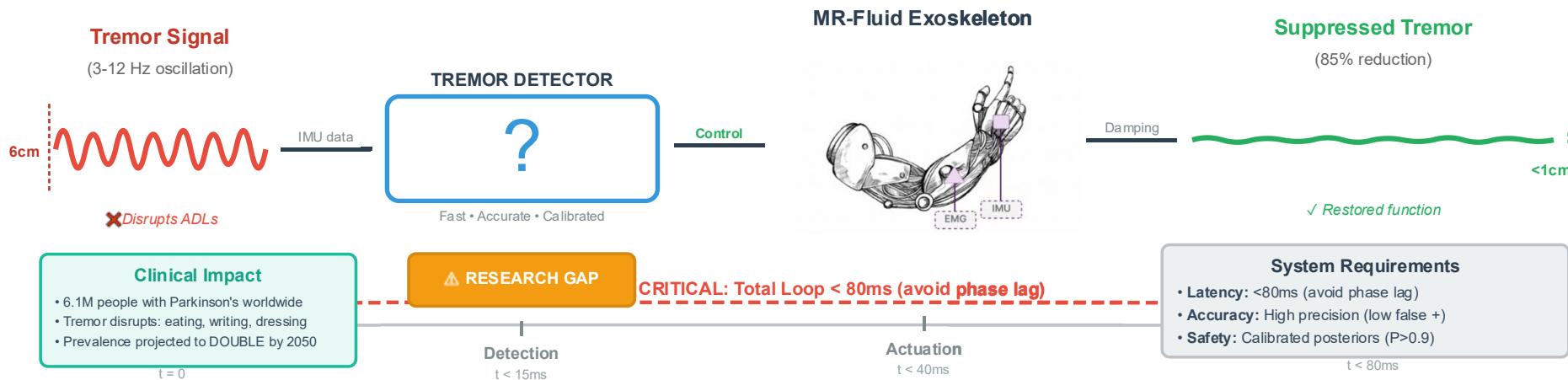


Hybrid ST-GCN/HMM Tremor Detector for a Wearable MR-Fluid Exoskeleton



Toufic Jrib¹

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Our Solution:

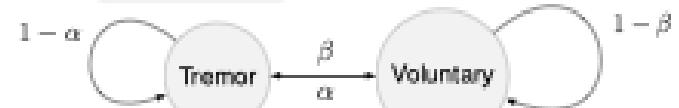
Spatio-temporal graph convolutional network:
learns motion patterns

IMU

p_t

two-state Hidden Markov Model:
enforces physiological dwell time

Bayesian network:
adds noise-robust priors



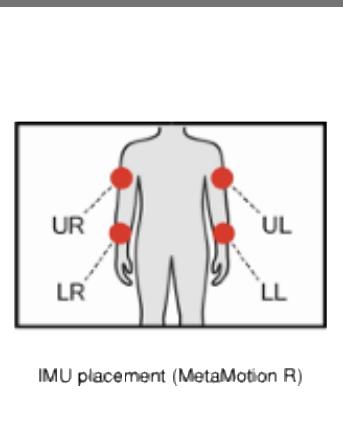
McGill

IEEE-EMBS BSN'25
Los Angeles, CA, USA

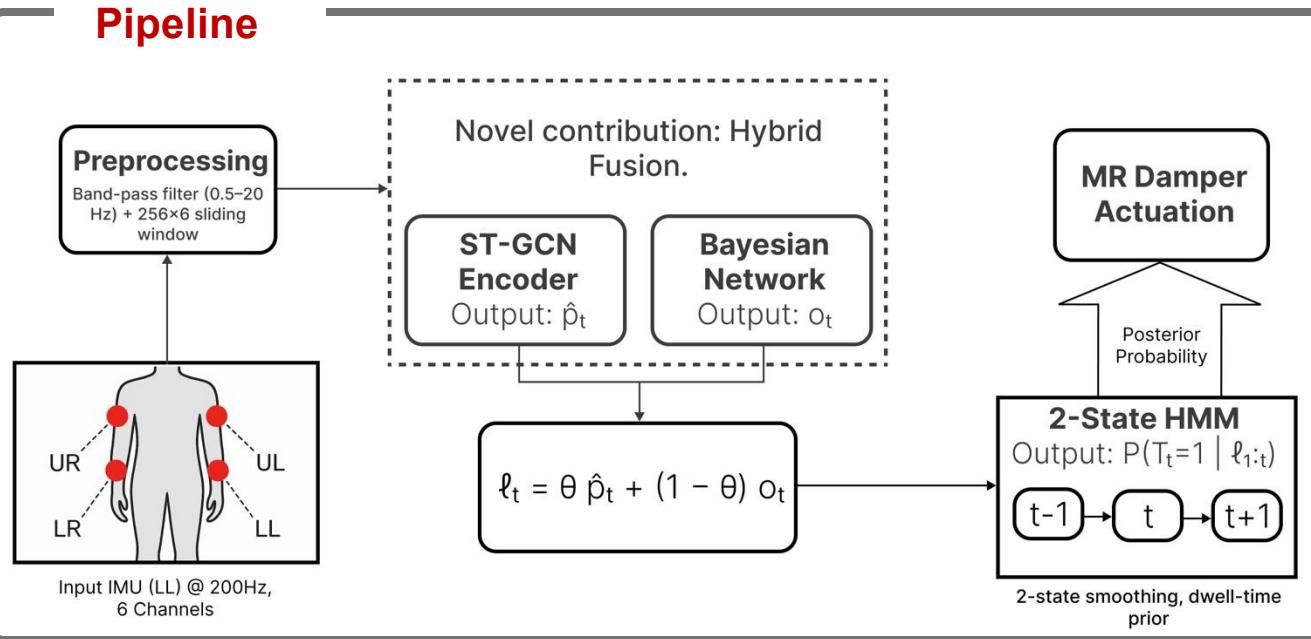
Briefly...

Dataset

Subjects: 34 (15 PD, 19 Ctrl, 21 M / 13 F)
Tasks: Toast, Cardigan, Door (3x each)
Sampling: 200 Hz, 0.5–20 Hz band-pass
Window: 256 samples (1.28 s), 50 % overlap
Split: Train 4 887 / Val 1 125 / Test 1 552
Labels: Clinician video scoring (± 200 ms)



Pipeline



Results

Model	Prec	Rec	F1	AUC	NLL	Lat (ms)
Rule	.26	.49	.34	.55	.89	0.02
BN	.25	.79	.38	.62	.76	0.03
LSTM	.33	.42	.37	.64	.72	21.6
ST-GCN	.37	.65	.47	.68	.66	16.6
HMM-BN	.28	.98	.43	.38	.98	0.05
HYBRID*	.41	.32	.36	.70	.61	15.2

