

# **Is human movement optimal? Application to the walk-to-run transition and sit-to-stand transition in cycling**

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Despite the apparent simplicity of a skilled movement, the organization of the underlying neuro-musculo-skeletal system remains unclear. A reason is the redundancy of the motor system: a given movement can be realized by different muscle and joint activity patterns. However, despite this conundrum, the central nervous system always finds robust and stable trajectories. Nowadays, no computational model can generate movements in terms of adaptability, robustness, accuracy and swiftness as fast as the central nervous system. One possible explanation is that the proper control criteria have not yet been identified.

Our presentation will focus on biomechanics of the musculo-skeletal model, which allows us to determine the inner dynamic of the body.

Then we will demonstrate how minimization of some cost functions may explain transitions in locomotion or cycling.