CURRICULUM VITAE

Xuan Ma, Ph. D.

POSITION: Research assistant professor
Northwestern University
Department of Neuroscience, Feinberg School of Medicine

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Chicago, IL 60611, United States
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EDUCATION:

Sept. 2010 – June 2017   **Ph. D.** in Control Science and Engineering,
Huazhong University of Science and Technology, Wuhan, China
Mentor: Jiping He, Professor, Ph. D.

Sept. 2006 – June 2010   **B. Eng.** in Control Science and Engineering,
Huazhong University of Science and Technology, Wuhan, China

PROFESSIONAL EXPERIENCE:

March 2024 – present   Research assistant professor
Northwestern University

Dec. 2017 – Feb. 2023   Postdoctoral research fellow
Northwestern University
Supervisor: Lee E. Miller, Professor, Ph.D.

March 2014 – Nov. 2017   Co-founder,
JOINHEALTH Technology, Wuhan, China

AREAS OF INTEREST/SKILLS:

Brain computer interface, Motor cortex, Biomedical signal processing, Machine learning,
Computational neuroscience

Nonhuman primate electrophysiology skills
Animal behavioral training, brain implantation surgery, data acquisition and analysis with
Neuropixels probes, EMG data acquisition and analysis

Software design and machine learning skills
C/C++, Python, Pytorch, MATLAB

Engineering skills
Analog and digital electronics system design, PCB design with Altium designer, Mechanical
design with Solidworks

PUBLICATIONS:

Ma X, Rizzoglio F, Bodkin KL, Miller, LE. Unsupervised, piecewise linear decoding enables an accurate prediction of muscle activity in a multi-task brain computer interface. Journal of Neural Engineering. 2025, 22(1):016019.

Ye J, Rizzoglio F, Smoulder A, Mao H, **Ma X**, Marino P, Chowdhury RH, Moore DD, Blumenthal G, Hockeimer W, Kunigk NG. A Generalist Intracortical Motor Decoder. bioRxiv. 2025:2025-02.

Alcolea P, **Ma X**, Bodkin K, Miller LE, Danziger ZC. Less is more: selection from a small set of options improves BCI velocity control. bioRxiv. 2024:2024-06.

Love K, Cao D, Chang JC, Dal'Bello LR, **Ma X**, O'Shea DJ, Schone HR, Shahbazi M, Smoulder A. Highlights from the 32nd Annual Meeting of the Society for the Neural Control of Movement. Journal of neurophysiology. 2024, 131(1):75-87.

Karpowicz BM, Ye J, Fan C, Tostado-Marcos P, Rizzoglio F, Washington CB, Scodeler T, de Lucena DS, Nason-Tomaszewski SR, Mender M, **Ma X**, … & Pandarinath C. Few-shot Algorithms for Consistent Neural Decoding (FALCON) Benchmark. InThe Thirty-eight Conference on Neural Information Processing Systems Datasets and Benchmarks Track.

Ma X, Rizzoglio F, Bodkin KL, Perreault E, Miller LE, Kennedy A. Using adversarial networks to extend brain computer interface decoding accuracy over time. eLife. 2023 Aug 23;12:e84296.

Rizzoglio F, Altan E, **Ma X**, Bodkin KL, Dekleva BM, Solla SA, Kennedy A, Miller LE. From monkeys to humans: observation-based EMG brain–computer interface decoders for humans with paralysis. Journal of Neural Engineering. 2023, 20(5):056040.

Altan E, **Ma X**, Miller LE, Perreault EJ, Solla SA. Low-dimensional neural manifolds for the control of constrained and unconstrained movements. bioRxiv. 2023.

Karpowicz BM, Ali YH, Wimalasena LN, Sedler AR, Keshtkaran MR, Bodkin KL, **Ma X**, Miller LE, Pandarinath C. Stabilizing brain-computer interfaces through alignment of latent dynamics. bioRxiv, 2022. (under review with Nature Biomedical Engineering)

Ma X, Bodkin KL, Miller LE. Population Activity in Motor Cortex is Influenced by the Contexts of the Motor Behavior. In: Proceedings of the 10th International IEEE/EMBS Conference on Neural Engineering (NER), 2021: 1152-1155.

Zhang P, Li W, **Ma X**, He J, Huang J, Li Q. Feature-Selection-Based Transfer Learning for Intracortical Brain–Machine Interface Decoding. IEEE Transactions on Neural Systems and Rehabilitation Engineering, 2021, 29: 60-73.

Zhang P, Huang J, Li W, **Ma X**, Yang P, Dai J, He J. Using High-frequency Local Field Potentials from Multi-cortex to Decode Reaching and Grasping Movements in Monkey. IEEE Transactions on Cognitive and Developmental Systems, 2018, 11(2): 270-280.

Zhang P, **Ma X**, Chen L, Zhou J, Wang C, Li W, He J. Decoder calibration with ultra small current sample set for intracortical brain–machine interface. Journal of Neural Engineering. 2018, 15(2): 026019.

Ma X, Ma C, Huang J, Zhang P, Xu J, He J. Decoding Lower Limb Muscle Activity and Kinematics from Cortical Neural Spike Trains during Monkey Performing Stand and Squat Movements. Frontiers in Neuroscience, 2017, 11: 44.

Ma X, Ma C, Kang T, Zhang P, He J. Neurons in Dorsal Premotor Cortex Represent the Switching of Intended Hand Path in a Delayed Reaching Task. Journal of Integrative Neuroscience, 2017, 16 (3): 365-382.

Ma C, **Ma X**, Fan J, He J. Neurons in Primary Motor Cortex Encode Hand Orientation in a Reach-to-Grasp Task. Neuroscience Bulletin, 2017, 4: 1-13.

Ma C, **Ma X**, Zhang P, Cai X, He J. Neurons in Dorsal Premotor Cortex Adapted to Abrupt External Perturbation in Reaching Behavior. Journal of Medical & Biological Engineering, 2016, 36(4): 1-10.

Chen X, Ke A, **Ma X**, He J. SoC-based Architecture for Robotic Prosthetics Control Using Surface Electromyography. 8th International Conference on Intelligent Human-Machine Systems and Cybernetics (IHMSC), Hangzhou, China, 2016: 134-137.

Ma C, **Ma X**, Zhang H, Zhang P, He J. Neuronal Representation of Stand and Squat in the Primary Motor Cortex of Monkeys. Behavioral & Brain Functions, 2015, 11(1): 15.

Li W, Guo Y, Fan J, Ma C, **Ma X**, Chen X, He J. The Neural Mechanism Exploration of Adaptive Motor Control: Dynamical Economic Cell Allocation in the Primary Motor Cortex. IEEE Transactions on Neural Systems & Rehabilitation Engineering, 2017, 25(5): 492-501.

Ma X, Zhang P, Huang H, He J. A Study of Predicting Movement Intentions in Various Spatial Reaching Tasks from M1 Neural Activities. In: Proceedings of the 36th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2014), Chicago, USA, 2014: 2666-2669.

Ma X, Zhang P, Chen L, He J. A Study Exploring Neuronal Activities in Spatial Reaching and Grasping Towards Brain-Machine Interface. 2014 IEEE International Conference on Complex Medical Engineering, Taipei, China, June 26-29, 2014.

Ma X, Hu D, Huang J, Li W, He J. Selection of Cortical Neurons for Identifying Movement Transitions in Stand and Squat. In: Proceedings of the 35th Annual International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC 2013), Osaka, Japan, 2013: 6051-6054.

PATENT:

A Fully Implantable Device for Neural Electric Stimulation, China Patent: ZL 2014 1 0270731.8

INVITED TALKS AND PRESENTATIONS:

2024   Poster presentation, "Point cloud registration reveals systematic changes in cortical population activity during motor learning", Neuroscience 2024, Chicago, IL, Oct. 9

2024   Invited talk, "The landscape of neural manifolds underlying real-world motor behaviors", CERVO, Laval University, Quebec City, Canada, May 24

2023   Oral presentation, "Unsupervised cluster discoveries for multiple motor behaviors in neural manifolds", 32nd Annual Meeting of Society for the Neural Control of Movement (NCM), Victoria, Canada, April 21

2022   Poster presentation, "Preserved neural covariance patterns across multiple unconstrained behaviors", Neuroscience 2022, San Diego, CA, Nov. 15

2021   Oral presentation, "Population Activity in Motor Cortex is Influenced by the Context of the Motor Behavior", 10th International IEEE EMBS Conference on Neural Engineering, Virtual, May 6

2020   Invited talk, "Searching a Unified Neural Manifold for a Variety of Naturalistic Behaviors", Simons-Emory International Consortium on Motor Control, Virtual, Oct. 30

2020   Lecture, "The Acquisition and Processing of EMG Signals", IEEE Brain virtual summer school, Virtual, August 19

2019   Poster presentation, "Probing the Relationship between Motor Cortex and Upper Limb Muscles during Spontaneous Natural Movements", Neuroscience 2019, Chicago, IL, Oct. 23

2019   Poster presentation, "Decoding Muscular Activity with Wireless Recordings during Unstructured Behaviors of Monkeys Moving Freely in Cage", RehabWeek 2019, Toronto, Canada, June 26

2018   Poster presentation, "The Stabilization of M1 Neural Modes for the Control of Muscle Activity through a Brain Computer Interface", Neuroscience 2018, San Diego, CA, Nov. 5

2015   Oral presentation, "Constructing Cortical and Peripheral Neural-Machine Interface towards Motor Function Restoration on Monkeys", Doctoral Student's Symposia at Collaborative Innovation Center for Brain Science, Shanghai, China, May 24

2014   Oral presentation, "Decoding Movement Intentions from Neuronal Activity Signals towards Brain-Machine Interface", 12th National Doctoral Student's Symposia, Kunming, China, May 25

2014   Invited talk, "Methods for Cortical Neural Recordings on Non-human Primates", China Neuroscience Workshop, Shanghai, China, July 22

2014   Poster presentation, "Exploring Cortical and Peripheral Neural Motor Control Signals Simultaneously during Spatial Reach and Grasp Tasks", 41st Neural Interfaces Conference, Dallas, TX, June 23

2013   Oral presentation, "Selection of Cortical Neurons for Identifying Movement Transitions in Stand and Squat", 35th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Osaka, Japan, July 5

TEACHING EXPERIENCES

Co-Instructor for the high dimensional data hands-on session during the Caltech/Chen Institute's Data Science and AI for Neuroscience Summer School, Pasadena, California, 2022.

Invited instructor for IEEE Brain Virtual Summer School 2020

HONORS

Travel Award for the International BCI Meeting, 2023

Travel Award for 32nd Annual Meeting of Society for the Neural Control of Movement, 2023

Shortlisted for the best paper award of the 10th International IEEE EMBS Conference on Neural Engineering, 2021

ACADEMIC SERVICE:

Reviewer for: IEEE Transactions on Neural Systems and Rehabilitation Engineering, Journal of Neural Engineering, Biomedical Signal Processing and Control, Frontiers in Human Neuroscience, Sensors, Brain Sciences, Journal of Medical & Biological Engineering, Journal of Visualized Experiments (JoVE), Computational and Systems Neuroscience (COSYNE)