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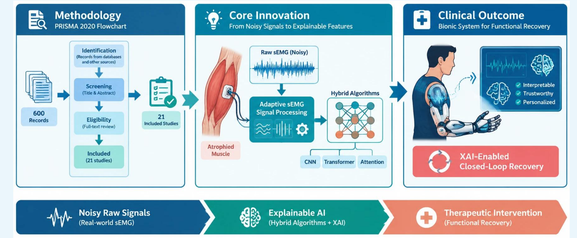


Neuromuscular Interfaces and Cyborg Systems in the Recovery of Atrophied Muscles: A Systematic Review of Adaptive EMG Signal Processing Approaches

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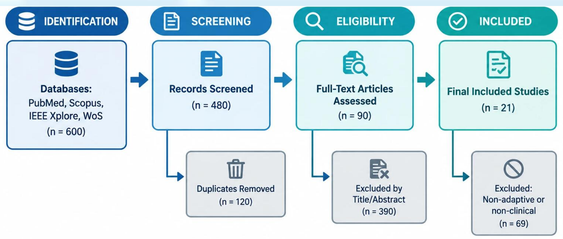
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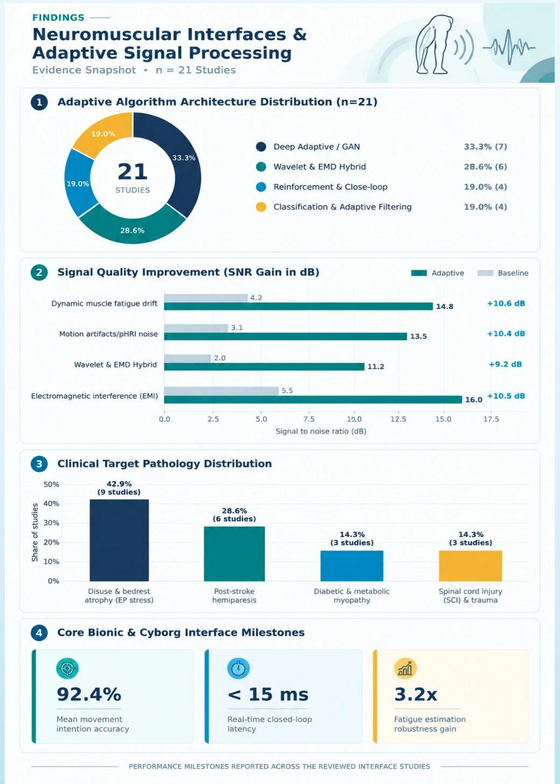
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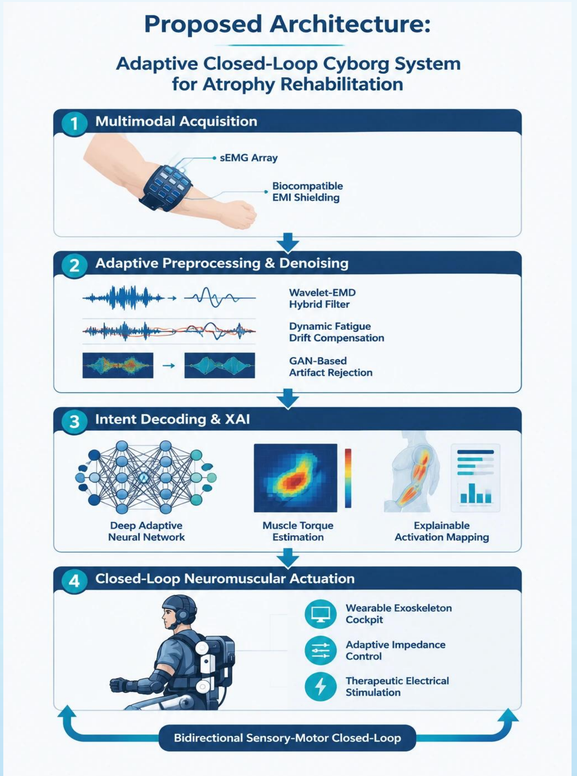
- **Clinical Imperative:** Skeletal muscle atrophy presents a debilitating functional challenge marked by progressive loss of muscle mass, driven by cellular dysfunctions such as endoplasmic reticulum (ER) stress and impaired motor unit recruitment .Conventional physical therapies often fail to deliver continuous, adaptive stimulation tailored to dynamic muscle fatigue states.
- **Technological Convergence:** Recent paradigms in bionic engineering and humanoid exoskeletons offer transformative pathways for neuromuscular rehabilitation . By capturing biological intent directly at the skin surface, surface electromyography (sEMG) serves as the primary conduit for physical Human-Robot Interaction (pHRI) . **The Core Bottleneck:** Standard sEMG processing algorithms struggle with the inherent **non-stationarity, dynamic fatigue drift, and low signal-to-noise ratio (SNR)** characteristic of degenerated muscle tissue. Conventional black-box architectures further lack real-time interpretability for clinical adoption.

Methods

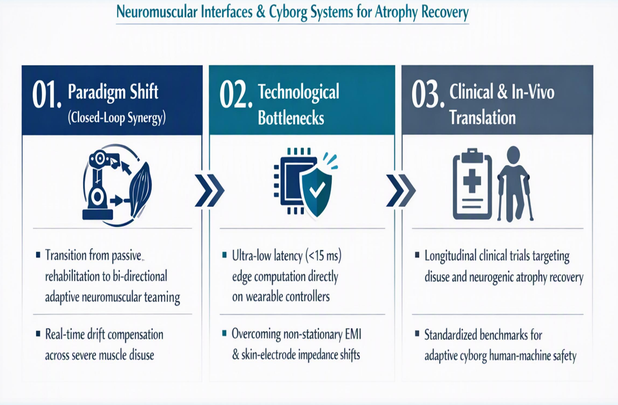


Findings





Conclusion



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