During downhill skiing races, skiers reach phenomenal speeds and have to be able to control each turn. The forces and vibrations that skiers undergo during races increase the risk of lower back injury and pain in particular. EPFL’s Laboratory of Movement Analysis and Measurement (LMAM) measures skiers’ movements in order to link them to other risk factors such as equipment, the race route and snow conditions. The measurement algorithm and system developed by LMAM can determine the exact position of the skier and give a better biomechanical understanding of the risks to which the athlete is exposed. The challenge of this project lies in the difficulty of making precise measurements, given the speed that skiers reach on the slope.

For this project, the laboratory uses information from various sources such as inertial sensors and the global navigation satellite system (GNSS). The algorithm is used to reconstruct the angles of athletes’ joints, the exact position of their body, and their trajectory and speed throughout the race. By applying the system and algorithm across a large number of athletes and in various races and snow conditions, the laboratory has achieved a better understanding of the factors that cause injury.