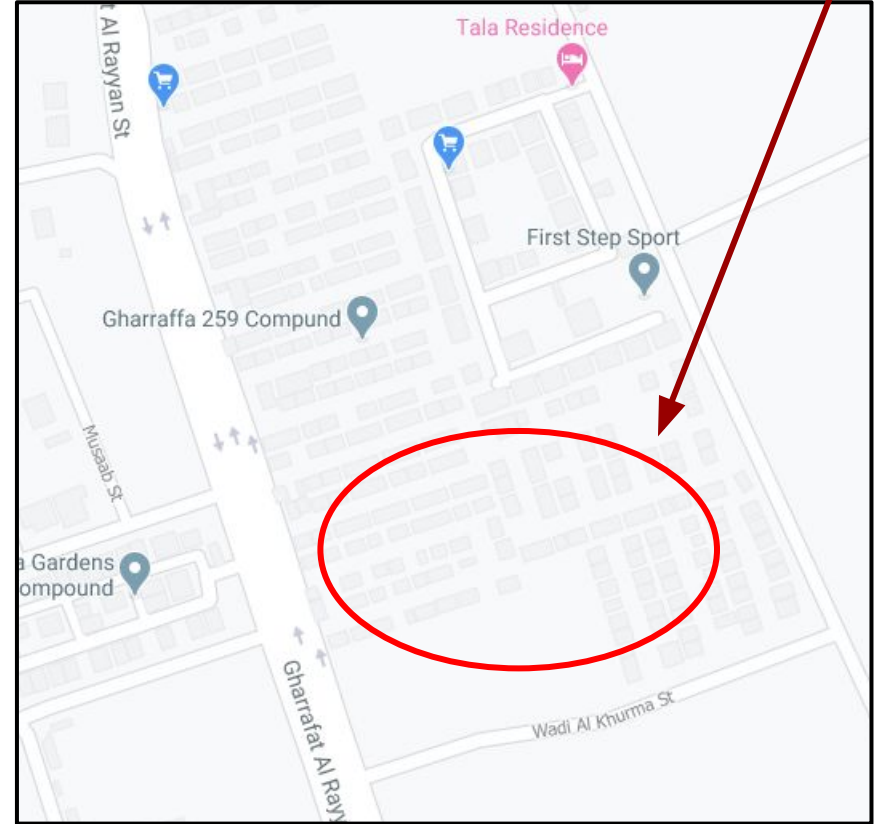


# Updating Street Maps using Changes Detected in Satellite Imagery

Favyen Bastani, Songtao He, Satvat Jagwani, Mohammad Alizadeh,  
Hari Balakrishnan, Sanjay Chawla, Sam Madden, Mohammad Amin Sadeghi

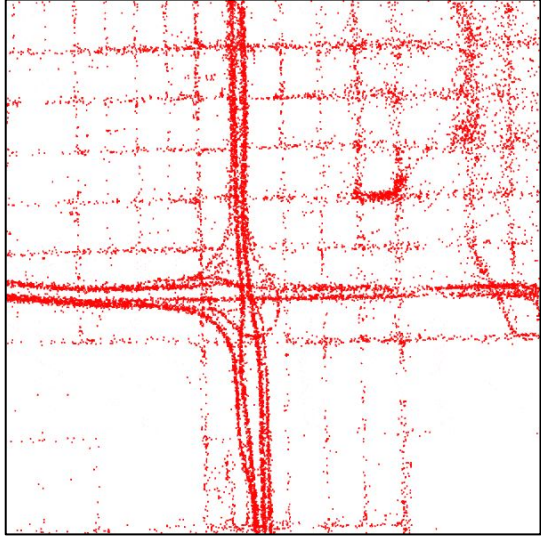
# Maintaining Digital Maps is Tedious and Costly

**Missing Roads**



Snapshot from Google Maps in Doha, Qatar (20 March 2020).

# Much work explores using GPS and imagery data in automated solutions

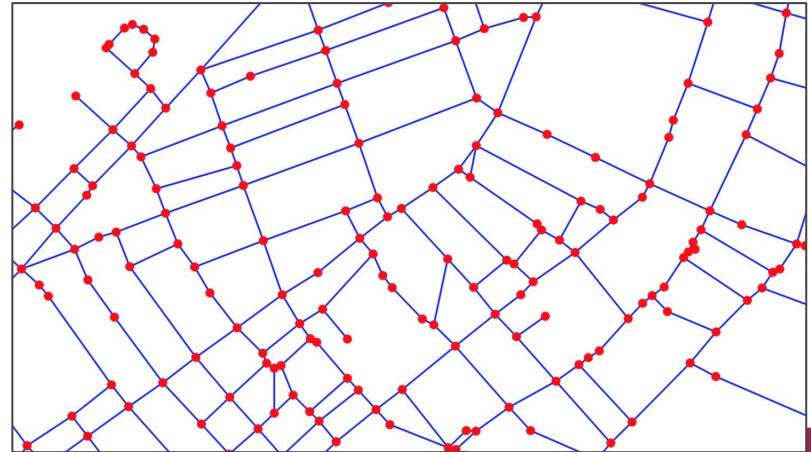


Challenges include occlusion of roads by shadows and trees



# Prior Work: Map Extraction

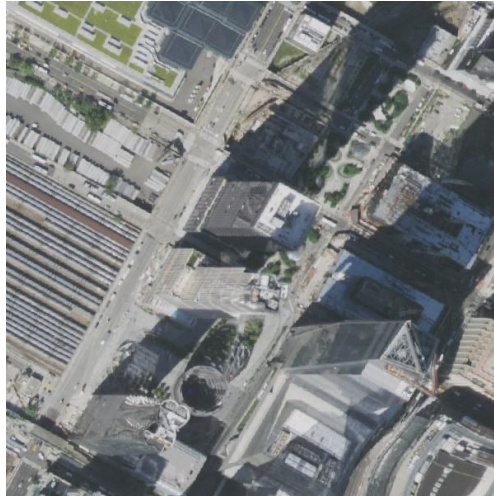
- Prior work tackles extracting road networks from imagery
- But this is not directly useful for keeping **existing maps** up-to-date



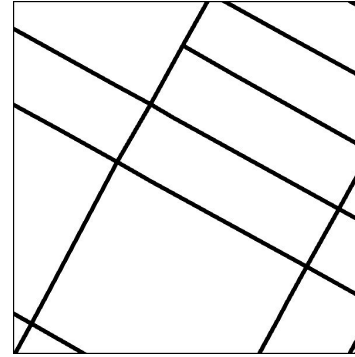
# In practice, want to keep existing maps up-to-date!



2012



2019



Existing Map



Can we automatically  
update the map?

# Extend Map Extraction Methods for Map Update through Fusing?



2012



2019



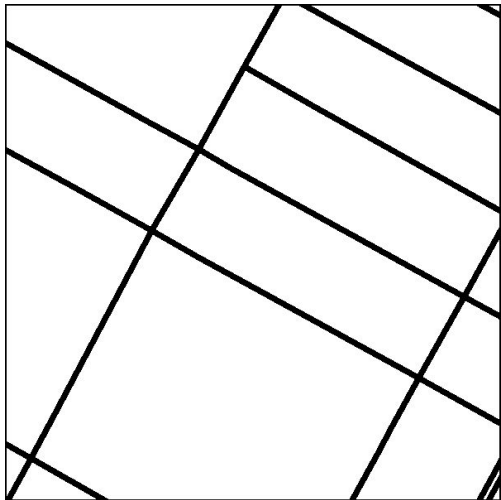
Inferred Map



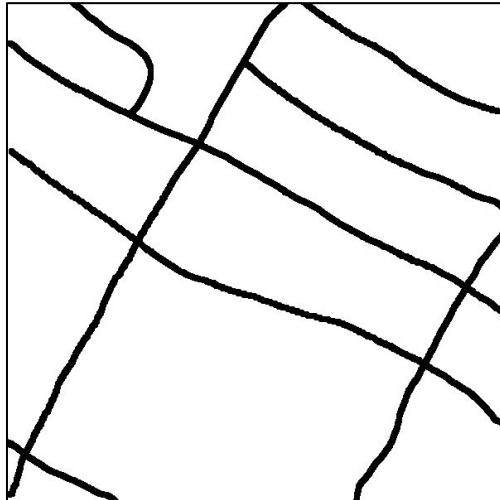
Existing Map



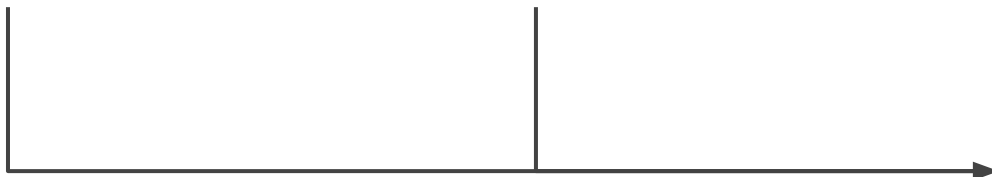
Fused Map



Existing Map



Inferred Map



Fusing:

- Most inferred roads are correct
- But, of the detected roads that were not already present in the map, most are false positives!





Old Image

New Image

Runway



Walkway



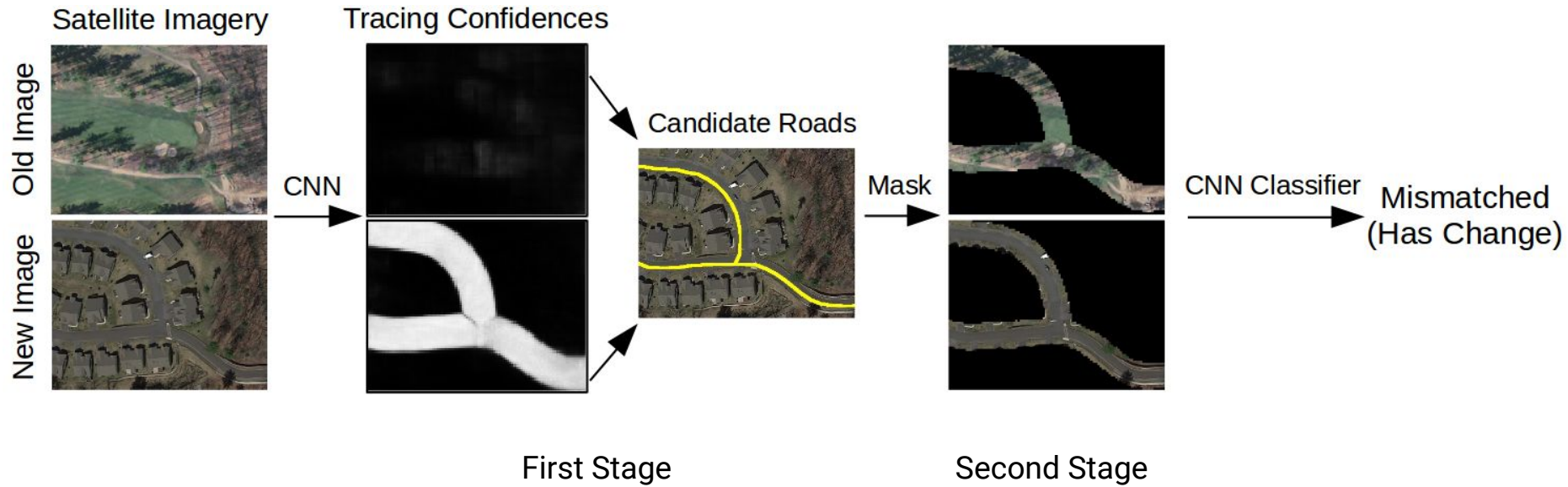
Railway

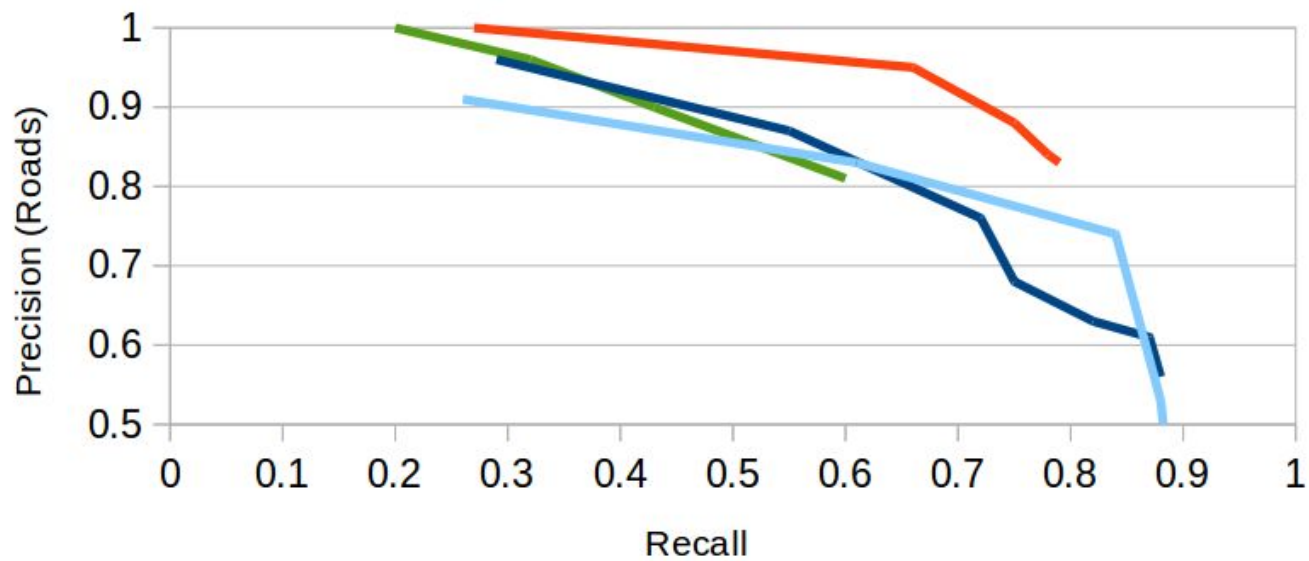


Crop Field









DeepRoadMapper RoadTracer++  
UnstructChange Cmp+Filter (Ours)





# Conclusion

- In practice, we need to update existing maps, not merely detect roads
- Our method automatically keeps maps up-to-date by leveraging the progression of satellite imagery over time
- At 50% recall, it reduces error rates four-fold, from 12% to 3%

For code/data, see our project webpage:

<https://favyen.com/mapupdate/>

