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#### PhD Program in Neural and Cognitive Sciences

#### Tuesday, February 2 - 10:30

**MS Teams - NeSC** 

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### Pausing the oculomotor system: on the race between cortical and subcortical visual

## bursts at the time of saccade generation

A hallmark of sensory processing is that inputs can be processed in parallel by diverse, functionally specialized circuits. In the visual system, the same visual input can quasisimultaneously reach neurons concerned with visual analysis, gaze orienting, and even gaze-orienting inhibition. From a behavioural perspective, such a "sensory race" leads to a paradoxical scenario: within essentially the same time, the same visual input can reach a brain circuit serving rapid orienting towards the appearing stimulus (e.g. superior colliculus and V1) or another circuit potently inhibiting orienting towards it (e.g. brainstem premotor nuclei). I will show that visuallyinduced spikes from stimulus onset and reaching the superior colliculus (SC) modify the saccade vector in a predictable manner, as if to "capture" it. On the other hand, the same stimulus can evoke a strong visual response within the brainstem premotor nuclei, abruptly inhibiting any eye movement. These behavioural modulations can be causally replicated by injecting short microstimulation pulse trains to "simulate" brief phasic visual responses in either the premotor nuclei, SC, or V1 individually. In the brainstem, they completely inhibited saccades. Contrarily, the same trains delivered in the SC triggered saccades, and V1 trains acted like visual stimuli (phosphenes). Therefore, we uncovered a sensory race between sensory-motor areas, in which inhibition wins overwhelmingly most of the time. Our results provide a highly mechanistic description of exactly what to expect in terms of two important aspects of adaptive behaviour: stopping versus orienting.









