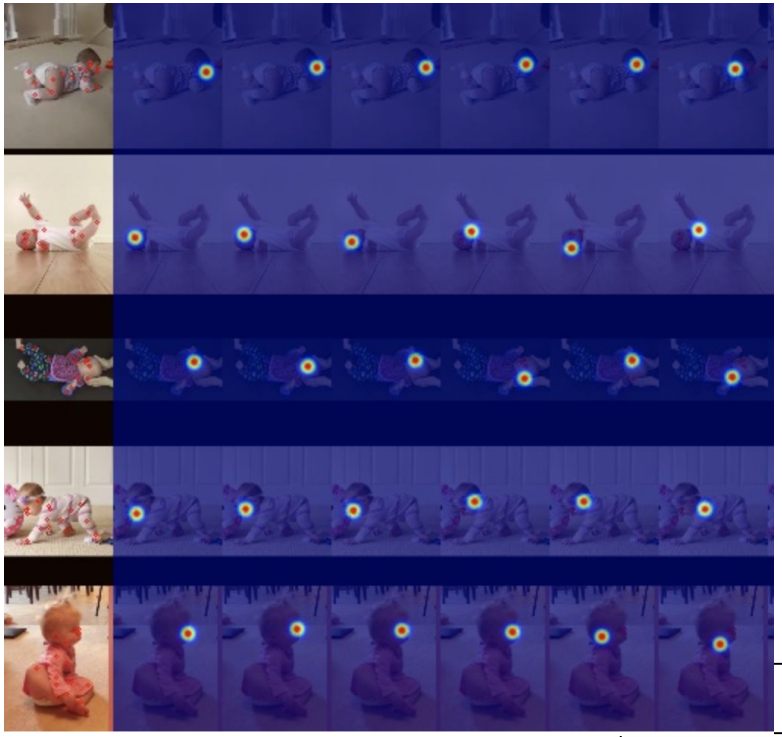
B+W, night vision cameras?

poor image focus



https://github.com/ostadabbas/Infant-Pose-Estimation

Results



$$Grayscale = 0.21 * R + 0.72 * G + 0.07 * B$$

	Accuracy (MSE)
Images	(Final Epoch, Avg)
As Is	0.939 (0.917)
Gray	0.733 (0.712)
RGB	0.747 (0.741)
Blur	0.846 (0.849)
Blur + RBG	0.819 (0.820)

Future Work

- Expanded dataset, currently limited size
- African American children? Underrepresentation in AI; in training set
  - ~5 in all the dataset
- Pose estimation -> tracking (video)
  - Apply similar physical layers
- Full automation GMA and quantifiable outcomes from poses

Questions?
Thank you!
@Dr.Horstmeyer, @Colin,@AugmentedCogLab

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