Dr. Suman K. Chowdhury

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Education and Post Graduate Training

Postdoctoral, University of Pittsburgh, 2017.
Major: Mechanical Engineering and Materials Science
Supporting Areas of Emphasis: Occupational and Orthopedics Biomechanics

Ph D, West Virginia University, 2016.
Major: Occupational Biomechanics
Supporting Areas of Emphasis: Human Factors Engineering
Dissertation Title: Evaluation of Concavity Compression Mechanism as a Possible Predictor of Shoulder Muscle Fatigue

MS, West Virginia University, 2012.
Major: Occupational Biomechanics
Supporting Areas of Emphasis: Human Factors Engineering
Dissertation Title: Discrete Wavelet Transform Analysis of Surface Electromyography for the Objective Assessment of Neck and Shoulder Muscle Fatigue

BS, Bangladesh University of Engineering and Technology, 2006.
Major: Industrial Engineering
Supporting Areas of Emphasis: Operation Research
Dissertation Title: Developing a Product Traceability Index for a Food Processing Industry

Academic and Professional Experience

Assistant Professor (September 1, 2019 - Present).
Department of Industrial, Manufacturing, and Systems Engineering
Texas Tech University, Lubbock, TX

Assistant Research Scientist (July 1, 2017 - August 30, 2019).
Department of Industrial and Systems Engineering
Texas A&M University, College Station, TX

Postdoctoral Associate, (August 2016 - July 2019).
Orthopedics Biodynamics Lab,
University of Pittsburgh, Pittsburgh, PA.

Graduate Research Assistant, Occupational Biomechanics Lab, West Virginia University (Sep 1, 2009 – Aug 01, 2016)
Department of Industrial Engineering,
West Virginia University, Morgantown, WV.

RESEARCH

Grant Activity

A total of $1,602,052 funding as the Lead Principal Investigator.

Current Funded Projects

1. Chowdhury, S. (Lead Principal Investigator), McKenna, G. (Co-PI), Cong, W. (Co-PI), *"NextGen Firefighter Helmet: A Prototype Design Through Computer-Aided Reverse Engineering and Biomechanical Modeling,"* Sponsored by **Department of Homeland Security Science & Technology,** Competitive Federal Grant, **$562,253.00.** My Share 60%. (September 2021 - Present).

2. Chowdhury, S. (Lead Principal Investigator), *"Evaluating the Technical Feasibility of Upper body Exoskeleton in Masonry Work in Mast Climbing Work Platforms,"* Sponsored by **CDC National Institute of Occupational Safety and Health,** Competitive Federal Grant, $40,208.00. (September 2021 - Present). My Share 100%.

3. Chowdhury, S. (Lead Principal Investigator), Non-invasive device to treat Acute Stress Reaction (ASR) and return warfighter performance. **U.S. Department of Homeland Security Science & Technology,** Competitive Federal Grant, **$994,591**. My Share 60%. (September 2022) **(AWARDED)**

Completed Internally Funded Project

1. Chowdhury, S. (Lead Principal Investigator), *"Knowledgebase of Head-Neck Musculoskeletal Dynamics for NextGen Firefighter Helmet Prototype Design,"* Sponsored by Texas Tech University Neuroimaging Center, $5,000.00. (October 2020 – August 2021). My Share 100%.

Pending

1. Chowdhury, S. (Lead Principal Investigator), *Non-invasive device to treat Acute Stress Reaction (ASR) and return warfighter performance.* **U.S. Department of Defense – U.S. Army STTR,** Competitive Federal Grant, **$55,000**. My Share 100%.

2. Chowdhury, S. (Principal Investigator), *Novel Sensor Algorithm for Monitoring and Improving Warfighter Performance.* **U.S. Department of Defense – U.S. Army SBIR,** Competitive Federal Grant, **$1,150,000**. My Share 20%.

3. Chowdhury, S. (Senior Personnel), Harry, J., Yang, J., *REU Site: Human-Centric Biomechanics and Engineering at Texas Tech University*. **National Science Foundation,** Competitive Federal Grant, **$503,781.00.** My Share: Support an Undergrad for three summers.

Non-Federal Grant

1. Chowdhury, S. (Lead Principal Investigator), *"Demographic Trends, Functional Capacity, and Virtual Reality Technology in Material Handling Operation,"* ***Toyota Material Handling University Research Program*****,** Competitive Grant **$291,220.00.** (Rejected). My Share 90%.

Publications

Google Scholar Citation Indices: Total citations: 270 h-index: 8 i10-index: 8

Peer-Reviewed Publications (After joining TTU)

Bold and asterisks (*) denote publications with TTU students as a corresponding author.

Peer-reviewed Journal Articles

Published/Accepted:

1. Mubarrat, S. T. & **Chowdhury, S***. (2021) Convolutional LSTM: A Deep Learning Approach to Predict Shoulder Joint Reaction Forces. *Computer Methods in Biomechanics and Biomedical Engineering.* Published. [Impact score 2.07]

2. Mubarrat, S.T., Fernandes, A., & **Chowdhury, S***. (2021) A Physics-based Virtual Reality System Design and Evaluation by Simulating Human-Robot Collaboration. *IEEE Transactions on Human-Machine Systems.* Accepted. Preprint. [Impact score 2.99]

3. Mubarrat, S.T., A. Fernandes, Binkley, K., & **Chowdhury, S***. (2021) Evaluating Visual-Spatiotemporal Coregistration of a Physics-based Virtual Reality Haptic Interface. *IEEE Transactions on Visualization and Computer Graphics.* TVCG-2021-06-0250. Preprint. [Impact score 4.58]

4. **Chowdhury, S.,** Zhou, Y., Wan, B., Reddy, C., Zhang, X. (2021). Neck Strength and Endurance and Associated Personal and Work-Related Factors. *Human Factors*. Published [Impact score 4.173]

5. Zhou, Y., **Chowdhury, S.,** Reddy, C. (2020). A State-of-the-Art Integrative Approach to Studying Neck Biomechanics In Vivo. *Science China Technological Sciences*. Published. 63 (7). pp. 1235-1246. [Impact score 3.57]

Under Revisions

1. Wei, L.H., Das, A., & **Chowdhury, S*.** Multi-muscle fatigue index formulation and validation for both static and dynamic tasks. *Computer Methods in Biomechanics and Biomedical Engineering.* Minor Revision. GCMB 2022-0127. [Impact score 2.07]

2. Mubarrat, S., Srinivasan, M., & **Chowdhury, S*.** Human Gait and Motor Performance in a Physics-Based Virtual Reality Simulation Testbed. Human Factors. [Impact score 4.173]

3. **Chowdhury, S* &** Fernandes, A. Can a Physics-Based Virtual Reality Testbed Regain Lost Skillset? Journal of Ergonomics. Special Issue (Invited Article). [Impact Score 2.93].

Working Papers

1. Santos, F.Z., Wei, L.H., **Chowdhury, S*.** (Expecting April 2022). Finding an optimal sandwich structure of Suspension Padding System Through Numerical Simulation. *Materials and Design.* [Impact Score 7.991].

2. Bahreinizad, H., Wei, L.Hl, **Chowdhury, S*.** (Expecting April 2022). MRI derived detailed brain and head-neck finite element model development and testing. *Nature Biomedical Engineering or PNAS.* [Impact Score 11.38].

3. Wei, L.H., Bahreinizad, H., **Chowdhury, S*,** (Expecting June 2022). Development and empirical validation of a full-body OpenSim model. *Annals of Biomedical Engineering.* [Impact Score 3.92].

4. Al-Alawi, M, **Chowdhury, S*,** Cross, J. (Expecting March 2022). A Systematic Literature Review of Fatigue Risk Management System: A Bibliometric Analysis. *International Journal of Occupational Safety and Ergonomics.* [Impact Score 1.67].

Peer-reviewed Conference Proceeding Papers

1. Srinivasan, M., Mubarrat, ST., Humphrey Q., Chen, T., Binkley, K., & **Chowdhury, S*** (2021). The Biomechanical Evaluation of a Human-Robot Collaborative Task in a Physically Interactive Virtual Reality Simulation Testbed. 65 (1). pp 403-407. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting.* [Impact score 0.99]

2. Humphrey Q., Srinivasan, M., Mubarrat, ST., & **Chowdhury, S*** (2021). Development of a Full-Body OpenSim Musculoskeletal Model Incorporating Head-mounted Virtual Reality Headset. 65 (1). pp 477-481. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting.* [Impact score 0.99]

3. Al-Alawi, M, & **Chowdhury, S*** (2021). Occupational Fatigue Risk Assessment and Management System: A Systematic Review and Bibliometric Analysis. 65 (1). pp 482-483. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting.* [Impact score 0.99]

4. Mubarrat, S.T., Opafunso, O., & **Chowdhury, S*,** (2020). The Evaluation of User Experience and Functional Workload of a Physically Interactive Virtual Reality System. 64 (1). pp 2084 – 2086. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*. [Impact score 0.99]

5. Tanzim, S., **Chowdhury, S.*,** Nimbarte, A., (2020). Predicting Shoulder Joint Reaction Forces from 3D Body Kinematics: A Deep Learning Approach. 64 (1). pp 939-941. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*. [Impact score 0.99]

Peer-reviewed Poster/Podium Presentations

1. Santos, F.Z., Wei, L.H., **Chowdhury, S*.** (2022). **Podium** presentation at the *North American Congress on Biomechanics (NACOB).* Can a Sandwich Structure of the Helmet Suspension Padding Provide a Better Oblique Impact Protection? Aug 21 – 25, 2022

2. Wei, L.H., **Chowdhury, S*.** (2022). **Podium** presentation at the *North American Congress on Biomechanics (NACOB).* An Electromyography Based Multi-Muscle Fatigue Index Formulation and Validation. Ottawa, Canada. Aug 21 – 25, 2022

3. Mubarrat, ST., Quinten, H., Srinivasan, M., **Chowdhury, S*.** (2021) Development of A Full-Body Musculoskeletal Model Incorporating Head-Mounted Device. **Poster** presented at the American Society of Biomechanics Annual Meeting. Virtual.

4. Mubarrat, S., Srinivasan, M., & **Chowdhury, S*.** (2021). **Poster** presented at the American Society of Biomechanics Annual Meeting. Human Gait and Motor Performance in a Physically Interactive Virtual Reality System. Virtual.

5. Fernandes, A. **Chowdhury, S*. (**Author Only). **Poster presentation** at the 2021 IISE Annual Conference, "Vulnerable Population Evaluation and Causalities in Bedrail Injuries and Deaths: A Systematic Review of Literature." (December 2020).

6. Mubarat, S. (Presenter & Author), **Chowdhury, S***. (Author Only), **Podium presentation** at the 2021 Institute of Industrial and Systems Engineering Annual Meeting, "Development of a physically interactive virtual reality system for sensorimotor training." (October 2020).

7. **Chowdhury, S***. (Co-Chair), Mubarat, S. (Presenter & Author), **Podium presentation** at Human Factors and Ergonomics Society Annual Meeting, "Predicting Shoulder Joint Reaction Forces From 3D Body Kinematics: A Convolutional Neural Network Approach," Human Factors and Ergonomics Society. (October 2020).

8. **Chowdhury, S*.** (Presenter & Author), **Poster** presented at Human Factors and Ergonomics Society Annual Meeting, "The Evaluation of User Experience and Functional Workload of a Physically Interactive Virtual Reality System." (October 2020).

9. **Chowdhury, S.** (Author Only), Poster presented at the Orthopedic Research Society Meeting, "Neck Strength Intra-person Correlations and Predictability from Muscle Geometry Are Sex-dependent," Phoenix, AZ. (February 2020).

Peer-Reviewed Publications (Before joining TTU)

Peer-Reviewed Journal Articles

1. **Chowdhury, S.,** Nimbarte, A. D., Hsiao, H., Gopalakrishnan, B., Jaridi, M. (2018). A biomechanical shoulder strain index based on stabilizing demand of shoulder joint. *Ergonomics, 61*(12), 1657-1670.

2. **Chowdhury, S.** & X. Zhang (2018). Lumbar facet joint kinematics and load effects during dynamic lifting. *Human Factors, 60*(8), 1130 - 1145.

3. Byrne, R. M., Zhou, Y., Zheng, L., **Chowdhury, S.,** Aiyangar, A., Zhang, X. (2018). Segmental variations in facet joint translations during in vivo lumbar extension. *Human Factors, 70*, 88-95.

4. **Chowdhury, S.,** Nimbarte, A. D. (2017). Effect of fatigue on the stationarity of surface electromyography signals. *International Journal of Industrial Ergonomics, 61*, 120-125.

5. **Chowdhury, S.,** Byrne, R. M., Zhou, Y., Gale, T., Zheng, L., Anderst, W., Zhang, X. (2017). Integrating Multi-Modality Imaging and Biodynamic Measurements for Studying Neck Biomechanics During Sustained-Till-Exhaustion Neck Exertions. *SAGE Publications, 61*(1), 986-990.

6. **Chowdhury, S.** K., Nimbarte, A. D., Moore, C. W. (2015). Effects of lift-assist device on trunk and shoulder kinematics. *International Journal of Occupational Safety and Health, 5*(1), 1-6.

7. **Chowdhury, S.,** Nimbarte, A. D. (2015). Comparison of Fourier and wavelet analysis for fatigue assessment during repetitive dynamic exertion. *Journal of Electromyography and Kinesiology, 25*(2), 205-213.

8. Nimbarte, A. D., Zreiqat, M. M., **Chowdhury, S.** (2014). Cervical flexion–relaxation response to neck muscle fatigue in males and females. *Journal of Electromyography and Kinesiology, 24*(6), 965-971.

9. **Chowdhury, S.,** Nimbarte, A. D., Jaridi, M., Creese, R. C. (2013). Discrete wavelet transform analysis of surface electromyography for the fatigue assessment of neck and shoulder muscles. *Journal of Electromyography and Kinesiology, 23*(5), 995-1003.

10. Nimbarte, A. D., **Chowdhury, S**., David Cartwright, E. (2013). Empirical evaluation of neck muscle fatigue generated by healthcare related exertions. *Safety Science, 57*, 100-107.

11. Nabatilan, L. B., Aghazadeh, F., Nimbarte, A. D., Harvey, C. C., **Chowdhury, S.** (2012). Effect of driving experience on visual behavior and driving performance under different driving conditions. *Cognition, Technology, & Work, 14*(4), 355-363.

Peer-Reviewed Conference Proceeding Papers

1. **Chowdhury, S. K.,** Zhou, Y., Wan, B., Reddy, C., Zhang, X. (2019). *Sex-specific differences in cervical muscle fatigue during sustained non-neutral exertions* (1st ed., vol. 63, pp. 1122 - 1125). Thousand Oaks, California: SAGE Publications. [Impact score 0.99]

2. **Chowdhury, S.** (2015). *Evaluation of concavity compression mechanism as a possible predictor of shoulder muscle fatigue during dynamic exertions* (27th ed., pp. 12-17). International Society of Occupational Ergonomics and Safety. [Impact score 0.99]

3. **Chowdhury, S.,** Nimbarte, A. D., Jaridi, M., Creese, R. C. (2012). *Assessment of neck and shoulder muscle fatigue using discrete wavelet transforms of surface electromyography* (1st ed., vol. 56, pp. 1145-1149). SAGE Publications. [Impact score 0.99]

4. **Chowdhury, S.**, Nimbarte, A. D., Cartwright, D. (2012). *Impact of Physical and Psychosocial Demand on the Neck and Shoulder Muscle Fatigue* (24th ed., pp. 199 - 203). International Society of Occupational Ergonomics and Safety.

Peer-reviewed Poster/Podium Presentations

1. **Chowdhury, S.** (Presenter & Author), 2019 Human Factors and Ergonomics Society Annual Meeting, "Sex-specific Fatigability Rates of Neck Muscles During Sustained Non-Neutral Exertions." (October 2019).

2. **Chowdhury, S.,** Industrial Advisory Board, "Human-Centric Design of Work and Industrial Technologies — From Mind to Muscle," Texas Tech University, Industrial, Manufacturing, and Systems Engineering. (October 2019).

3. **Chowdhury, S.** (Author Only), International Society of Biomechanics, "Piecewise Multi-modal Spine Registration to Build Personalized Neck Musculoskeletal Models," Calgary, Canada. (August 2019).

4. **Chowdhury, S**. (Presenter & Author), Annual Institute of Industrial Engineers Conference, "Predicting cervical intervertebral kinematics via deep-learning approach from minimal surface markers," Orlando, FL. (May 2019).

5. **Chowdhury, S.** (Presenter & Author), American Society of Biomechanics Annual Meeting, "Does neck muscle fatigue affect cervical intervertebral kinematics?," Rochester, MN. (August 2018).

6. **Chowdhury, S.** (Author Only), Annual Institute of Industrial Engineers Conference, "Evaluation of a construction block lift-assist device," Pittsburgh, PA. (May 2017).

7. **Chowdhury, S.** (Presenter & Author), Annual Institute of Industrial Engineers Conference, "Electromyography based global muscle fatigue index formulation," Anaheim, CA. (May 2016).

TEACHING

Courses Taught

- IE 4361, Engineering Design for People.
- IE 5301, Advanced Industrial Ergonomics & accompanying distance section
- IE 5304, Biomechanics and Work Physiology & accompanying distance section
- IE 5331, Special Topics – Experimental Methods in Biomechanics and Work Physiology & accompanying distance section
- IE 5331 – Special Topics in Industrial Engineering & accompanying distance section.

New Course Development

- Engineering Design for Human (IE 4361)
- Advanced Industrial Ergonomics (IE 5301 & IE 5331)
- Experimental Methods in Biomechanics and Work Physiology (IE 5304)
- Biomechanics and Work Physiology (IE 5331)

ADVISING ACTIVITIES

Doctor of Philosophy Students:

No	Name of Student	Year of Graduation	Degree	Type	Distance student?	Role
1.	Hossein Bahreinizad	Ongoing	Ph.D.	Dissertation	X	Committee Chair
2.	Felipe Santos	Ongoing	Ph.D.	Dissertation	X	Committee Chair
3.	Leonardo Wei	Ongoing	Ph.D.	Dissertation	X	Committee Chair
4.	Mundhir Al-Alawi	Ongoing	Ph.D.	Dissertation	Yes	Committee Chair
5.	Antonio Fernandes	Ongoing	Ph.D.	Dissertation	Yes	Committee Chair
6.	Elizabeth Ogunkola	Ongoing	Ph.D.	Dissertation	Yes	Committee Chair
7.	Jeremy Dieringer	Ongoing	Ph.D.	Dissertation	Yes	Committee Chair
8.	Tanzim Mubarrat	August, 2021	MS	Thesis	X	Committee Chair
9.	Sourya Banik	August, 2021	Ph.D.	Dissertation	X	Dean's representative
10.	Natalie Lodinger	December, 2021	Ph.D.	Dissertation	X	Dean's representative
11.	Zhiyoung Hu	June 2021	Ph.D.	Dissertation	X	Committee Member

Master of Science Students:

No	Name of Student	Year of Graduation	Degree	Type	Distance student?	Role
1.	Tanzim Mubarrat	August, 2021	MS	Thesis	X	Committee Chair
2.	Manoj Srinivasan	Ongoing	MS	Coursework-only	X	Research Advisor
3.	Sneha Shrestha	Ongoing	MS	Thesis	X	Committee Chair
4.	Quinten Humphrey	Ongoing	MS	Coursework-only	X	Research Advisor
5.	Oluwatosin Opafunso	August, 2021	MS	Coursework-only	X	Research Advisor
6.	Siddharth Shah	May 2020	MS	Coursework-only	X	Committee Member

Undergraduate Students:

No	Name of Student	Year of Graduation	Degree	Type	Role
1.	Kieran Binkley	Ongoing	BS	Research Experience	Research Advisor
2.	Kathryn Bell	Ongoing	BS	Research Experience	Research Advisor
3.	Thomas Chen	May 2022	BS	Research Experience	Research Advisor

Media Contributions

Blog

Responderssafety. (January 2022). *Emergency Responder Safety Institute Supports Texas Tech and Lubbock Fire Rescue Partnership to Design a New Multi-Purpose Firefighter Helmet* *https://www.respondersafety.com/news/news/2022/01/emergency-responder-safety-institute-supports-texas-tech-and-lubbock-fire-rescue-partnership-to-design-a-new-multi-purpose-firefighter-helmet/*

Magazine

Firehouse. (August 2020). TX Fire Department, University Team Up to Improve FF Safety. https://www.firehouse.com/safety-health/news/21151781/tx-fire-department-university-partner-to-improve-firefighter-safety

Firehouse. (October 2020). Virtual Reality Training: It's Not a Video Game. https://www.firehouse.com/tech-comm/news/21158116/virtual-reality-firefighter-training-its-not-a-video-game

Newspaper

Fox34.Com. (November 2021). Texas Tech researchers team up with fire crews for their latest project. https://www.fox34.com/2021/11/09/texas-tech-researchers-team-up-with-fire-crews-their-latest-project/

Daily Toreador. (November 2021). Students participate in firefighter training for new helmet research. http://www.dailytoreador.com/news/students-participate-in-firefighter-training-for-new-helmet-research/article_6f15d64e-40c3-11ec-8586-a342791410d2.html

Daily Advent. (November 2021). Tech students work to create next-generation helmet for firefighters.
https://www.dailyadvent.com/news/964ec6f3fced55c65ec627b9db20a2be-Tech-students-work-to-create-nextgeneration-helmet-for-firefighters

Radio

93.7 The Eagle. (September 2020). Lubbock fire rescue, Texas Tech partner to help improve firefighter safety. https://www.937theeagle.com/local-news/lubbock-fire-rescue-texas-tech-partner-to-help-improve-firefighter-safety/article_d5af9399-66b0-5fed-a393-3a8873fae08b.htm

TV

Everything Lubbock. (November 2021). Tech students work to create next-generation helmet for firefighters. https://www.everythinglubbock.com/news/local-news/tech-students-work-to-create-next-generation-helmet-for-firefighters

KCBD. (November 2021). Texas Tech researchers team up with fire crews for their latest project. https://www.kcbd.com/2021/11/09/texas-tech-researchers-team-up-with-fire-crews-their-latest-project/

SERVICE

Department Service

- Recruitment Activity, Faculty Hiring. (November 2020 – May 2021).
- Undergraduate Faculty Advisor. (October 2020 - Present).
- Committee Member, Undergraduate Faculty Committee. (September 2020 – August 2021).
- Committee Member, Graduate Recruitment. (September 2019 - August 2020).
- Committee Member, Graduate Affairs. (September 2021 - August 2022).
- Department Safety Officer (September 2021 - August 2022).

Professional Service

- Reviewer, Journal Article, Ergonomics in Design. (December 2020 - Present).
- Reviewer, Journal Article, IEEE Transaction of Human-Machine Systems. (October 2020 - Present).
- Reviewer, Grant Proposal, National Institute of Occupational Safety and Health. (June 2020 - Present).
- Reviewer, Conference Paper, American Society of Biomechanics. (May 2020 - Present).
- Reviewer, Conference Paper, Human Factors and Ergonomics Society, Lubbock, TX. (March 2020 - Present).
- Reviewer, Journal Article, Human Factors and Ergonomics in Manufacturing and Service Industries. (2020 - Present).
- Chair-Elect, Occupational Ergonomics Technical Group, Human Factors and Ergonomics Society. (October 2020 - October 2022).
- Reviewer, Journal Article, Ergonomics. (December 2019 - December 2020).
- Reviewer, Journal Article, Human Factors. (August 2019 - December 2019).

Public Service

Partnered with the Lubbock Fire Department, Lubbock, TX to host workshops and seminars on (2020 - Present).

Professional Memberships

- Member, Institute of Electrical and Electronics Engineers. (2020 - 2022).
- Member, American Society of Biomechanics. (2018 - 2022).
- Member, North American Society of Biomechanics. (2017 - 2022).
- Chair-Elect, Occupational Ergonomics Technical Group, Human Factors and Ergonomics Society. (2012 - 2022).
- Member, Institute of Industrial and Systems Engineering. (2011 - 2021).