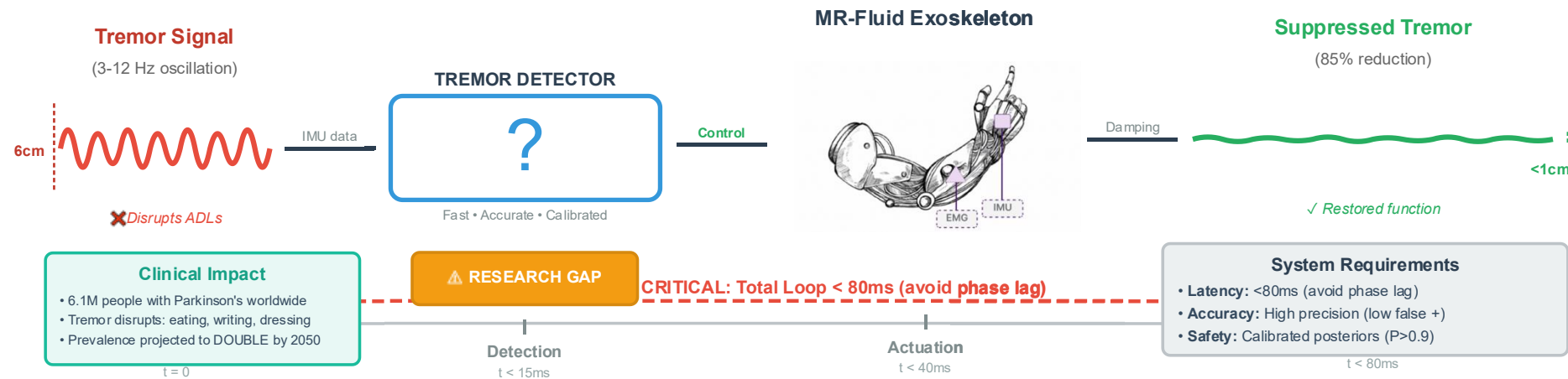


Hybrid ST-GCN/HMM Tremor Detector for a Wearable MR-Fluid Exoskeleton



Toufic Jrab¹

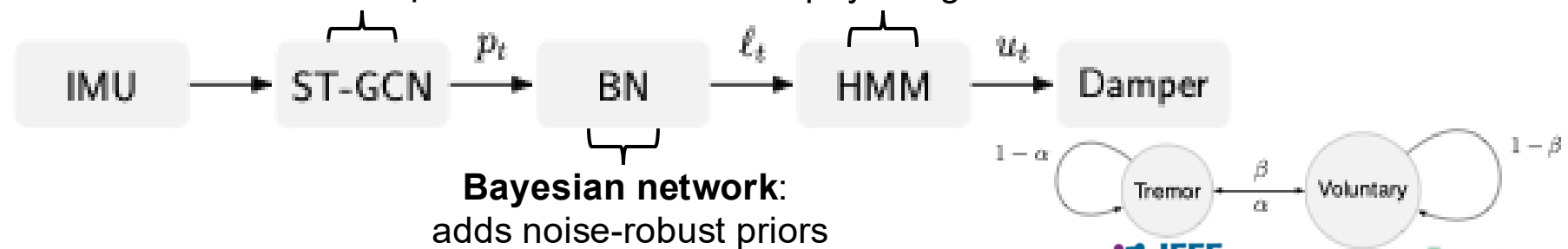
¹Department of Bioengineering, McGill University, QC Canada
 toufic.jrab@mail.mcgill.ca



Our Solution:

Spatio-temporal graph convolutional network:
 learns motion patterns

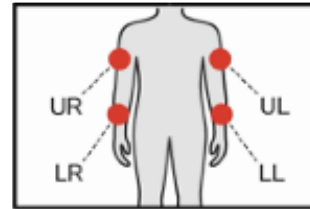
two-state Hidden Markov Model:
 enforces physiological dwell time



Briefly...

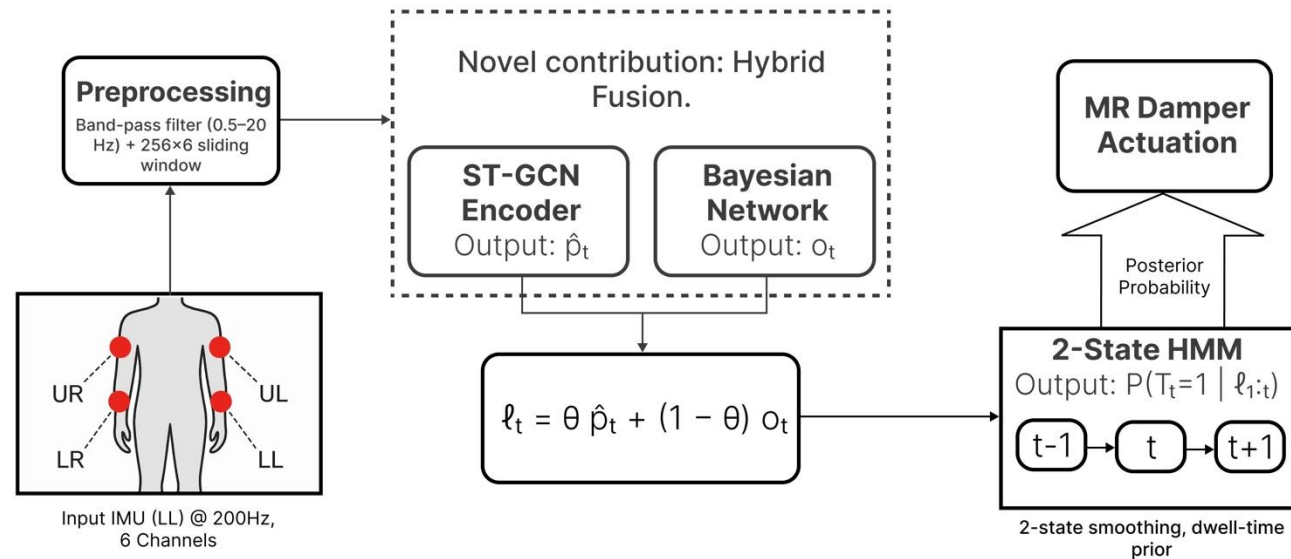
Dataset

Subjects: 34 (15 PD, 19 Ctrl, 21 M / 13 F)
Tasks: Toast, Cardigan, Door (3× 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)



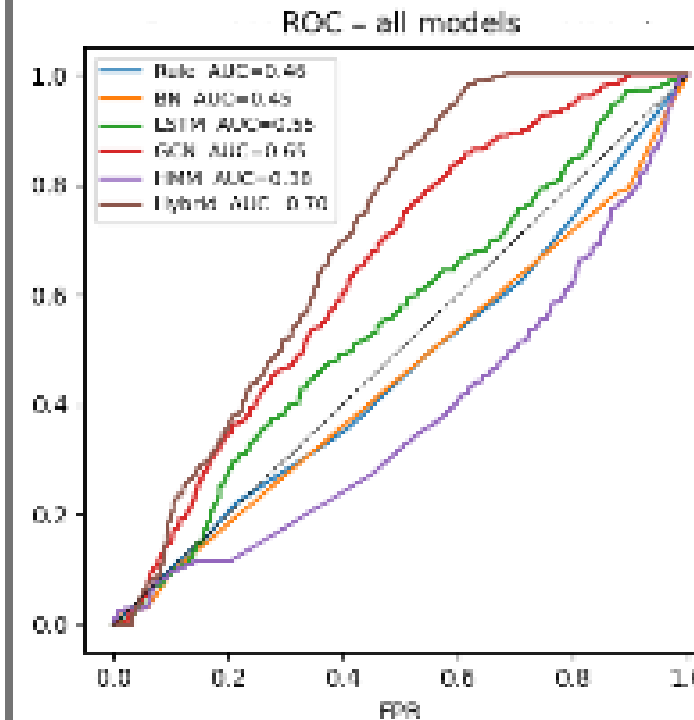
IMU placement (MetaMotion R)

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



Accuracy+
22k params+
low latency!