Bishoy M. Galoaa

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EDUCATION

Northeastern University *Boston, MA*
Doctor of Philosophy in Electrical and Computer Engineering *September 2025 - Present*
Advisor: Prof. Sarah Ostadabbas *Expected Graduation: May 2029*
Concentration: Computer Vision and Machine Learning

Northeastern University *Boston, MA*
Master of Science in Electrical and Computer Engineering *May 2025*
Concentration: Computer Vision and Machine Learning

The American University in Cairo *Cairo, Egypt*
Bachelor of Science in Electronics and Communications *May 2020*

PROFESSIONAL EXPERIENCE

ACLab Northeastern University *Boston, MA*
Graduate Research Assistant *September 2023 - Present*

- Developing novel approaches for learning spatial reasoning from educational video content, leveraging pedagogically-structured question-answer sequences to improve vision-language model performance on counting, spatial relationships, and compositional reasoning tasks
- Conducting research on motion-centric video understanding, multi-object tracking, and vision-language models, with a focus on bridging visual motion patterns with natural language understanding
- Developed novel tracking algorithms for single and multi-camera setups, including transformer-enhanced graphical tracking (DragonTrack) and volumetric attention mechanisms (LAPA) for multi-camera point tracking, achieving state-of-the-art performance in complex scenarios
- Pioneered query-free motion discovery and description systems that autonomously identify and describe events in videos without explicit queries, enabling automated video understanding at scale
- Created text-to-motion generation frameworks (Lang2Motion) that synthesize realistic point trajectories directly from language descriptions, achieving sub-second inference times and enabling natural language control of motion synthesis
- Enhanced multi-object tracking performance through differentiable graph-based loss functions (UniTrack) and optical flow integration with softmax splatting, improving tracking robustness in occluded and crowded environments
- Published papers at top-tier conferences including ICML 2025, WACV 2025, 3DV 2025, and BMVC 2025, demonstrating consistent contributions to the computer vision research community

NAIL Northeastern University *Boston, MA*
Graduate Research Assistant - Prof. Michael Everett and Prof. Max Shepherd *September 2023 - August 2025*

- Collaborated with Prof. Michael Everett and Prof. Max Shepherd on developing novel ML approaches to classify assistable vs. non-assistable ankle motions using deep learning architectures (AE, VAE, GAN, Transformers) and attention mechanisms, improving exoskeleton control efficacy

- Designed and implemented comprehensive data collection protocols from diverse subjects for human motion analysis, incorporating uncertainty quantification to enhance model reliability
- Engineered an end-to-end testing framework for evaluating human motion anomaly detection, including metrics for assessing assistability classification performance in real-world scenarios

MGB Orthopedic Oncology Department *Boston, MA*
Graduate Research Assistant - Dr. Santiago Lozano-Calderon *December 2023 - September 2025*

- Conducted comprehensive data analysis on the SEER dataset, National Cancer Database, and external validation datasets, focusing on calculating cancer survival probabilities to support clinical research and patient care strategies
- Deployed the models on www.mgbmskoncology.org/
- Developed a microRNA multi-modal diffusion model to generate novel drug candidates tailored to modulate microRNA-mRNA interactions in Ewing Sarcoma (ESOS), personalized based on individual patient molecular profiles
- Utilized advanced machine learning algorithms and Large Language Models (LLMs) to enhance cancer prognosis and survival analysis

BMC ENT Oncology Department *Boston, MA*
Graduate Research Assistant - Dr. Anand K. Devaiah *January 2023 - September 2025*

- Collaborated on pioneering research focusing on developing a machine learning solution for optimizing treatment protocols in salivary gland cancer
- Conducted extensive data analysis using the SEER dataset to collect, train, and validate models, ensuring high fidelity to established cancer treatment guidelines
- Enhanced the model's performance by addressing demographic biases, ensuring equitable and effective clinical outcomes across diverse patient populations
- Deployed the optimized treatment models on cancercloudai.org

Electrical and Computer Engineering Department, Northeastern University *Boston, MA*
Teaching Assistant, Verifiable Machine Learning Course *Fall 2023*

- Collaborated closely with Prof. Michael Everett to deliver instructional support for the Verifiable Machine Learning course
- Facilitated student learning by providing expert guidance on intricate coding assignments and challenges within the machine learning domain
- Leveraged deep knowledge of Python, PyTorch, and TensorFlow to enhance students' comprehension and practical skills

Northeastern University D'Amore-McKim School of Business *Boston, MA*
Data Science Graduate Research Assistant *September 2022 - September 2023*

- Developed an attention evaluation matrix for visual advertisements to predict the tune-in percentages
- Extracted multi-modal: textual, audio, visual features of +80,000 video advertisements
- Researched a self-attention layer for cross-modal features embeddings training
- Analyzed visual advertisement using CLAP and BERT Algorithms for textual, speech and Visual features

Valify Solutions *Cairo, Egypt*
Machine Learning Engineer *February 2020 - August 2023*

- Researched and implemented ML algorithms and tools for Arabic OCR, text detection, face recognition and fraud detection
- Trained OCR and text detection models with 95% accuracy
- Developed Automated Data Augmentation pipeline engines
- Designed a ML models deployment engine for high traffic usage, handling over 500,000 transactions per month

PUBLICATIONS

Accepted

- X. Bai, H. Liang, **B. Galoaa**, U. Nandi, S. Moezzi, Y. He, and S. Ostadabbas, "MoReGen: Multi-Agent Motion-Reasoning Engine for Code-based Text-to-Video Synthesis," Conference on Computer Vision and Pattern Recognition (CVPR), 2026.
- **B. Galoaa**, X. Bai, U. Nandi, S. Amraee, and S. Ostadabbas, "UniTrack: Differentiable Graph Representation Learning for Multi-Object Tracking," in International Conference on Learning Representations (ICLR), 2026. **Also accepted to the Nectar Track at 3DV 2026** (Spotlight (Oral) on Strong Papers session).
- **B. Galoaa**, P. Closas and S. Ostadabbas, "K-Track: Kalman-Enhanced Tracking for Accelerating Deep Point Trackers on Edge Devices," in *Real World Surveillance (RWS) Workshop, IEEE/CVF Winter Conference on Applications of Computer Vision (WACV) Workshops*, 2026.
- **B. Galoaa**, X. Bai, S. Moezzi, U. Nandi, S. S. V. D. Rangoju, S. Amraee, and S. Ostadabbas, "Look Around and Pay Attention: Multi-camera Point Tracking Reimagined with Transformers," International Conference on 3D Vision (3DV), 2026.
- X. Bai, S. A. Sreeramagiri, S. S. V. D. Rangoju, **B. Galoaa**, E. C. Mortin, and S. Ostadabbas, "SPARTAN: Spatiotemporal Pose-Aware Retrieval for Text-Guided Autonomous Navigation," British Machine Vision Conference (BMVC), 2025.
- **B. Galoaa**, S. Amraee, and S. Ostadabbas, "More Than Meets the Eye: Enhancing Multi-Object Tracking with Softmax Splatting and Optical Flow," International Conference on Machine Learning (ICML), 2025.
- **B. Galoaa**, S. Amraee, and S. Ostadabbas, "Dragontrack: Transformer-enhanced graphical multi-person tracking for complex scenarios," Winter Conference on Applications of Computer Vision (WACV), 2025.
- S. Moezzi, M. Wan, S. K. R. Manne, A. Mathew, S. Zhu, **B. Galoaa**, et al., "Classification of Infant Sleep-Wake States from Natural Overnight In-Crib Sleep Videos," Proceedings of the Winter Conference on Applications of Computer Vision Workshops (WACVW), pp. 42-51, 2025.
- S. Amraee, **B. Galoaa**, M. Goodwin, E. Hatamimajoumerd, and S. Ostadabbas, "Multiple toddler tracking in indoor videos," IEEE/CVF Winter Conference on Applications of Computer Vision Workshops (WACVW), Jan. 2024.
- S. A. Lozano-Calderon, **B. M. Galoaa**, J. O. Werenski, J. J. Connolly, J. Bowers, C. Lietz, and D. Spentzos, "Extraskeletal Osteosarcoma: MicroRNA Patterns Provide Insights into Similarities and Contrasts with Other Sarcomas," Connective Tissue Oncology Society (CTOS) Annual Meeting, 2025.

- A. G. Girgis, **B. M. Galoaa**, M. R. Gonzalez, and S. A. Lozano-Calderon, "Advancing prognostics in oncology: developing a machine learning model for predicting 2-year and 5-year survival rates in patients with undifferentiated pleomorphic sarcoma," Annals of Surgical Oncology, pp. 1-9, 2025.
- A. G. Girgis, **B. M. Galoaa**, M. R. Gonzalez, and S. A. Lozano-Calderón, "ASO Author Reflections: Advancing Prognostics in Oncology: Developing a Machine Learning Model for Predicting 2-Year and 5-Year Survival Rates in Patients with Undifferentiated Pleomorphic Sarcoma," Annals of Surgical Oncology, pp. 1-3, 2025.
- S. Rampam, A. G. Girgis, **B. M. Galoaa**, J. O. Werenski, M. R. Gonzalez, et al., "Predicting Long Term Survival in Myxofibrosarcoma: Development and Evaluation of Machine Learning Models for 2-and 5-Year Outcomes," Surgical Oncology, vol. 102314, 2025.
- A. G. Girgis, **B. M. Galoaa**, M. H. Goh, M. R. Gonzalez, and S. A. Lozano-Calderón, "Bias or best fit? A comparative analysis of the SEER and NCDB data sets in single-model machine learning for predicting osteosarcoma survival outcomes," Clinical Orthopaedics and Related Research, vol. 10.1097, 2022.
- A. Girgis, **B. Galoaa**, and A. Devaiah, "A personalized predictive model for Salivary Gland Cancer using Artificial Intelligence," Combined Otolaryngology Spring Meetings (COSM), 2024.
- A. Girgis, **B. Galoaa**, and A. Devaiah, "A Novel Artificial Intelligence Model for Optimizing Treatment of Salivary Gland Malignancies," AAO-HNSF Annual Meeting, 2024.
- P. A. Rizk, M. R. Gonzalez, **B. M. Galoaa**, A. G. Girgis, L. Van Der Linden, C. Y. Chang, and S. A. Lozano-Calderon, "Machine Learning-Assisted Decision Making in Orthopaedic Oncology," accepted for publication.
- **B. M. Galoaa**, A. G. Girgis, M. R. Gonzalez, and S. A. Lozano-Calderon, "Advancing Prognostics in Oncology: Machine Learning Models for Predicting 2-Year and 5-Year Survival Rates in Patients with Undifferentiated Pleomorphic Sarcoma," Poster Presentation CTOS, 2024.

Under Review

- **B. Galoaa**, X. Bai, and S. Ostadabbas, "Structured Over Scale: Learning Spatial Reasoning from Educational Video," under review, 2026.
- **B. Galoaa**, and S. Ostadabbas, "Track and Caption Any Motion: Query-Free Motion Discovery and Description in Videos," under review, 2026.
- **B. Galoaa**, X. Bai, and S. Ostadabbas, "Lang2Motion: Bridging Language and Motion Through Joint Embedding Spaces," under review, 2026.
- F. M. Tourk, **B. Galoaa**, S. Shajan, A. J. Young, M. Everett, and M. K. Shepherd, "Uncertainty-Aware Ankle Exoskeleton Control," arXiv preprint arXiv:2508.21221, 2025.
- **B. Galoaa**, and S. Ostadabbas "Cognitive Learning through Hierarchical Prototypes and Dynamic Focus," under review, 2025.
- J. O. Werenski, S. Rampam, M. R. Gonzalez, **B. Galoaa**, A. G. Girgis, and S. A. Lozano-Calderon, "Development and External Validation of Machine Learning Algorithms for Survival Prediction in Synovial Sarcoma," under review.

AWARDS

Best Paper Award Nominee *2026*
International Conference on 3D Vision (3DV)

- Nominated for Best Paper Award at 3DV 2026 for "Look Around and Pay Attention: Multi-camera Point Tracking Reimagined with Transformers"

Best Poster Presentation Award *Spring 2025*
Combined Otolaryngology Spring Meetings - American Head and Neck Society Foundation (COSM-AHNSF)

- Recognized for outstanding poster presentation at the Combined Otolaryngology Spring Meetings

COE Outstanding Graduate Student Award *Spring 2025*
College of Engineering, Northeastern University

- Awarded for outstanding academic and research achievements as a graduate student in the College of Engineering at Northeastern University

COE Outstanding Graduate Student Award *Spring 2024*
College of Engineering, Northeastern University

- Awarded for outstanding academic and research achievements as a graduate student in the College of Engineering at Northeastern University

Best of Scientific Orals Award *Fall 2024*
Scientific Oral Presentations, AAO-HNSF 2024 Annual Meeting & OTO EXPO

- Recognized for delivering one of the best scientific oral presentations at the American Academy of Otolaryngology-Head and Neck Surgery Foundation (AAO-HNSF) Annual Meeting & OTO EXPO 2024