

CURRICULUM VITAE  
**Ke Song, PhD**

**CONTACT INFORMATION:**

Human Motion Laboratory  
Department of Orthopaedic Surgery  
University of Pennsylvania Perelman School of Medicine  
3737 Market Street, 6th Floor  
Philadelphia, PA, USA 19104  
ke.song@pennmedicine.upenn.edu  
(215) 294-9613

**PRESENT POSITION:**

September 2021 – Present

**Postdoctoral Researcher**  
Human Motion Laboratory  
Department of Orthopaedic Surgery  
University of Pennsylvania Perelman School of Medicine  
Philadelphia, PA, USA  
Advisor: Josh R. Baxter, PhD

**EDUCATION:**

August 2015 – May 2021

**Doctor of Philosophy, Mechanical Engineering**  
Washington University in St. Louis  
St. Louis, MO, USA  
*Dissertation: Subject-Specific Musculoskeletal Modeling of Hip Dysplasia Biomechanics*  
Advisor: Michael D. Harris, PhD

September 2013 – December 2014

**Master of Science, Biomedical Engineering**  
University of Michigan  
Ann Arbor, MI, USA

September 2009 – June 2013

**Bachelor of Science, Biomedical Engineering**  
Hong Kong Polytechnic University  
Hong Kong, China  
*Honours Class II-1*

**PAST ACADEMIC POSITIONS / EMPLOYMENT:**

January 2016 – May 2021

**Graduate Research Assistant**  
Movement Science Research Center  
Program in Physical Therapy  
Washington University in St. Louis  
St. Louis, MO, USA  
Advisor: Michael D. Harris, PhD

September – December 2019 September – December 2017	<b>Guest Lecturer</b> <i>IPMS5510: Movement Science II – Biomechanics</i> PhD Program in Movement Science (WUSTL PT) St. Louis, MO, USA Instructors: Michael D. Harris; Michael J. Mueller
September 2015 – April 2016	<b>Graduate Teaching Assistant</b> <i>JEE4980: Electrical Engineering Design Project</i> WUSTL – UMSL Joint Engineering Program St. Louis, MO, USA Instructor: Dedric A. Carter, PhD
September – December 2015	<b>Rotational Research Assistant</b> Applied Biomechanics Laboratory Program in Physical Therapy Washington University in St. Louis St. Louis, MO, USA Advisor: Michael J. Mueller, PT, PhD, FAPTA
September 2013 – December 2014	<b>Research Assistant</b> Biomechanics Research Laboratory Department of Mechanical Engineering University in Michigan Ann Arbor, MI, USA Advisor: James A. Ashton-Miller, PhD

## **HONORS and AWARDS:**

2025	Orthopaedic Research Society Early Career Outreach Travel Award
2020	American Society of Biomechanics Three Minute Thesis (3MT) Competition – Winner, PhD Category
2018, 2019	Washington University Graduate Research Symposium – 3 <sup>rd</sup> Place Poster, Engineering Category
2018	American Society of Biomechanics Student Travel Award

## **EDITORIAL RESPONSIBILITIES:**

Manuscript Reviewer	<i>PLoS ONE</i> <i>Journal of Biomechanics</i> <i>IEEE Journal of Biomedical and Health Informatics</i> <i>Annals of Biomedical Engineering</i> <i>IEEE Journal of Translational Engineering in Health &amp; Medicine</i> <i>Journal of Applied Biomechanics</i> <i>Medicine &amp; Science in Sports &amp; Exercise</i> <i>Frontiers in Bioengineering and Biotechnology</i> <i>Scientific Reports</i> <i>Clinical Biomechanics</i>
---------------------	--

Abstract Reviewer

*Computer Methods in Biomechanics and Biomedical Engineering*  
American Society of Biomechanics Annual Meeting  
Orthopaedic Research Society Annual Meeting

### **SERVICE CONTRIBUTIONS:**

2025 – Present      Member, American Society of Biomechanics Communications Committee  
2025                  Contributor, Orthopaedic Research Society *Open Door* Outreach Program  
2024                  Reviewer, ASB Graduate Student Grant-in-Aid Program  
2024 – Present      Ambassador, Orthopaedic Research Society  
2023 – Present      Member, American Society of Biomechanics Education Committee  
2023                  Judge, ASB *Journal of Biomechanics* Award  
2023 – 24            Contributor, *Learning on a Limb* Outreach Program (UPenn Orthopaedics)  
2023 – 24            Session Moderator, Orthopaedic Research Society Annual Meeting  
2023 – Present      Member, American Society of Biomechanics Membership Committee  
2017 – 19, 2024 – 25   Contributor, *National Biomechanics Day* Community Outreach Program

### **PROFESSIONAL SOCIETIES:**

2021 – Present      Orthopaedic Research Society Tendon Section  
2018 – Present      Orthopaedic Research Society  
2017 – Present      American Society of Biomechanics

### **TEACHING RESPONSIBILITIES:**

Guest Lecturer      *IPMS 5510: Movement Science II – Biomechanics* (2017, 2019)  
                              PhD Program in Movement Science (WUSTL Physical Therapy)  
Teaching Assistant   *JEE 4980: Electrical Engineering Design Project* (2015 – 2016)  
                              WUSTL – UMSL Joint Engineering Program

### **RESEARCH SUPPORT:**

#### Present

NIH NIAMS R01AR078898

PI: Josh R. Baxter

Title: Tendon loading profiles that promote healing in Achilles tendinopathy

Duration: 4/1/2021 – 2/28/2026

**Role: Postdoctoral Researcher**

#### Past

NIH NIAMS K01AR072072

PI: Michael D. Harris

Title: Muscle Geometry and its Influence on Function in Patients with Developmental Dysplasia of the Hip

Duration: 4/1/2018 – 3/30/2023

**Role: Graduate Research Assistant**

## BIBLIOGRAPHY:

### Peer-Reviewed Journal Articles

1. Phan V, **Song K**, Scattone Silva R, Silbernagel KG, Baxter JR, Halilaj E. 2024. Seven things to know about exercise classification with inertial sensing wearables. *IEEE Journal of Biomedical and Health Informatics* 28(6):3411-3421. doi: 10.1109/JBHI.2024.3368042.
2. Scattone Silva R, **Song K**, Hullfish TJ, Sprague AL, Silbernagel KG, Baxter JR. 2023. Patellar tendon load progression during rehabilitation exercises: Implications for the treatment of patellar tendon injuries. *Medicine & Science in Sports & Exercise* 56(3):545-552. doi: 10.1249/MSS.0000000000003323.
3. Wu T, Lohse KR, Van Dillen LR, **Song K**, Clohisy JC, Harris MD. 2023. Are abnormal muscle Biomechanics and patient-reported outcomes associated in patients with hip dysplasia? *Clinical Orthopaedics and Related Research* 481(12):2380-2389. doi: 10.1097/CORR.0000000000002728.
4. **Song K**, Hullfish TJ, Scattone Silva R, Silbernagel KG, Baxter JR. 2023. Markerless motion capture estimates of lower extremity kinematics and kinetics are comparable to marker-based across 8 movements. *Journal of Biomechanics* 157:111751. doi: 10.1016/j.jbiomech.2023.111751.
5. **Song K**, Scattone Silva R, Hullfish TJ, Silbernagel KG, Baxter JR. 2023. Patellofemoral joint loading progression across 35 weight-bearing rehabilitation exercises and activities of daily living. *American Journal of Sports Medicine* 51(8):2110-2119. doi: 10.1177/03635465231175160.
6. Shepherd MC, Gaffney BMM, **Song K**, Clohisy JC, Nepple JJ, Harris MD. 2022. The Impact of Femoral Version Deformity on Joint Reaction Forces in Dysplastic Hips. *Journal of Orthopaedic Research* 135:111023. doi: 10.1016/j.jbiomech.2022.111023.
7. **Song K**, Pascual-Garrido C, Clohisy JC, Harris MD. 2022. Hip Dysplasia Elevates Loading at the Posterior Acetabular Edge during Double-Legged Squat. *Journal of Orthopaedic Research* 40(9):2147-2155. doi: 10.1002/jor.25249.
8. Harris MD, Shepherd MC, **Song K**, Gaffney BMM, Hillen TJ, Harris-Hayes M, Clohisy JC. 2022. The Biomechanical Disadvantage of Dysplastic Hips. *Journal of Orthopaedic Research* 40(6):1387-1396. doi: 10.1002/jor.25165.
9. **Song K**, Pascual-Garrido C, Clohisy JC, Harris MD. 2021. Acetabular Edge Loading during Gait is Elevated by the Anatomical Deformities of Hip Dysplasia. *Frontiers in Sports and Active Living* 3:687419. doi: 10.3389/fspor.2021.687419.
10. **Song K**, Gaffney BMM, Shelburne KB, Pascual-Garrido C, Clohisy JC, Harris MD. 2020. Dysplastic Hip Anatomy Alters Muscle Moment Arm Lengths, Lines of Action, and Contributions to Joint Reaction Forces during Gait. *Journal of Biomechanics* 110:109968. doi: 10.1016/j.jbiomech.2020.109968.
11. **Song K**, Anderson AE, Weiss JA, Harris MD. 2019. Musculoskeletal Models with Generic and Subject-Specific Geometry Estimate Different Joint Biomechanics in Dysplastic Hips. *Computer Methods in Biomechanics and Biomedical Engineering* 22(3):259-270. doi: 10.1080/10255842.2018.1550577.

### **Preprint / Non-Peer-Reviewed Articles**

1. Phan V, **Song K**, Scattone Silva R, Silbernagel KG, Baxter JR, Halilaj E. 2023. Seven things to know about exercise monitoring with inertial sensing wearables. *TechRxiv*. doi: 10.36227/techrxiv.23296487.v1.
2. **Song K**, Hullfish TJ, Scattone Silva R, Silbernagel KG, Baxter JR. 2023. Markerless Motion Capture Estimates of Lower Extremity Kinematics and Kinetics are Comparable to Marker-based across 8 Movements. *bioRxiv*. doi: 10.1101/2023.02.21.526496.

### **Conference Abstracts**

1. **Song K**, Scanzello CR, Baker JF, Baxter JR. Validity of Markerless Motion Capture for Assessing Osteoarthritic Knee Biomechanics. 49<sup>th</sup> Annual Meeting of the American Society of Biomechanics. Pittsburgh, PA, USA, August 2025.
2. **Song K**, Kwon MP, Smith AK, Pohlign RT, Silbernagel KG, Baxter JR. How Much Insole Sensor Data is Enough to Identify Habitual Achilles Tendon Loading? 49<sup>th</sup> Annual Meeting of the American Society of Biomechanics. Pittsburgh, PA, USA, August 2025.
3. **Song K**, Kwon MP, Smith AK, Pohlign RT, Silbernagel KG, Baxter JR. Sensor-Measured Achilles Tendon Load is Associated with Plantarflexor Dynamic Function in Achilles Tendinopathy. 71<sup>st</sup> Annual Meeting of the Orthopaedic Research Society. Phoenix, AZ, USA, February 2025.
4. Meyers MN, Nkansah-Andoh A, Russo DP, **Song K**, Durnwald CP, Humbyrd CJ, Baxter JR. Pregnancy Gait Biomechanics using Markerless Motion Capture. 71<sup>st</sup> Annual Meeting of the Orthopaedic Research Society. Phoenix, AZ, USA, February 2025.
5. Nkansah-Andoh A, Meyers MN, Russo DP, **Song K**, Humbyrd CJ, Baxter JR. Using an Instrumented Insole to Detect Changes in Achilles Tendon Loading Between Pregnant Women in Their First Trimester and Pregnant Women in Their Third Trimester. 71<sup>st</sup> Annual Meeting of the Orthopaedic Research Society. Phoenix, AZ, USA, February 2025.
6. **Song K**, Kwon MP, Smith AK, Silbernagel KG, Baxter JR. Two Weeks of Achilles Tendon Loading Monitored by Instrumented Insole is Associated with Plantarflexor Function. 48<sup>th</sup> Annual Meeting of the American Society of Biomechanics. Madison, WI, USA, August 2024.
7. **Song K**, Kwon MP, Smith AK, Silbernagel KG, Baxter JR. Tendon Loads Measured over 2 Weeks of Daily Living are Associated with Achilles Tendinopathy Patient Outcomes. 70<sup>th</sup> Annual Meeting of the Orthopaedic Research Society. Long Beach, CA, USA, February 2024.
8. **Song K**, Hullfish TJ, Scattone Silva R, Silbernagel KG, Baxter JR. Markerless Motion Capture Estimates of Lower Extremity Biomechanics are Comparable to Marker-based across 8 Movements. 47<sup>th</sup> Annual Meeting of the American Society of Biomechanics. Knoxville, TN, USA, August 2023.
9. Phan V, **Song K**, Scattone Silva R, Silbernagel KG, Baxter JR, Halilaj E. What You Need to Know About Exercise Monitoring with Inertial Sensing Wearables. 47<sup>th</sup> Annual Meeting of the American Society of Biomechanics. Knoxville, TN, USA, August 2023.
10. **Song K**, Scattone Silva R, Hullfish TJ, Silbernagel KG, Baxter JR. Patellofemoral Joint Loading Progression Across 35 Weight-Bearing Rehabilitation Exercises and Activities of

Daily Living. 69<sup>th</sup> Annual Meeting of the Orthopaedic Research Society. Dallas, TX, USA, February 2023.

11. **Song K**, Cone SG, Zellers JA, Thelen DG, Baxter JR. Tracking Day-to-Day Achilles Tendon Loading Progression during Rupture Recovery. 5<sup>th</sup> North American Congress on Biomechanics. Ottawa, ON, Canada, August 2022.
12. **Song K**, Cone SG, Zellers JA, Thelen DG, Baxter JR. Day-to-Day Loading Progression in Repaired Achilles Tendon Corresponds to Real-World Events of Tendon Health. 2022 ORS Tendon Section Conference. Philadelphia, PA, USA, May 2022.
13. **Song K**, Pascual-Garrido C, Clohisy JC, Harris MD. Hip Dysplasia Elevates Loading at the Posterior Acetabular Edge during Double-Legged Squat. 67<sup>th</sup> Annual Meeting of the Orthopaedic Research Society. *Virtual*, February 2021.
14. Shepherd MC, Gaffney BMM, **Song K**, Clohisy JC, Harris MD. The Influence of Femoral Version Deformity on Joint Reaction Forces in Dysplastic Hips. 67<sup>th</sup> Annual Meeting of the Orthopaedic Research Society. *Virtual*, February 2021.
15. Harris MD, Shepherd MC, **Song K**, Gaffney BMM, Hillen TJ, Clohisy JC. The Mechanical Disadvantage of Dysplastic Hips. 67<sup>th</sup> Annual Meeting of the Orthopaedic Research Society. *Virtual*, February 2021.
16. **Song K**, Shepherd MC, Clohisy JC, Harris MD. Periacetabular Osteotomy for Hip Dysplasia Alters Dynamic Flexor and Abductor Muscle Moment Arms and Lines of Action. 44<sup>th</sup> Annual Meeting of the American Society of Biomechanics. *Virtual*, August 2020.
17. **Song K**, Clohisy JC, Harris MD. Effects of Periacetabular Osteotomy on In-Vivo Loading at the Edge of Dysplastic Acetabula during Gait. 66<sup>th</sup> Annual Meeting of the Orthopaedic Research Society. Phoenix, AZ, USA, February 2020.
18. Gaffney BMM, **Song K**, Harris-Hayes M, Clohisy JC, Harris MD. Influence of Hip Kinematic Perturbations during Walking on Joint Loading in Patients with Acetabular Dysplasia. 66<sup>th</sup> Annual Meeting of the Orthopaedic Research Society. Phoenix, AZ, USA, February 2020.
19. **Song K**, Clohisy JC, Harris MD. Dysplastic Hip Anatomy and Joint Reaction Forces Affect Instantaneous and Accumulative Loads at the Acetabular Edge. ISB Congress XXVII / 43<sup>rd</sup> Annual Meeting of the American Society of Biomechanics. Calgary, AB, Canada, August 2019.
20. **Song K**, Gaffney BMM, Harris MD. Hip Joint Reaction Force Contributions to Acetabular Edge Loading in Dysplastic Hips: A Subject-Specific Musculoskeletal Modeling Study. 65<sup>th</sup> Annual Meeting of the Orthopaedic Research Society. Austin, TX, USA, February 2019.
21. **Song K**, Gaffney BMM, Pascual-Garrido C, Harris MD. Effects of Dysplastic Pelvis Morphology on Hip Muscle Lines of Action, Moment Arm Lengths, and Contributions to Joint Reaction Forces. 42<sup>nd</sup> Annual Meeting of the American Society of Biomechanics. Rochester, MN, USA, August 2018.
22. Harris MD, **Song K**, Gaffney BMM. How femoral version changes joint loading in patients with developmental dysplasia of the hip. 42<sup>nd</sup> Annual Meeting of the American Society of Biomechanics. Rochester, MN, USA, August 2018.
23. **Song K**, Anderson AE, Weiss JA, Harris MD. Musculoskeletal Models Scaled with CT Images versus Skin Markers in a Population with Hip Deformity Compared to Controls.

41<sup>st</sup> Annual Meeting of the American Society of Biomechanics. Boulder, CO, USA, August 2017.

24. Harris MD, **Song K**, Davidson BS, Decker MJ, Shelburne KB. Multi-joint Compensations during Landing and Cutting at least One Year after Return to Sport following ACL Reconstruction. 63<sup>rd</sup> Annual Meeting of the Orthopaedic Research Society. San Diego, CA, USA, March 2017.
25. Harris MD, **Song K**, Davidson BS, Decker MJ, Shelburne KB. The Influence of a Functional Knee Brace and Orthopaedic Tights on Lower Extremity Mechanics During Land and Cut Maneuvers. 63<sup>rd</sup> Annual Meeting of the Orthopaedic Research Society. San Diego, CA, USA, March 2017.

### **RESEARCH INTERESTS:**

- Human motion capture & analysis
- Subject-specific musculoskeletal modeling
- Wearable technology, artificial intelligence & machine learning
- Real-world and clinically-oriented musculoskeletal biomechanics
- Muscle-tendon biomechanics of the shoulder joint
- Multi-joint biomechanics of the lower extremity
- Biomechanics of hip morphological conditions
- Sports biomechanics, injury rehabilitation & prevention

### **TECHNICAL SKILLS:**

**Proficient:** Python, MATLAB, OpenSim, Visual3D, Theia3D Markerless, Optitrack Motive, APDM Motion Studio, Axivity AX6, Novel Loadsol, Motion Analysis Cortex, Vicon Nexus, Amira, SPSS Statistics, MS Office

**Skills with:** Ultrasonic imaging, R, C/C++, LabView, Abaqus, SolidWorks, PreView/PostView, SketchUp/LayOut, Mimics/3-Matics