DORSA REZAYAT

As a dedicated scientist, I have worked extensively on simulation-driven human digital twin frameworks that integrate physics-based modeling and data-driven AI for manufacturing applications. My experience includes developing and validating physics-informed learning models, analyzing human motion and ergonomic risk, and embedding physically consistent constraints into digital twin environments to enable predictive and reliable human–system interaction.

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Dorsa Rezayat | LinkedIn

Languages

Persian: Native
English: Fluent
French: Basic

EDUCATION

Ph.D.
University of Cincinnati
Mechanical Engineering
Expected year of Graduation: 2028

Master of Science
University of Cincinnati
Mechanical Engineering
2023-2025
Cincinnati, OH
GPA: 4/4

Bachelor of Science
Azad University Science and Research Branch
Biomedical Engineering-Biomechanics
2015-202
Tehran, Iran
GPA: 3.46/4

WORK EXPERIENCES

Research Assistant
University of Cincinnati, OH, United States
April 2024- Now
OH, USA

Conducted advanced research on human digital twin technologies for workplace injury prevention under a project funded by the Ohio Bureau of Workers' Compensation (BWC). Led the ergonomic analysis component, developing and validating biomechanical and posture-based risk assessment methods to identify hazardous work motions and support data-driven safety interventions for industrial environments.

Teaching Assistant
University of Cincinnati, OH, United States
August 2023- April 2024
OH, USA

As a Teaching Assistant, I offered assistance for two courses: Manufacturing Processing and Engineering Design Graphics. Both courses heavily rely on NX CAM software, so my proficiency extends to a thorough comprehension of NX CAM and NXOpen. Furthermore, I have demonstrated adeptness in various facets of the application of NX.

Analyst
Shafapain Clinic
April. 2022- August 2023
TEHRAN, IRAN

As a member of the patient movement analysis department, I oversaw a technologically advanced department with tools like video cameras, force platforms, and Visual 3D software. My primary role was to analyze biomechanical data for diagnosing and planning treatments for movement disorders. I also manage assessments using the Isokinetic Dynamometer, playing a key role in patient rehabilitation and ensuring effective communication of data across departments.

Sales and Marketing Coordinator
Hamidandan Dental Equipment Company
May 2021- January 2022
TEHRAN, IRAN

As the Coordinator for Hamidandan Dental Equipment, I organized dentists' classes across Iran, featuring renowned endodontists in different cities. My role involved presenting and advising on specialized dental equipment during these sessions. I'm also dedicated to developing and maintaining strong customer relationships, ensuring continuous, timely support for all clients.

Teaching Physics
High school and Undergrad Students
September 2014- September 2023
TEHRAN, IRAN

I have taught physics to talented high school students in seven Tehran's top high schools, including Talash, Negaresh, and Nohbegan. Additionally, I've provided private physics tutoring to undergraduate and university students, enhancing their academic performance in related fields.

Quality Control Manager
Dentiwa Dental Equipment Company
December 2020- March 2021
TEHRAN, IRAN

I was responsible for the verification and quality control of dental products.

Publications

- **Rezayat, D**., & Anand, S. (2025). *Physics-Informed Deep Learning for Personalized Ergonomic Risk Prediction for Manufacturing Tasks*. Under Revision at NAMRC 2026
- Khorsandi, D., **Rezayat, D**., Sezen, S., Ferrao, R., Khosravi, A., Zarepour, A., ... & Zarrabi, A. (2024). Application of 3D, 4D, 5D, and 6D bioprinting in cancer research: what does the future look like?. *Journal of Materials Chemistry B*, *12*(19), 4584-4612.

DORSA REZAYAT

Research Projects

July 2025-NOW

Phase 2 – Human Digital Twin & Physics-Informed Ergonomic Modeling

•**Leading a five-member research team** in Phase 2 of a **$2M Ohio BWC–funded project**, advancing a **Physics-Informed Neural Network (PINN)–**based human digital twin for ergonomic risk assessment in manufacturing

•Expanding the digital twin to incorporate a richer set of parameters (multi-joint kinematics, temporal dynamics, biomechanical constraints, task context, and worker-specific factors) to jointly optimize worker safety and task productivity

•Building physics-based learning objectives that enforce ergonomic safety limits while preserving efficient task execution, ensuring safety improvements do not come at the cost of throughput or usability

•Building on Phase 1 results demonstrating **up to a 43% improvement in ergonomic safety**, with Phase 2 targeting further reduction of injury risk through more accurate, personalized, and predictive modeling

•Overseeing end-to-end model development, validation, and integration to deliver scalable, explainable ergonomic feedback suitable for deployment on the factory floor

Jun 2024-July 2025

PHASE1 -Human Digital Twin Modeling for Improving Worker Safety in Manufacturing and Logistics
Ohio BWC (Bureau of Workers' Compensation) – State Agency Research Contract
Industry Partners: Siemens Technology, Innovative Numerics, Worthington Steel, thyssenkrupp Bilstein
Role: *Lead Ergonomics & Human Digital Twin Modeling Researcher*
Impact: Reducing non-fatal worker injuries (~75% per NIOSH) through real-time, camera- and smartwatch-based ergonomic feedback on the factory floor.

- **Served as the project's ergonomic and human digital twin expert**, leading the definition, modeling, and validation of ergonomic risk metrics within the digital twin framework
- Designed and implemented **ergonomic analysis pipelines** that translate human motion data into actionable safety feedback for manufacturing and logistics workers
- As part of a four-member research team, **co-developed a motion language model**, with primary responsibility for embedding ergonomic principles and injury-risk reasoning into the model outputs
- Trained an in-domain, multi-task GPT-based model to:
    - Generate **ergonomically optimal 3D motions** for novel manufacturing tasks
    - Provide **expert-level ergonomic feedback** on injury risk from observed worker motion
    - Predict projected worker trajectories to support **collision and hazard prevention**
- **Developed an LLM-assisted ergonomic annotation toolbox** for labeling factory worker motion data with domain-specific ergonomic descriptors and risk indicators
- Supported Co-PIs **Prof. Sam Anand and Prof. Kumar** in technical writing and justification of ergonomic and human-centric components for the down-selected **$1.3M proposal**

ACCOMPLISHMENTS

-Co-filed US Patent Application #PCT/US25/18785 on "Systems and Methods for Predicting and Assessing Motion of Humans and/or Objects in an Environment, Granted four invention disclosures

Skills

- Programming languages: Python, MATLAB
- Commercial software: NX, Siemens Jack/Process Simulate, Ansys Additive, Autodesk Netfabb, Cortex , OpenSim
- Open-source libraries: OpenCV, PyTorch, GitHub

Honors

-Recognized as the top university student with the highest semester marks, Tehran (2018-2020).

-Gold medalist in kickboxing under 60 kg category, Tehran, Iran (April 2022)

-Bronze medalist in speed skating competitions, Tehran, Iran (Jun 2013).

Related Courses

Kinesiology, Intelligent Systems, Industrial big data and AI, Human-machine/robot interaction, Design of Components in Biomechanics