

## **Orientation Estimation for Instrumented Helmet Using Neural Networks**

A head orientation estimation solution is presented in this work. The proposed solution utilizes instrumented helmets that incorporate inertial measurement units (IMU), and the collected measurements are processed by an orientation estimation algorithm to compensate for bias and noise in the orientation measurements. The structure of the proposed dynamic estimation algorithm is motivated by complementary filters, and introduces a Convolutional Neural Network (CNN) model that is trained to capture a wide range of human head motion profiles. Experimental evaluation of the proposed head orientation estimation solution is presented in this work, and the obtained results are compared to both learning and non-learning-based solutions found in the literature. Test results demonstrate the potential advantages of the proposed CNN based solution for motion profiles with high acceleration disturbance that are characteristic of head motion.