Pianists who practice hours per day may have a risk for developing playing-related musculoskeletal injuries if they do not play with proper hand alignment. In order to detect the harmful, misaligned hand postures (such as wrist flexion and extension, knuckle collapse, and ulnar and radial deviation) and analyze the injury risk, a motion capture and analysis system was developed using the Microsoft Kinect depth camera. Data were captured on 15 subjects including both professional pianists and student pianists from the School of Music, University of Missouri. This system calculates features to measure the degree of the misalignment of the subjects. Machine learning methods were applied to train the dataset in order to detect the misaligned hand postures. The result shows that this research work makes it possible for pianists to have an affordable, portable and markerless screening tool to get objective hand posture assessment to help prevent play-related injury.