WiFi Sensors Meet Visual Tracking For An Accurate Positioning System

Savvas Papaioannou, Hongkai Wen, Zhuoling Xiao, Andrew Markham and Niki Trigoni
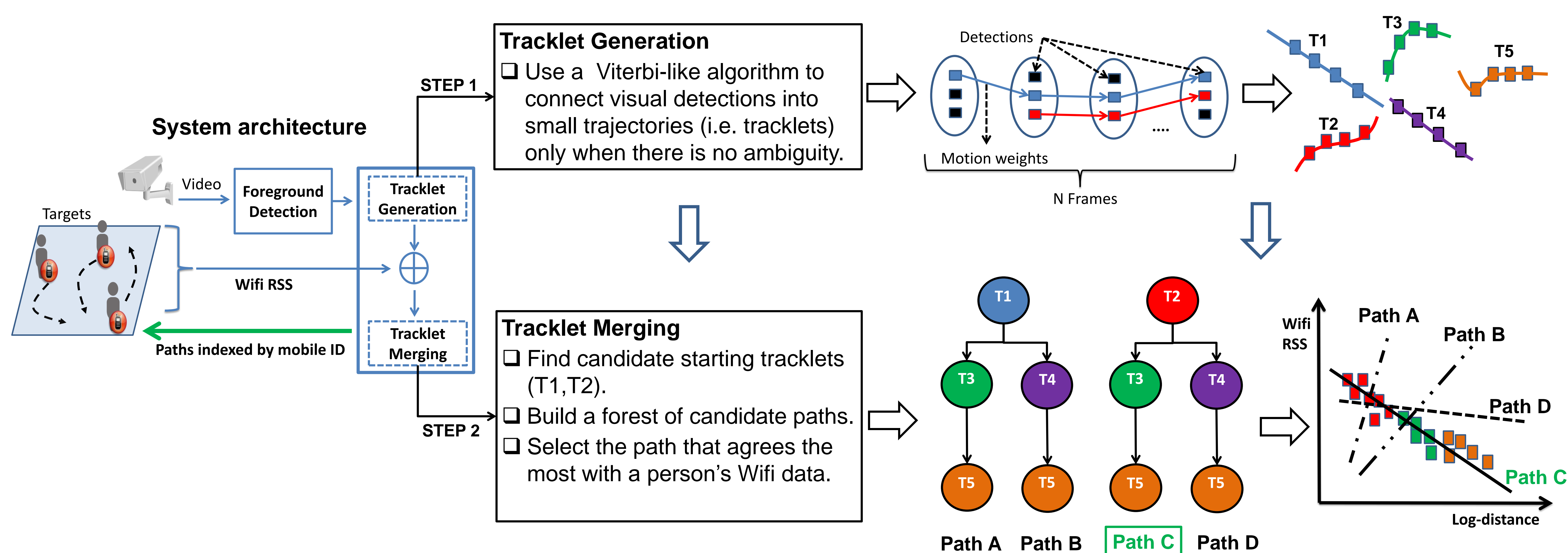
University of Oxford
firstname.lastname@cs.ox.ac.uk

Motivation

❑ Nowadays an increasing number of indoor spaces are equipped with surveillance cameras and Wifi access points.

❑ Visual tracking is an appealing approach for accurate localization.

❑ However, it lacks strong identification accuracy.

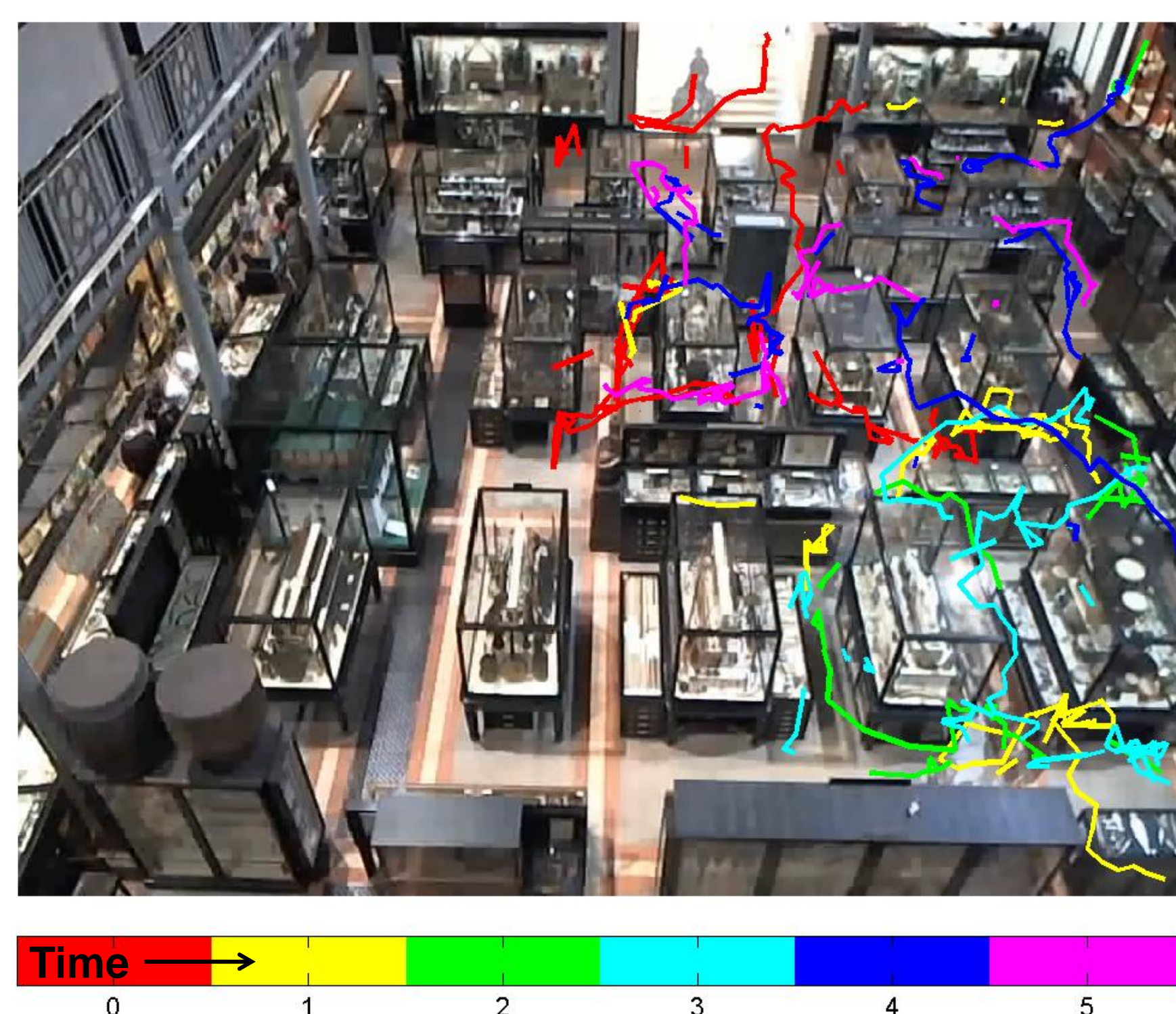❑ Tracking performance decreases in many cases due to uninformative appearance features, complex human motion, etc.

Main Objectives

❑ Provide visual tracking with strong Wifi identification.
❑ Improve visual tracking in complex scenarios:
 - Uninformative appearance features.
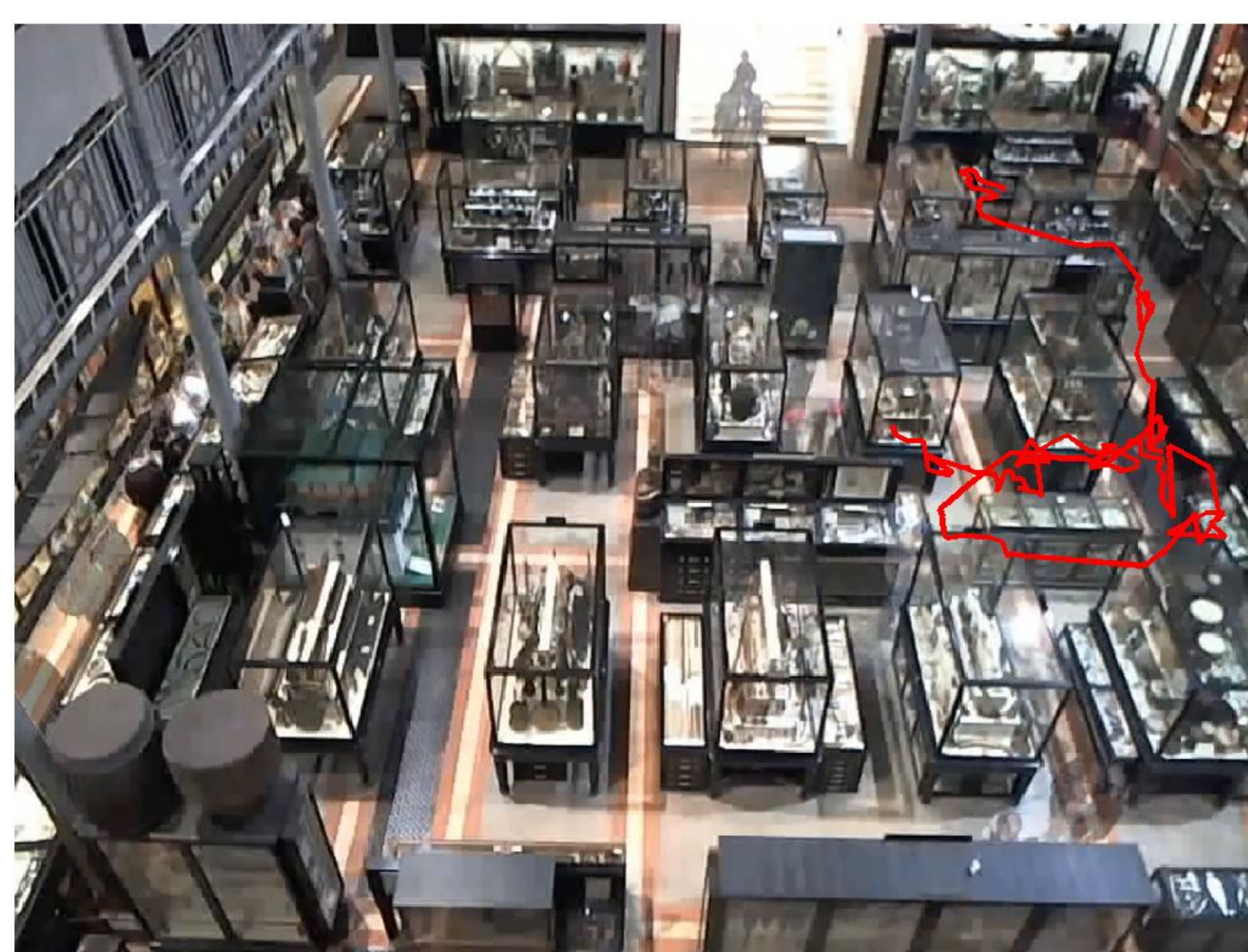 - Complex human motion.
 - Long term occlusions.

Proposed Approach

System architecture

Tracklet Generation
❑ Use a Viterbi-like algorithm to connect visual detections into small trajectories (i.e. tracklets) only when there is no ambiguity.

Tracklet Merging
❑ Find candidate starting tracklets (T1,T2).
❑ Build a forest of candidate paths.
❑ Select the path that agrees the most with a person's Wifi data.

Preliminary Results

Tracklet Generation.

Tracklet Merging: The most likely path (tracklet combination) given a person's Wifi data.

Person's ground truth trajectory.

Summary

❑ The proposed positioning system integrates Wifi sensing with visual tracking.

❑ The key novelty is that it uses Wifi measurements to identify visual trajectories and resolve ambiguities due to occlusions, missing detections and poor appearance features.

❑ A testbed has been deployed at the Pitt Rivers museum in Oxford.

❑ Preliminary results on real world data show that the proposed approach is able to uniquely identify and accurately track a person under long term occlusions and without requiring the use of appearance features.