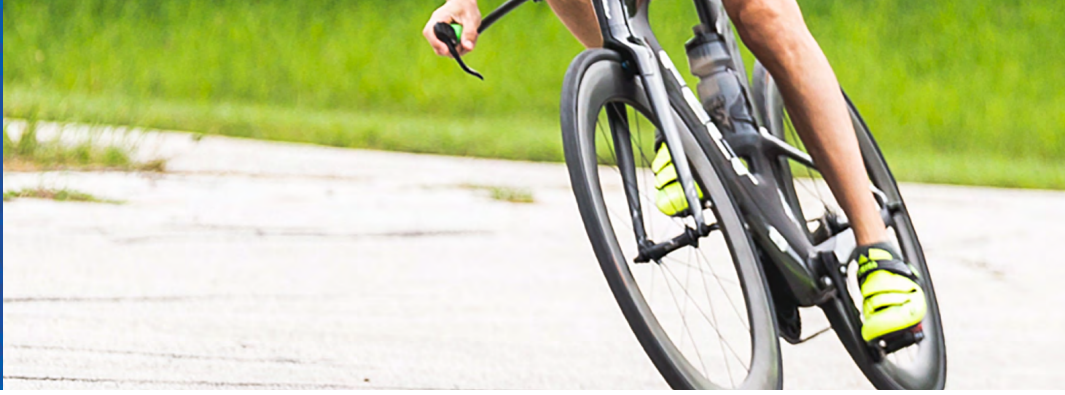# Markerless Biomechanics for Cycling

The Human Performance Initiative at Southwest Research Institute® (SwRI®) applies a multidisciplinary scientific and engineering approach to better understand and quantify the complex biomechanical and physiological components of physical performance.

Building on more than 30 years of experience in modeling and simulation of complex systems for military and commercial clients, our team of scientists and engineers is advancing markerless motion capture solutions in biomedicine and sports science to better understand and predict the risk of injury, optimize rehabilitation, and develop innovative products.

A New Tool for Sports Scientists

SwRI's research in markerless biomechanics is poised to be a game-changer in the field of cycling by providing an easy-to-use solution for biomechanical analysis whenever the athlete is on the bike.

This research breakthrough can be used to measure the athlete's biomechanics during pre-season and in-season training sessions, as well as during competition, which allows performance staff to use one tool throughout the entire competition cycle. Its ease of use, non-invasive nature, and repeatable results enable continual assessment without interrupting the training and competition cycle.

SwRI's markerless technology is the result of extensive research, development, and expertise in complex biomechanical modeling, machine learning, and sensor fusion techniques. By employing an athlete-specific biomechanical model, this markerless solution provides a level of accuracy that has previously been available only in the laboratory.

On-road analysis of rider biomechanics
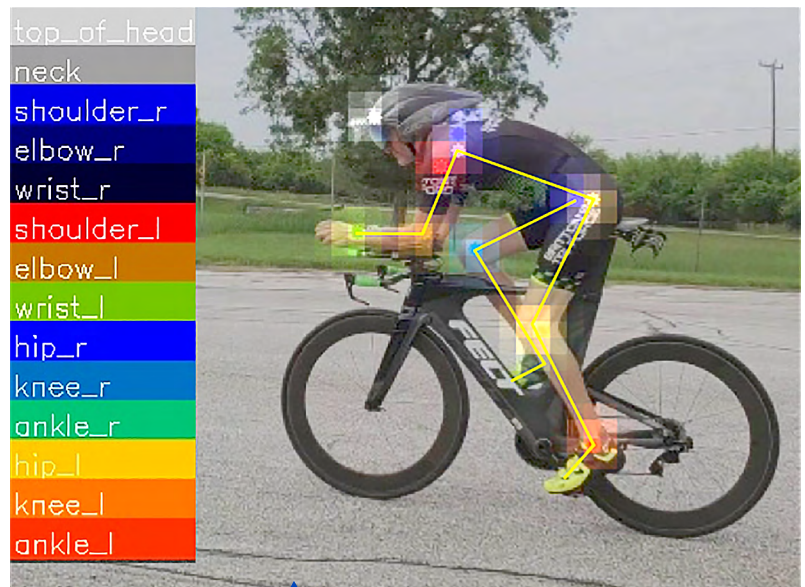
Biomechanics available during the ride

Advanced science. Applied technology.

Laboratory Biomechanics in the Field

Our robust solution highlights features such as:

- Can be mounted to team car
- Operable in adverse weather conditions
- Functions on the road, on a trainer, in a wind tunnel
- No proprietary hardware
- Commodity-based video cameras (cell phones, action cameras, etc.)
- Data saved in an open format for import to your workflow
- Extensible and customizable
- Interface with cycling computers and other sensors
- Customized to your complex needs and challenges

Applications

Examples of applications include:

- Optimal bike fitting to improve efficiency and performance
- On-road analysis of rider biomechanics vs. power output to improve efficiency and performance
- Custom high-fidelity biomechanically driven performance metrics
- Biomechanical modeling to optimize bike design

Commercial off-the-shelf hardware for easy deployment

We welcome your inquiries.
For more information, please contact:

Kase Saylor, PMP
Manager
Decision Technologies
210.522.3703
ksaylor@swri.org

Dan Nicolella, PhD
Institute Engineer
Musculoskeletal Biomechanics
210.522.3222
dnicolella@swri.org

hpi.swri.org

Benefiting government, industry and the public through innovative science and technology