

*Abstract— This study explores an advanced approach to multi-object tracking in surveillance systems by employing the Extended Kalman Filter (EKF) and Aggregate Channel Features (ACF) detection. Our research addresses challenges inherent in real-time object tracking, such as occlusions and complex trajectories, with an EKF-based solution that offers enhanced tracking precision and continuity. By integrating ACF detection, we improve initial object detection speed and accuracy, thereby facilitating more reliable tracking initialization. We tested this approach on diverse datasets—each representing varied environmental conditions—to assess performance across metrics including Multiple Object Tracking Accuracy (MOTA), Multiple Object Tracking Precision (MOTP), precision, and recall. The results demonstrate that while the EKF-ACF framework achieves high spatial accuracy and precision, it also encounters limitations in minimizing missed detections in crowded scenes. This study underscores the utility of the EKF-ACF approach in surveillance applications, especially in scenarios demanding real-time, high-precision tracking of dynamic objects.*

*Keywords—Extended Kalman Filter (EKF), Object Tracking, MultiObject Tracking, ACF Detection, Pedestrian.*