NEUROSCIENCE 2025 SATELLITE EVENT

NEURO-INSPIRED PERCEPTION & COGNITION

12TH ANNUAL IEEE Engineering Medicine and Biology Society International Conference on Neural Engineering
11-14 NOV 2025
SAN DIEGO
IEEE EMBS
IEEE Engineering Medicine & Biology Society

What's catching your eye?

Event-driven sensing and neuromorphic computing for active vision

CTU CZECH TECHNICAL UNIVERSITY IN PRAGUE

Giulia D'Angelo
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Czech Technical University in Prague (CTU)







Università di Genova
KING'S College LONDON
MANCHESTER 1824 The University of Manchester
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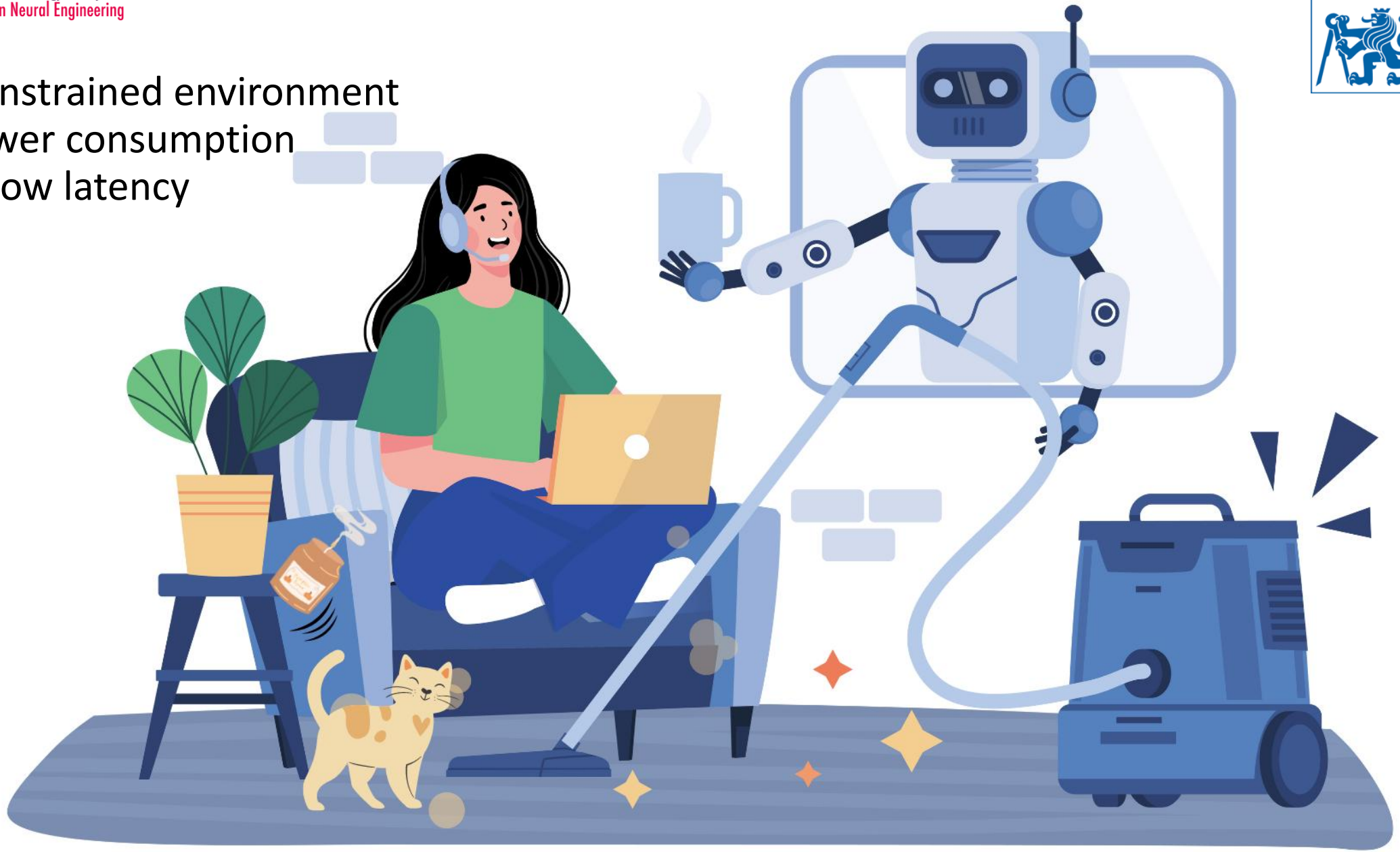
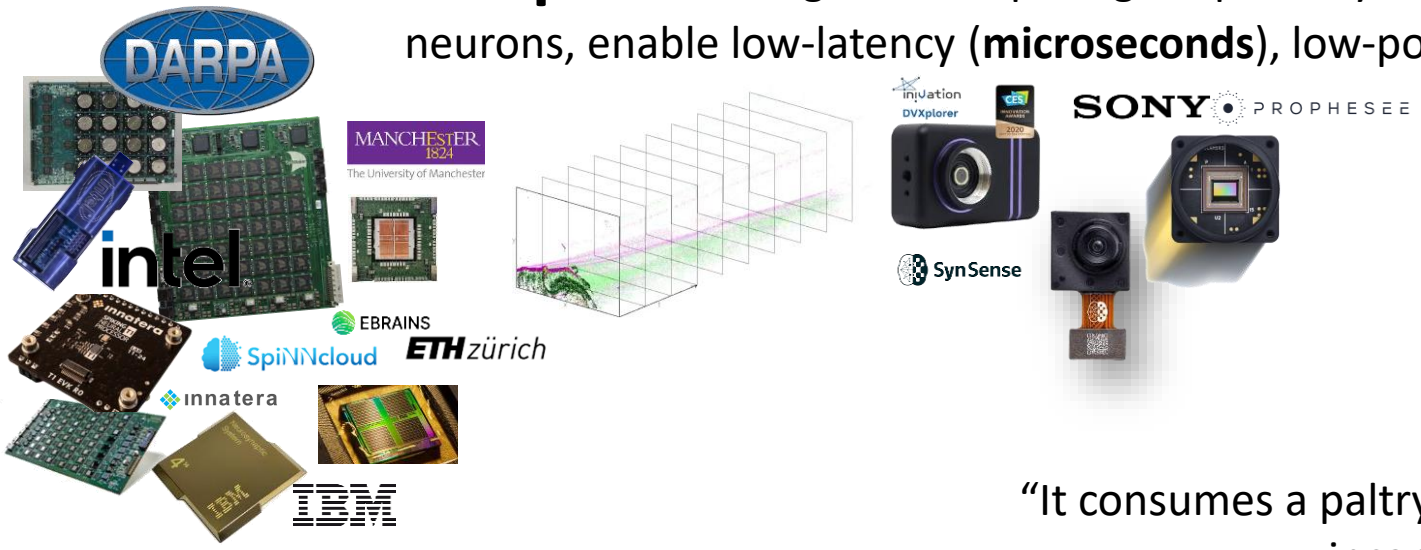
Unconstrained environment
Low power consumption
Low latency



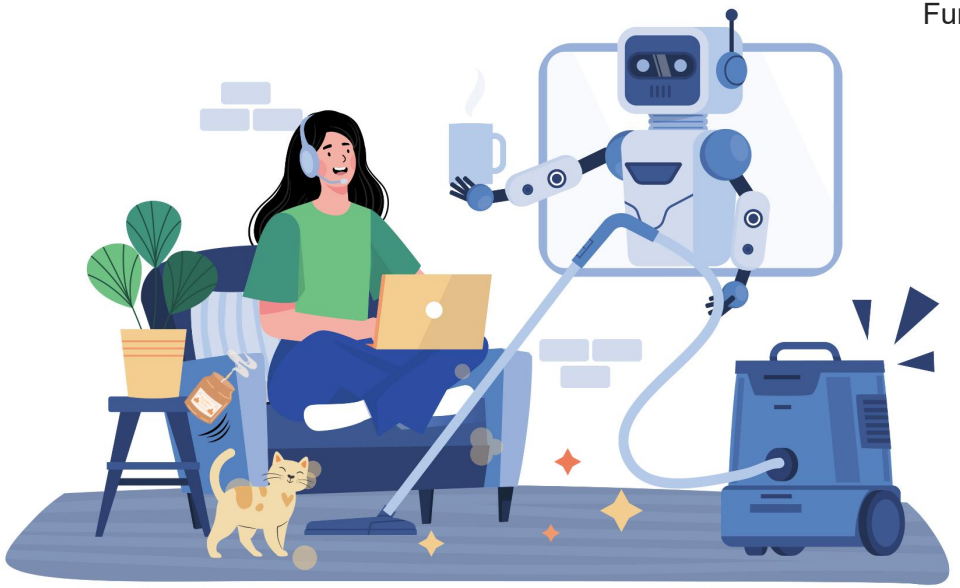
Neuromorphic sensing and computing, inspired by biological visual systems and neurons, enable low-latency (**microseconds**), low-power (**milliwatts**).



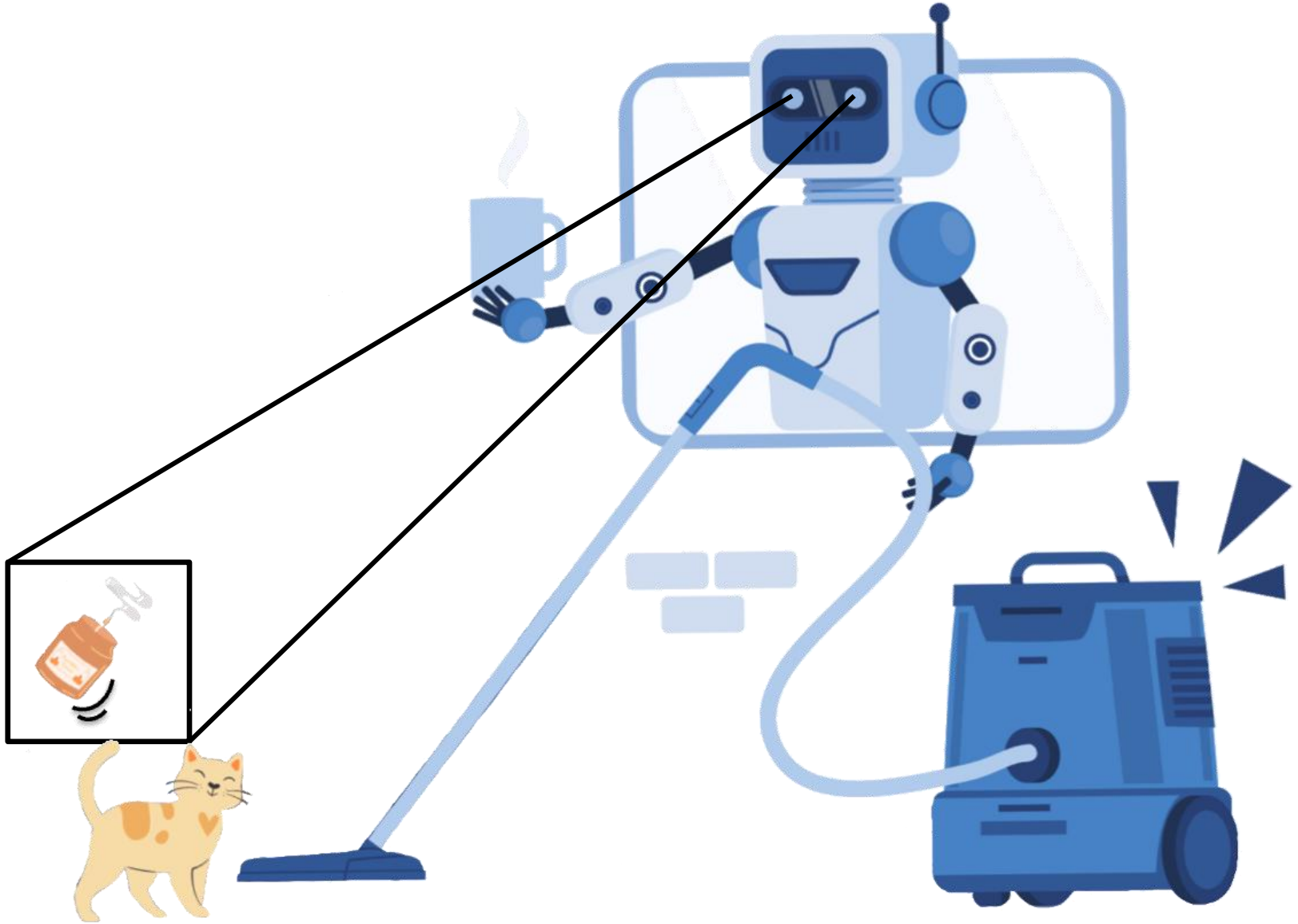
Someone has already done it!

"It consumes a paltry 20 watts, much less than a typical incandescent lightbulb"

Furber, Steve. "To build a brain." *IEEE spectrum* 49.8 (2012): 44-49.

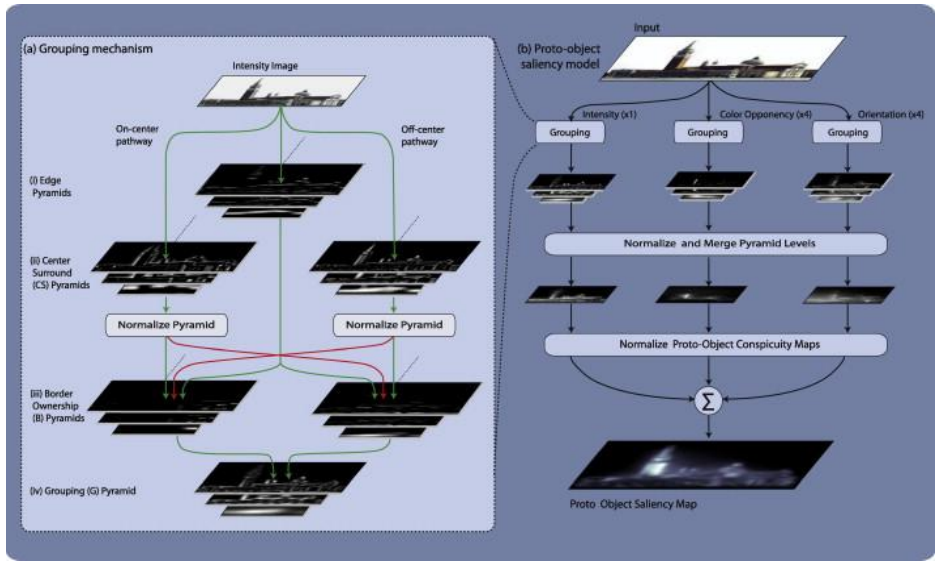


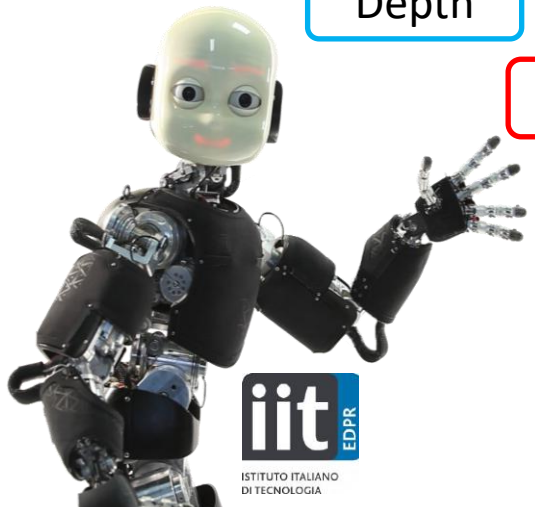
How do we define attention?



How do we define attention?

Russell, Alexander F., et al. "A model of proto-object based saliency." *Vision research* 94 (2014): 1-15.

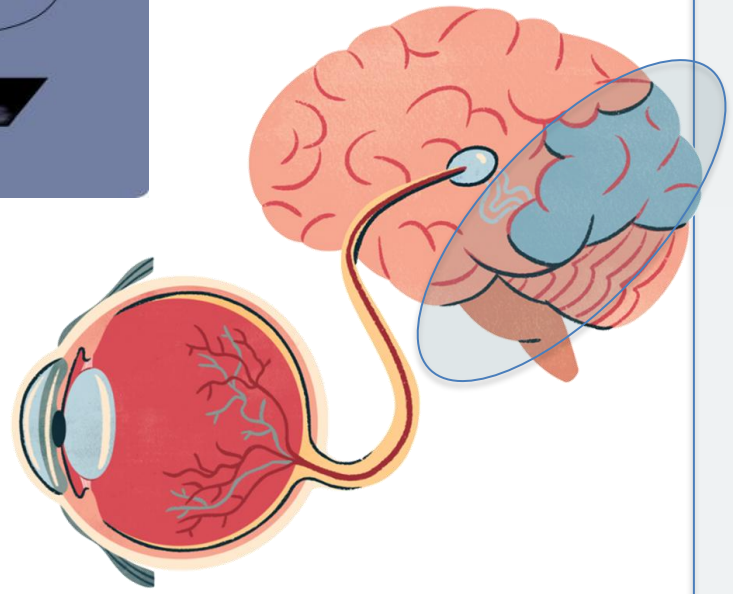


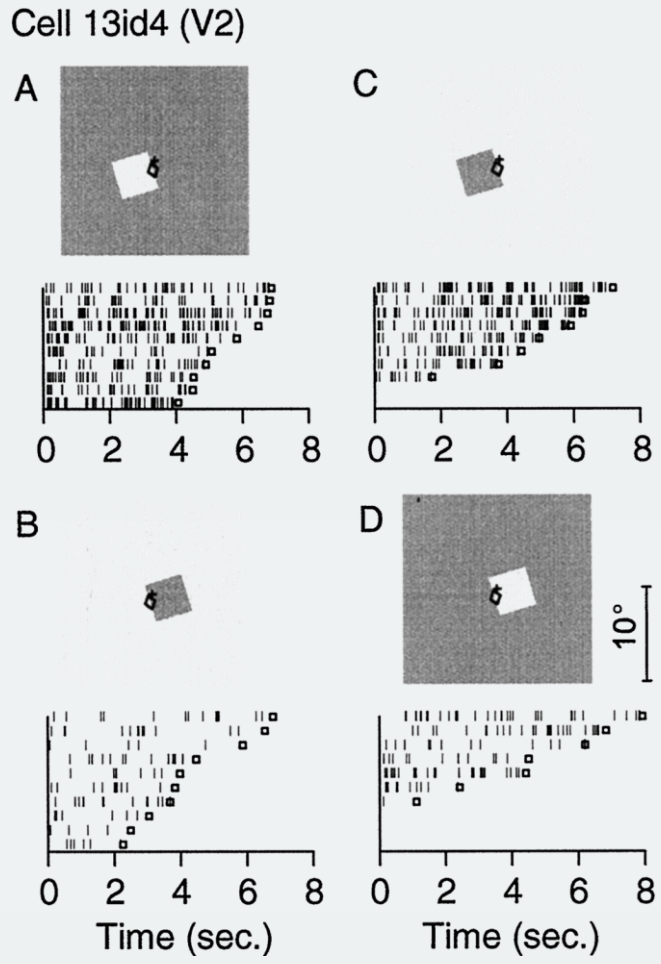


Depth

Motion

Intensity





Zhou, Hong, Howard S. Friedman, and Rüdiger Von Der Heydt. "Coding of border ownership in monkey visual cortex." *Journal of Neuroscience* 20.17 (2000): 6594-6611.

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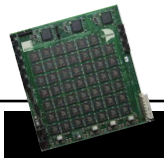
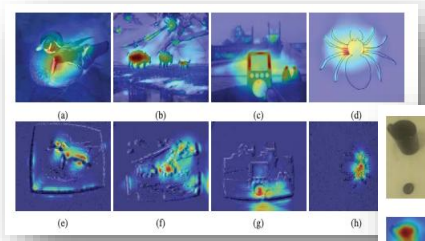
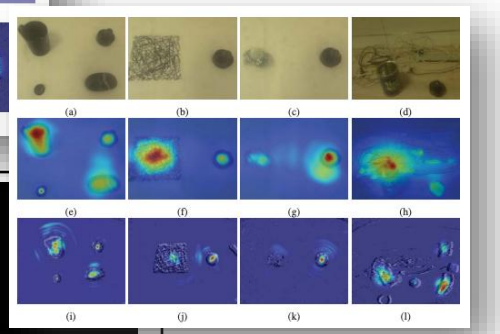
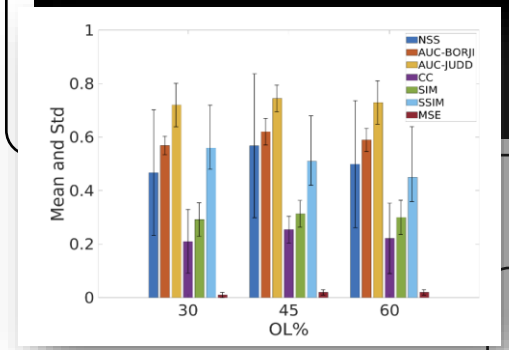
Iacono, M. et al. 2019
D'Angelo, G. et al. (2022)

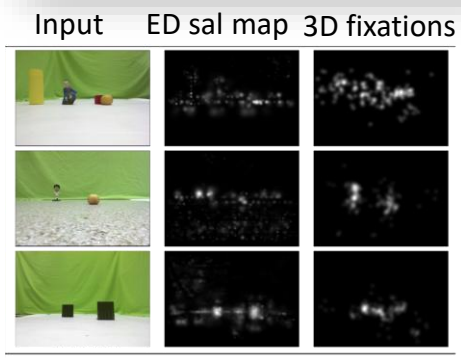


Intensity



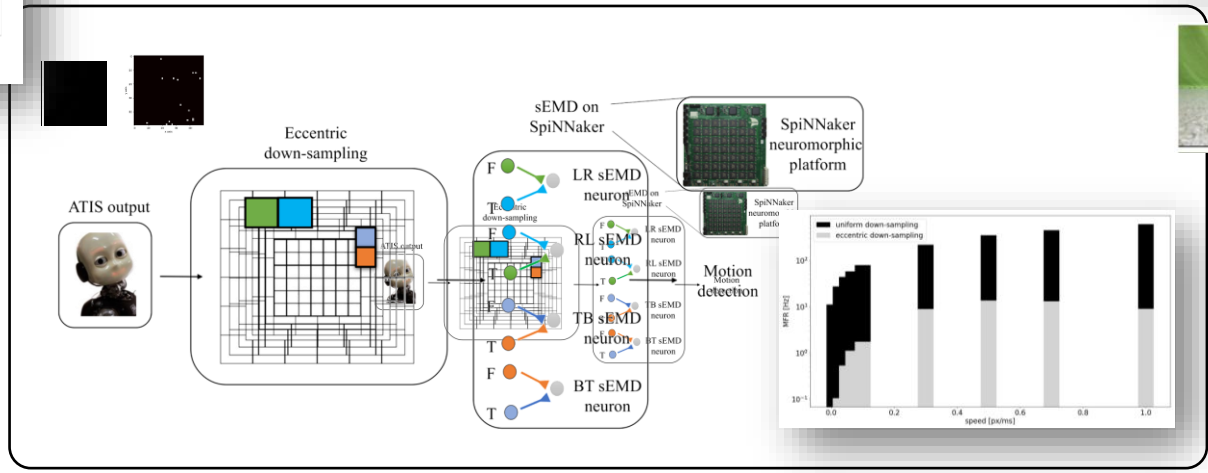






Motion

D'Angelo, G. et al. (2020)



Ghosh, S & D'Angelo, G. et al. (2022)

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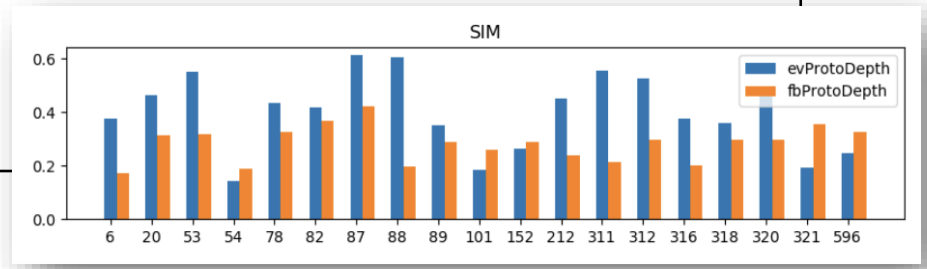
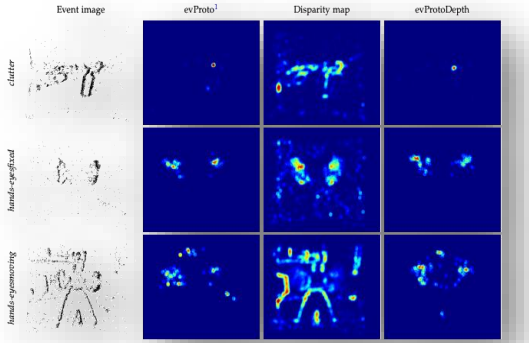
Depth

What interests a robot: Event-Driven Proto-object saliency in 3D space

Giulia D'Angelo and Suman Ghosh, Arren Glover, Massimiliano Iacono, Ernst Niebur, Chiara Bartolozzi





Iacono, M. et al. 2019

~100 ms GPU

Ghosh, S & D'Angelo, G. et al. (2022)

~170 ms GPU

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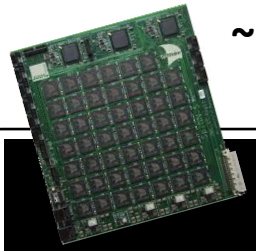
D'Angelo, G. et al. (2022)



~16 ms

Intensity

Depth

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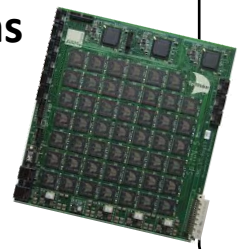
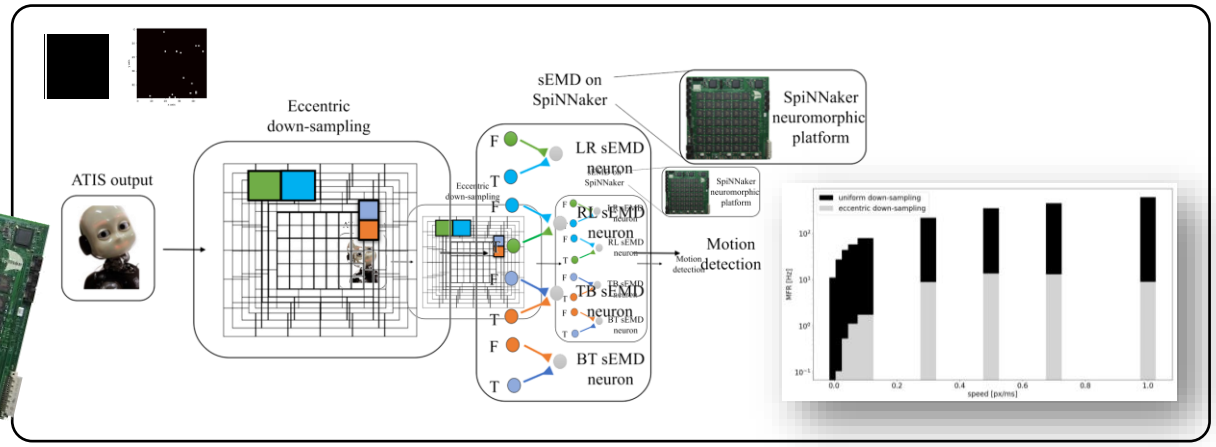
Motion

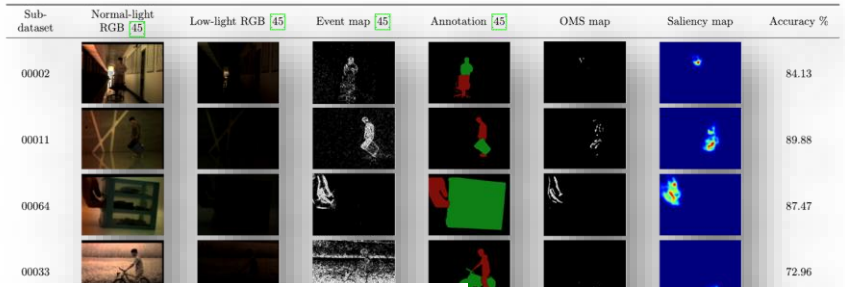
D'Angelo, G. et al. (2020)

~4 ms

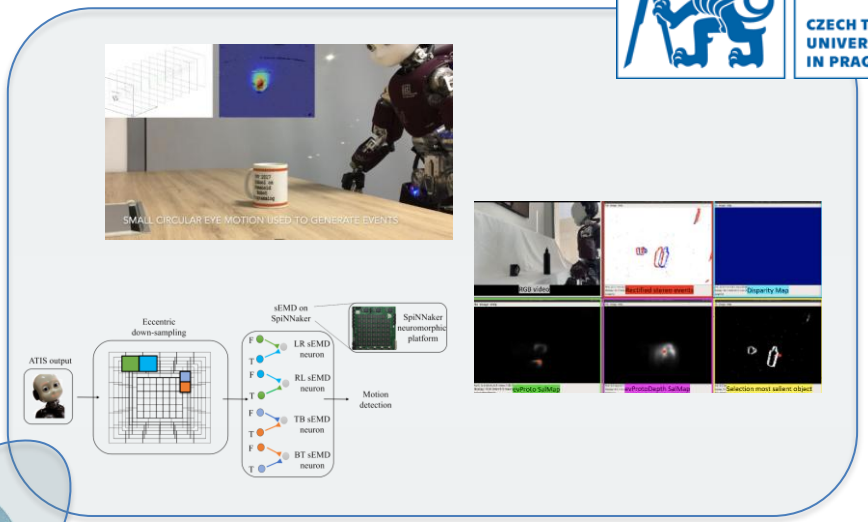




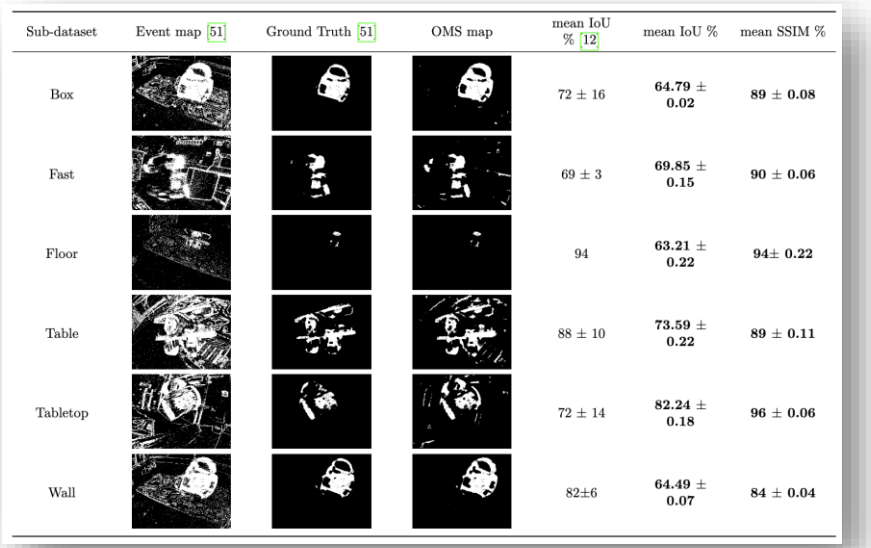
D'Angelo, G et al. (2025)

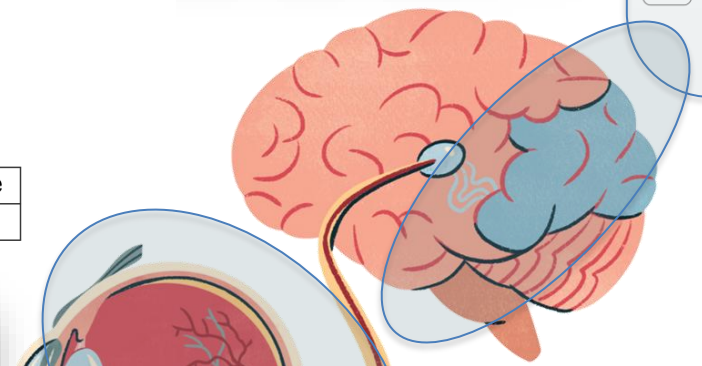


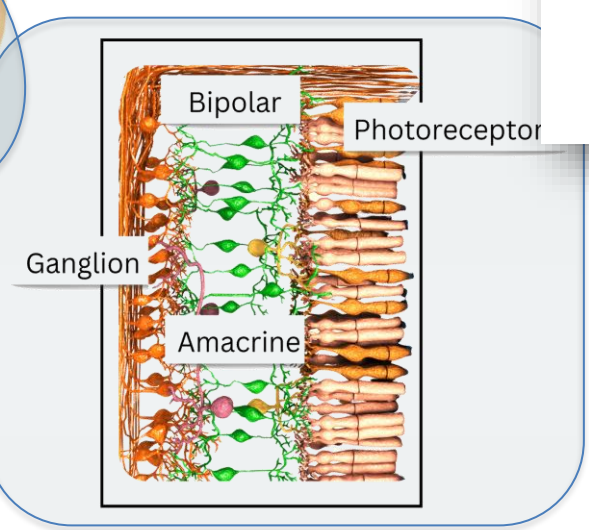
Visual attention

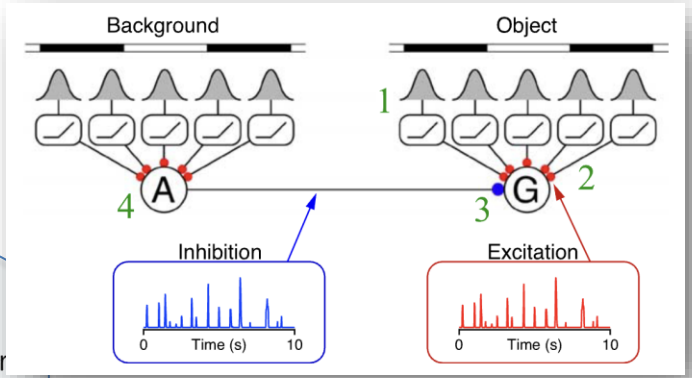


Trials	# Events	# sOMS Events	Percentage
10	14747.03 ± 2029.17	2189.15 ± 385.57	85.16%







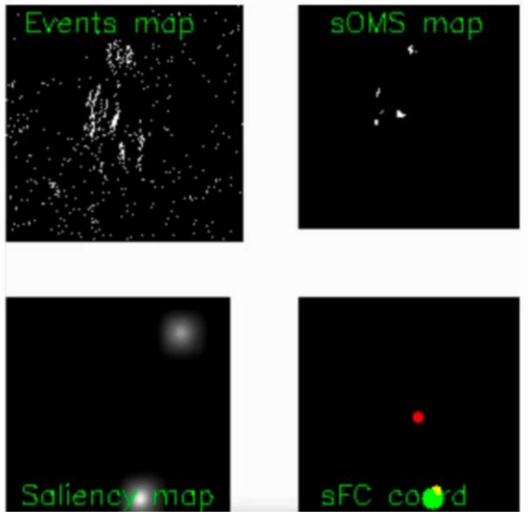


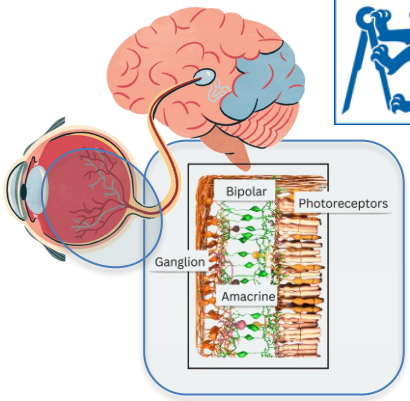
Baccus, S. A., Ölveczky, B. P., Manu, M., & Meister, M. (2008). A retinal circuit that computes object motion. *Journal of Neuroscience*, *28*(27), 6807-6817.

D'Angelo, G et al. (2025)

~120 ms M2

~1 ms Speck
<= 1 W





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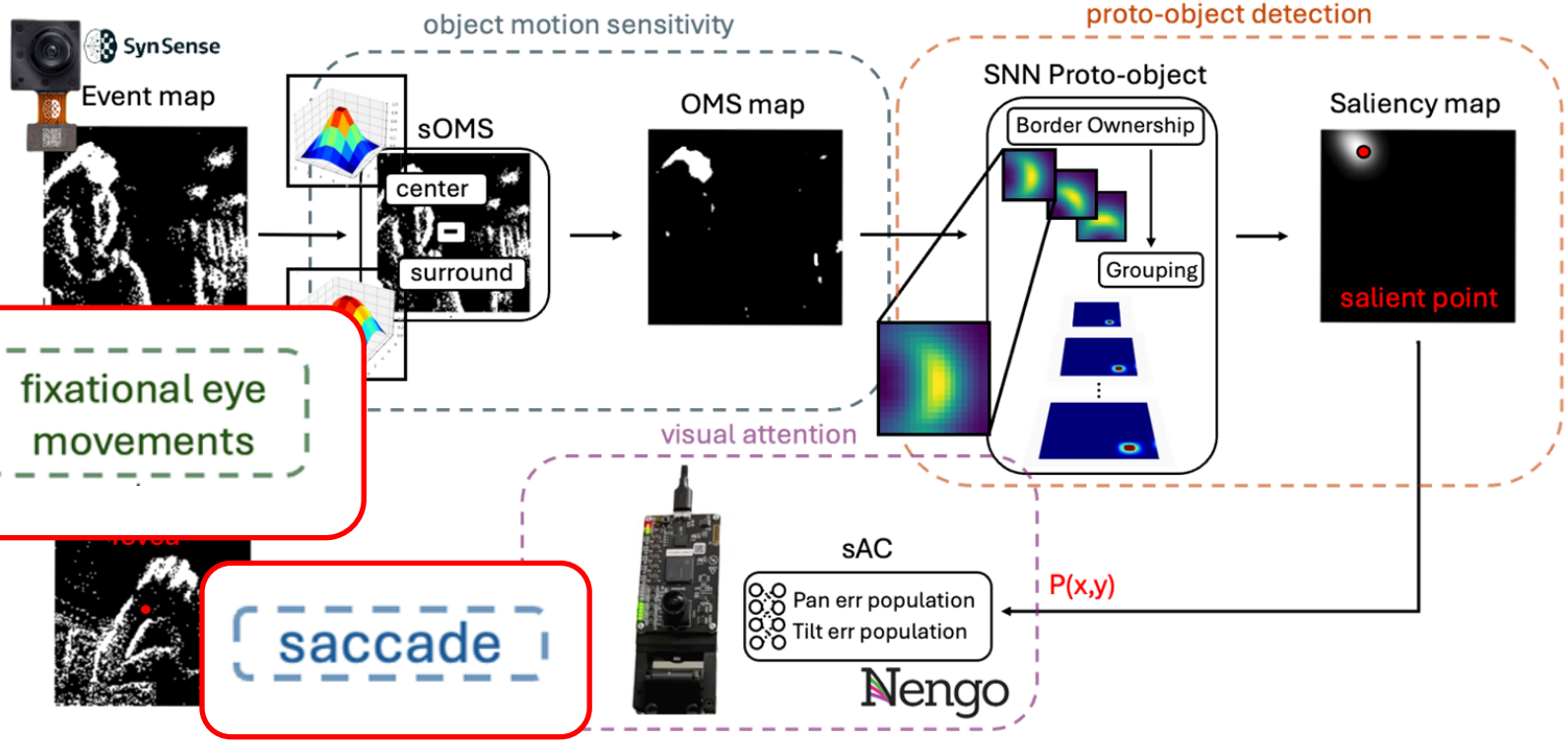

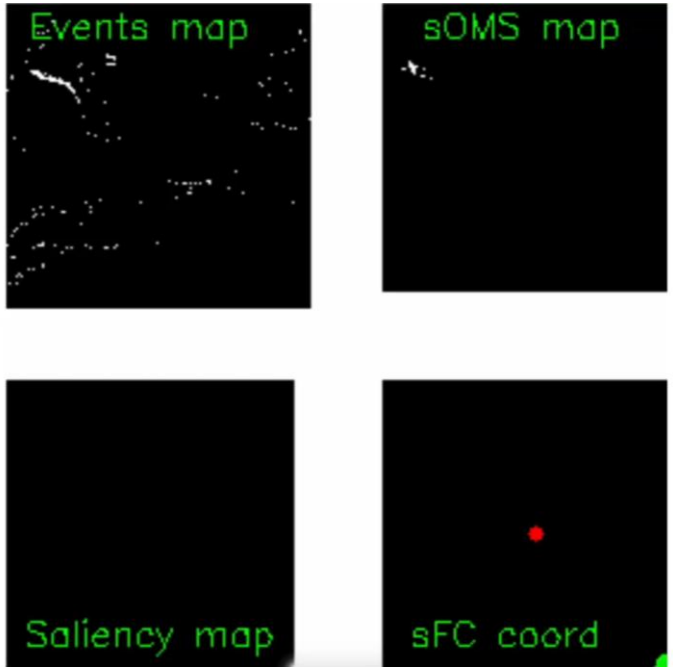

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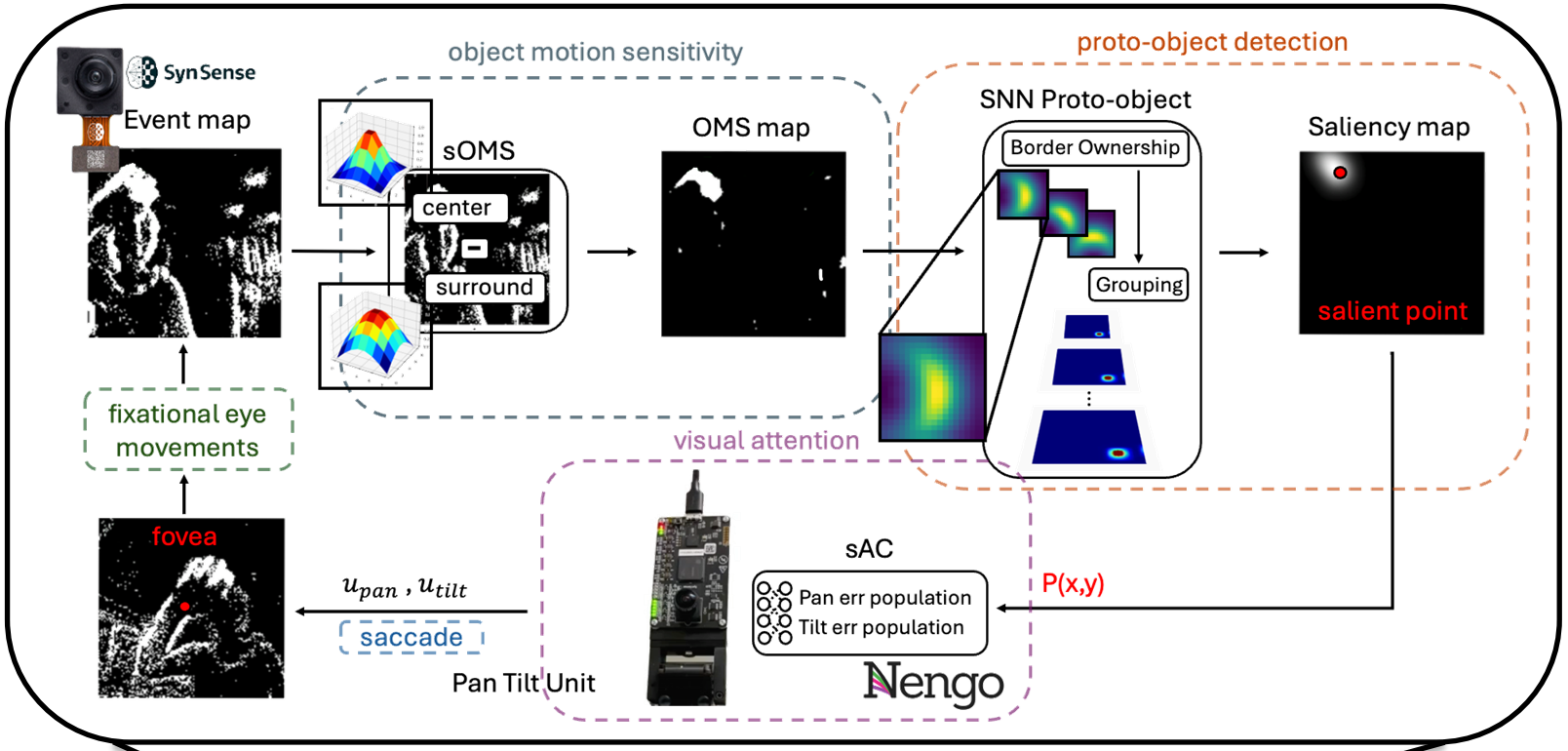
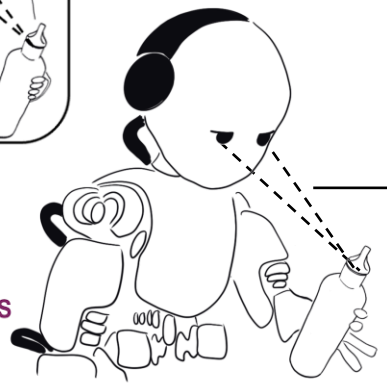
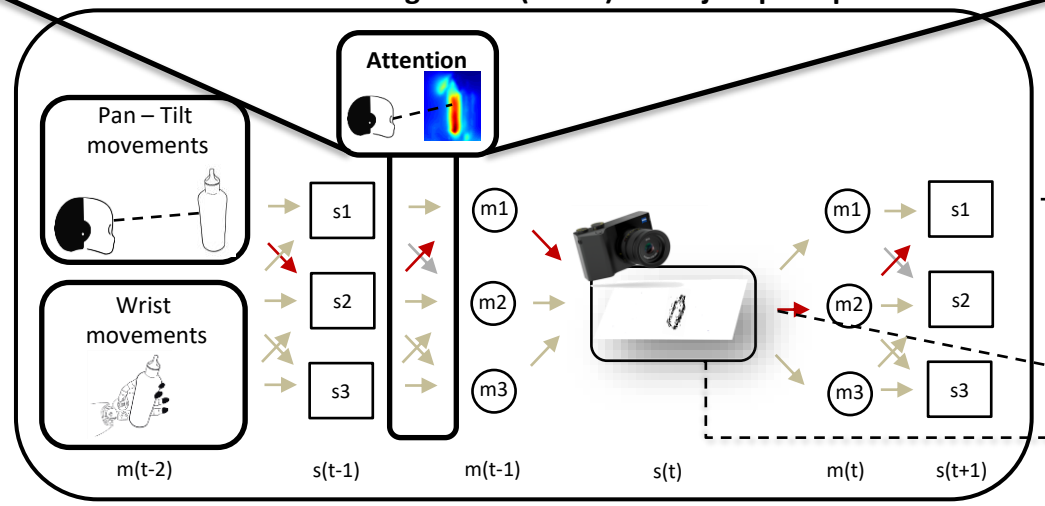
Attention





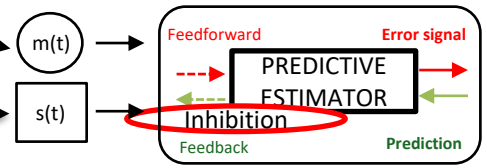
MARIE CURIE ACTIONS

Sensorimotor Contingiencies (SMCT) for object perception



Object discrimination

PreCNet



Next object position

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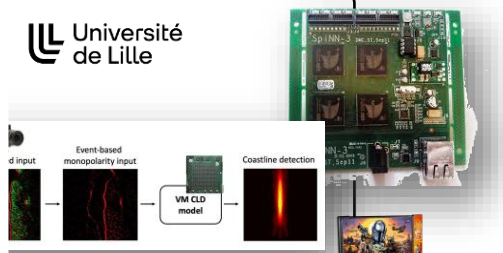
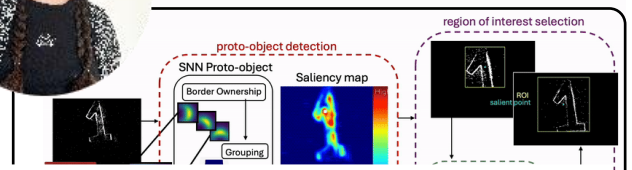
e detection on SpiNNaker

Université de Lille

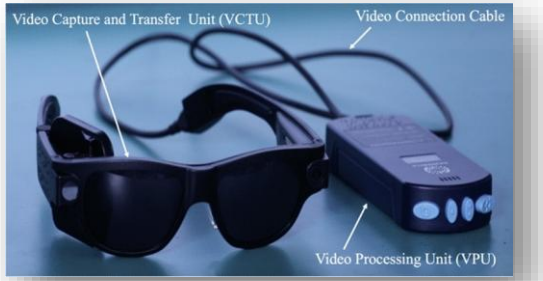


20 ms is 0.3756 mW

Visual stabilization for object recognition

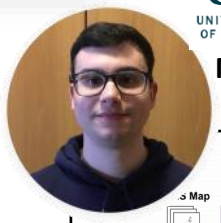


Visual prosthesis

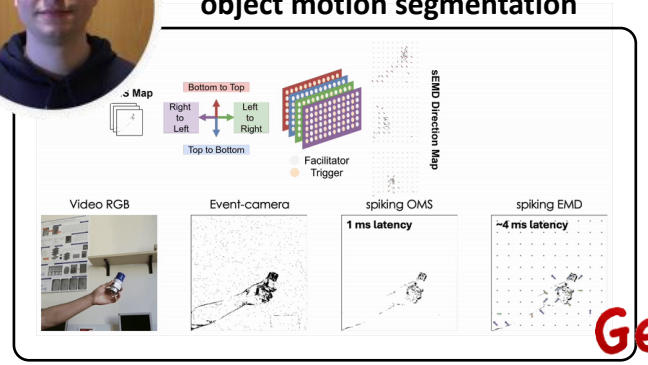


Bioinspired active vision: learning through exploration

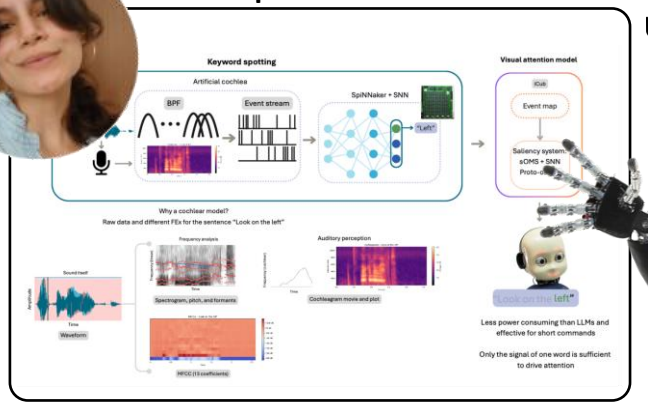
US UNIVERSITY OF SUSSEX
Politecnico di Torino



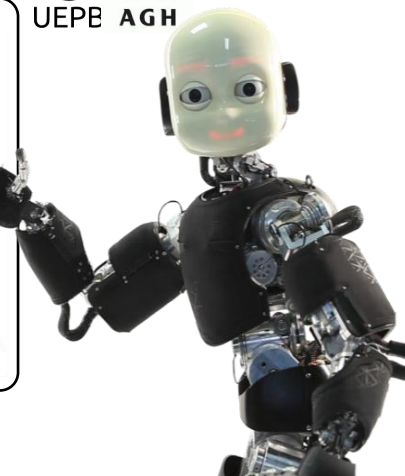
Motion direction detection though object motion segmentation



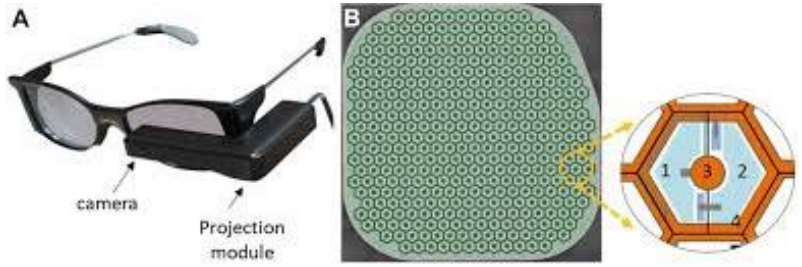
Talk to look: visual attention influenced by spoken commands



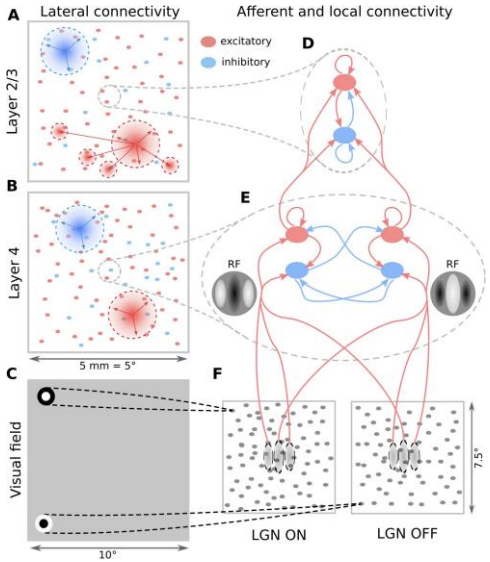
UEPB AGH



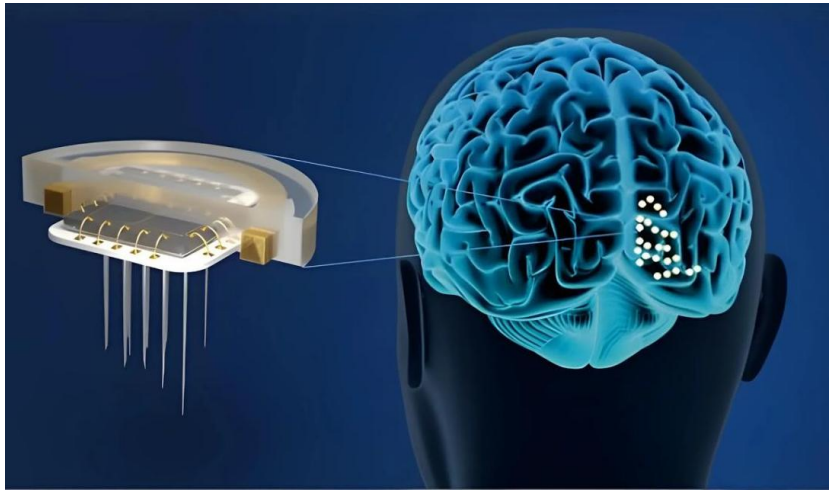
GeNN



Muqit, Mahiul Muhammed Khan, et al. "Prosthetic visual acuity with the PRIMA subretinal microchip in patients with atrophic age-related macular degeneration at 4 years follow-up." *Ophthalmology Science* 4.5 (2024): 100510.



Antolik, Jan, et al. "Assessment of optogenetically-driven strategies for prosthetic restoration of cortical vision in large-scale neural simulation of V1." Scientific reports 11.1 (2021): 10783.



Intracortical Visual Prosthesis (ICVP): Revolutionary Wireless Visual Prosthesis Brain Implant Marks Two Years of Successful Testing After Surgical Implantation

Ramirez, Kailyn A., et al. "An update on visual prosthesis." *International Journal of Retina and Vitreous* 9.1 (2023): 73.

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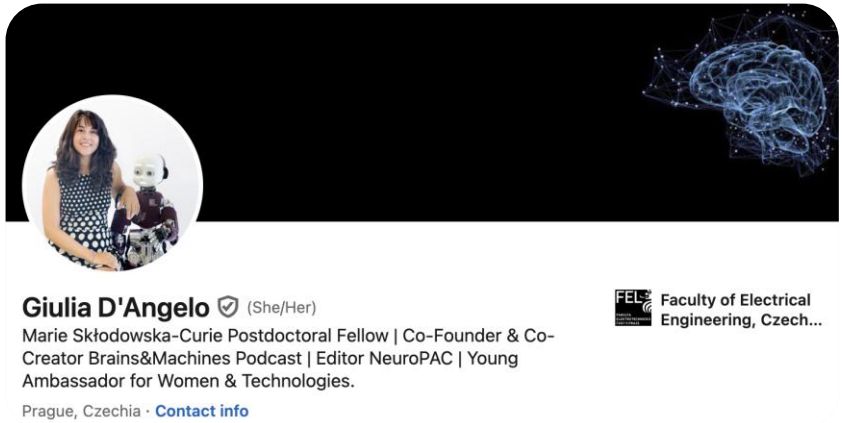

Giulia D'Angelo (She/Her)
Marie Skłodowska-Curie Postdoctoral Fellow | Co-Founder & Co-Creator Brains&Machines Podcast | Editor NeuroPAC | Young Ambassador for Women & Technologies.
Prague, Czechia · Contact info

Faculty of Electrical Engineering, Czech...

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