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To whom it may concern:
Recommendation letter for Sam Rahnemayan

Dear Colleagues,

It is with pleasure that I write this letter of recommendation for Sam Rahnemayan, who did his master project in the laboratory of Prof. Marc Carmichael at the University of Technology in Sydney, and who I followed remotely as EPFL supervisor. The project was entitled "Neuromuscular Adaptation to Exoskeleton Assistance: A Multi-Modal Analysis" and Mr Rahnemayan obtained the **excellent grade of 5.75** on a scale where 6.0 is the maximum, and 4.0 is the minimum to pass. This places him in **the top 20% of master students** doing a project under my supervision. During this project, he demonstrated **excellent analytical abilities, technical competence, and a genuine aptitude for scientific research.**

The project addressed the challenging problem of understanding how the human nervous system adapts to the constraints imposed by a commercial upper-limb rehabilitation exoskeleton. Given the limited access to the device's internal control mechanisms, this required the development of an experimental strategy capable of extracting meaningful information from multiple complementary measurement modalities. To this end, Mr Rahnemayan designed and implemented an experimental protocol combining optical motion capture and multi-channel electromyography under several assistance conditions. He also developed a comprehensive data-processing pipeline in Python to synchronize, filter, and analyze the resulting datasets. This work required a strong command of scientific programming as well as careful attention to data quality and reproducibility.

A notable strength of the project was the student's ability to integrate methods from different disciplines. He applied dimensionality reduction techniques based on Non-negative Matrix Factorization to investigate muscle synergies and employed kinematic analyses to characterize movement dynamics and coordination patterns. Throughout the project, he showed a very good capacity to learn new methods independently and to apply them appropriately to the scientific questions at hand.

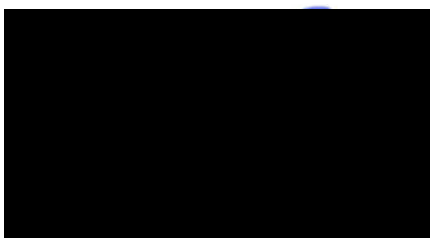
The study produced several interesting findings. In particular, the results suggested that the exoskeleton acts as a strong spatiotemporal constraint on movement, restoring certain kinematic characteristics while simultaneously introducing additional neuromuscular demands. The work also highlighted the potential limitations of relying exclusively on kinematic performance metrics when assessing motor recovery, as seemingly successful movements may conceal compensatory muscular activation patterns.

Beyond the technical aspects of the project, Mr Rahnemayan approached his work with seriousness and persistence, as far as I could assess in this remote supervision. He gave excellent presentations summarizing his work. He was able to navigate complex datasets, identify methodological challenges, and contribute thoughtful interpretations of the results.

Overall, I consider Mr Rahnemayan to be a highly capable and promising young researcher with an excellent foundation in quantitative analysis and interdisciplinary research. I believe he has an excellent potential to succeed in graduate studies and research-oriented environments, and I am pleased to strongly recommend him to you.

Please do not hesitate to contact me should you need any further information.

Sincerely yours,



Auke Ijspeert
Professor, IEEE Fellow
Director of the Biorobotics Laboratory