Zhenyuan Zhang

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Education

PhD candidate in Human Movement Biomechanics Jul 2023 – Present
Research Institute for Sport and Exercise Science
Liverpool John Moores University, United Kingdom

Master of Science in Sport and Clinical Biomechanics Sep 2020 – Nov 2021
School of Sport and Exercise Science
Liverpool John Moores University, United Kingdom

Bachelor of Education in Human Movement Science Sep 2016 – Jun 2020
School of Exercise and Health Science
Chengdu Sport University, China

Skills

Languages: Python, Matlab, Git, Shell, LaTeX
Computer Simulations: OpenSim, Visual3D, Pyomeca, MyoSuite
Biomechanics Tools: Optical Motion Capture, Inertial Measurement Unit, Force Plates, EMG
High-Performance Computing: SLURM, AWS, Dask
Machine Learning: PyTorch, TensorFlow, Keras, Scikit-learn

Experience

Biomechanics Laboratory Technician Sep 2025 – Present
Liverpool John Moores University, Contracted
United Kingdom

- Built up and fine-tuned 3 advanced biomechanics systems with the senior technician, provided professional training for staff and students. I am also responsible for managing them for both teaching and research activities.
- System1: 10 Qualysis Arqus motion capture cameras integrated with 8 Qualysis Miqus cameras for marker-less motion capture, 2 Kistler force plates, 16 Delsys Trigno EMGs.
- System2: 8 Qualysis Arqus motion capture cameras integrated with a Treadmetrix treadmill (AMTI force plate embedded), 16 Delsys Trigno EMGs and 8 Noraxon EMGs.
- System3: 14 Vicon Vero motion capture cameras integrated with 16 Vicon T-series cameras, 2 Kistler force plates, 8 Vicon Blue Trident IMUs and 16 Delsys Trigno EMGs.

Machine Learning and Biomechanics Researcher Jul 2023 – Present
SportScientia Ltd., Contracted
Remote

- Developed and validated deep learning neural network models to estimate ground reaction forces from instrumented insoles for various movement tasks.
- Validated instrumented insoles with sensor fusion algorithm for measuring spatiotemporal gait parameters against optical motion capture and force plates for athletic performance and load monitoring applications.
- Assisted in developing cloud computing pipelines with AWS to automate data processing and analysis for the instrumented insoles.

Graduate Research Assistant Nov 2021 – Jul 2023
Liverpool John Moores University, Contracted
United Kingdom

- Assisted in commercial projects with New Balance Athletics, USA to test biomechanical interactions between soccer boots with different studs and artificial turfs using high-speed motion capture and force plates.
- Assisted in commercial projects with New Balance Athletics, USA to test effects of different running shoes on lower limb biomechanics and muscle co-contractions during treadmill running using motion capture integrated with instrumented treadmill and EMGs.

Publications

Zhang, Z., Verhuel, J., Robinson, M., and Lake, M. Estimating ground reaction forces in dynamic sports movements using instrumented insoles and deep learning. *XXX Congress of International Society of Biomechanics.* (2025)

Yang, C., Yang, Y., Xu, Y., **Zhang, Z.**, Lake, M., and Fu, W. Whole leg compression garments influence lower limb kinematics and associated muscle synergies during running. *Frontiers in Bioengineering and Biotechnology, 12, 1310464.* (2024)

Zhang, Z. and Lake, M. Rate of knee flexion at the instant of landing during running can influence initial knee joint stiffness estimates due to running shoe cushioning. *Oral Presentation, XXIX Congress of International Society of Biomechanics, p.314.* (2023)

Zhang, Z. and Lake, M. A re-examination of the measurement of foot strike mechanics during running: the immediate effect of footwear midsole thickness. *Frontiers in Sports and Active Living, 4, 824183.* (2022)

Zhang, Z. and Lake, M. A comparison of unmatched and matched filtering approaches for knee joint stiffness calculation during running. *Oral Presentation, ISBS Proceedings Archive, 40(1), 807.* (2022)

Projects

TechLayer | *GitHub*

- A Python project which trained and implemented a deep learning model to predict Ground Reaction Forces (GRFs) from IMU and pressure sensor data collected from instrumented insoles during various dynamic sports movements.
- The model is trained and validated on a dataset of 32 participants using High-Performance Computing (HPC) clusters and demonstrated high accuracy in predicting vertical and anterior-posterior GRFs again force plates.

Wearable_IK | *GitHub*

- A Python project integrating open-source sensor fusion algorithms and OpenSim API to estimate joint kinematics from IMU data and validating the results against optical motion capture data.
- It automates the entire workflow from data loading, preprocessing, sensor fusion, sensor-to-segment calibration, inverse kinematics, to results visualization
- It also features a calibration-free approach for IMU sensors as it does not require magnetometers and parallelized computing to speed up processing.

Wearable_System(Under Development) | *GitHub*

- A Python project integrating **TechLayer** and **Wearable_IK** to simulate neural-muscular dynamics from a complete set of wearable sensors (instrumented insoles + IMUs + EMGs) using optimal control framework in OpenSim.

My_Website | *GitHub*

- A personal academic website adapted from an open-source TypeScript template for fun.

References

References available upon request.