

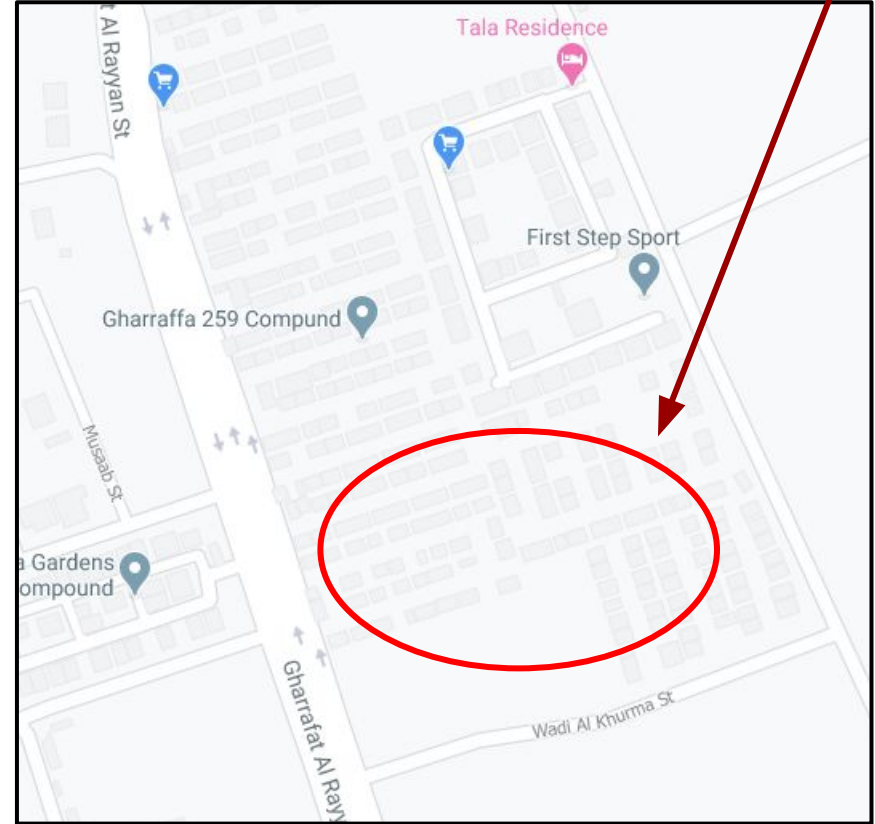


# Beyond Road Extraction: A Dataset for Map Update using Aerial Images

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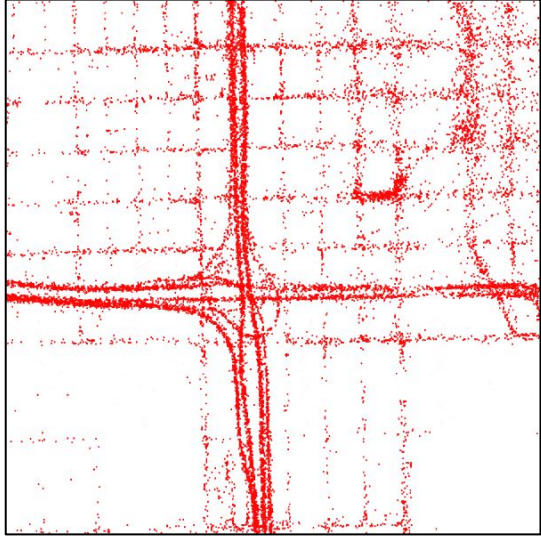
# Maintaining Digital Maps is Tedious and Costly

**Missing Roads**



Snapshot from Google Maps, 20 March 2020.

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

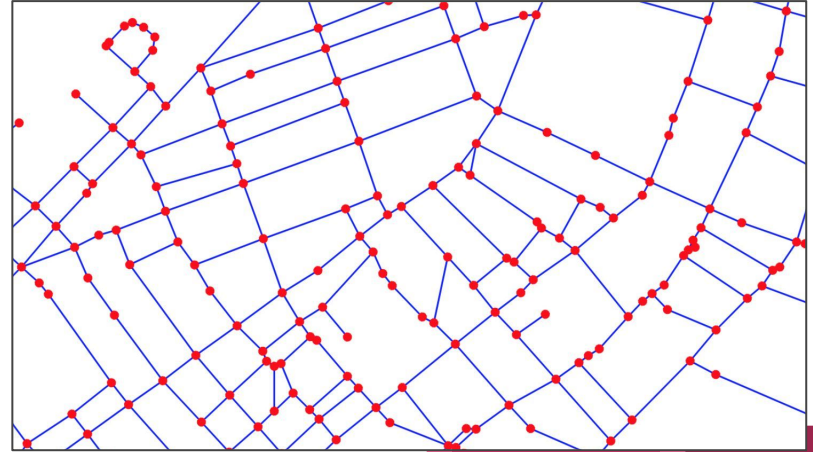


Challenges include occlusion of roads by shadows and trees



# Prior Work: Map Extraction

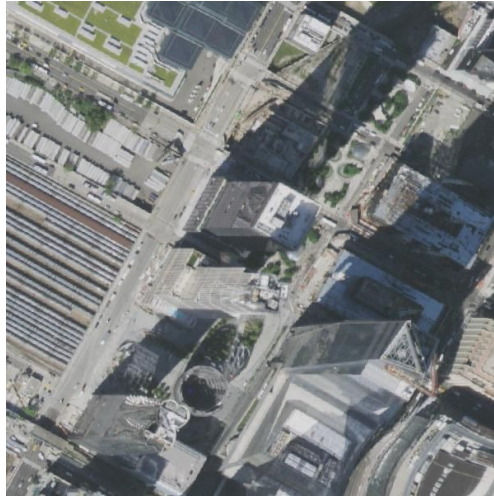
- Prior work tackles extracting road networks from imagery
- But this is not directly useful for keeping **existing maps** up-to-date



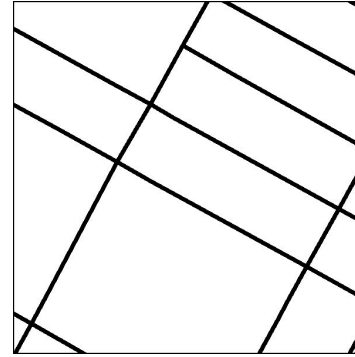
# In practice, want to keep existing maps up-to-date!



2012



2019



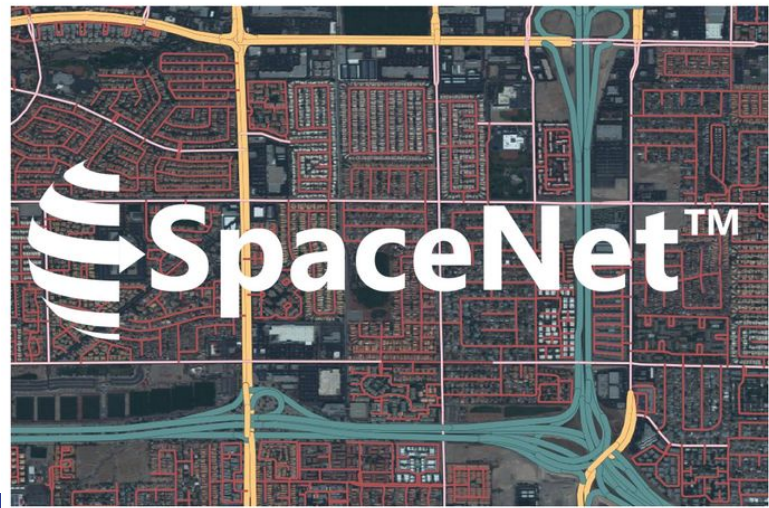
Existing Map



Can we automatically  
update the map?

# Existing datasets focus on map extraction

## Introducing the SpaceNet Road Detection and Routing Challenge and Dataset



## DeepGlobe 2018: A Challenge to Parse the Earth through Satellite Images



Figure 1: **DeepGlobe Challenges:** Example road extraction, building detection, and land cover classification training images superimposed on corresponding satellite images.



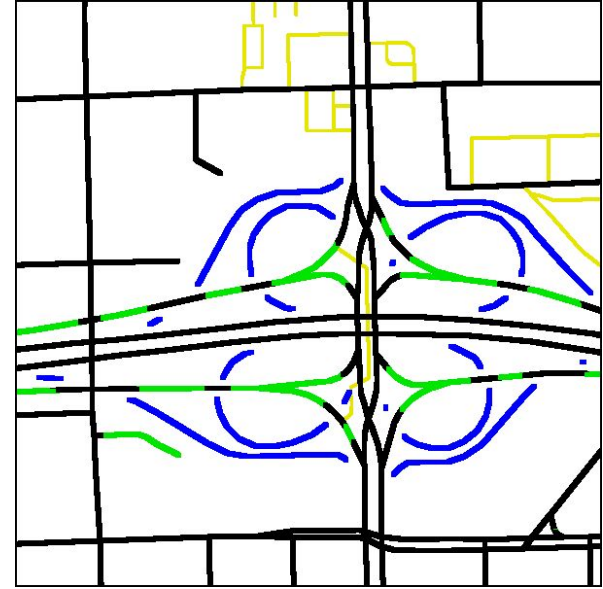
# Updating maps introduces new challenges



2012



2019



Updates

- Added roads
- Deleted roads

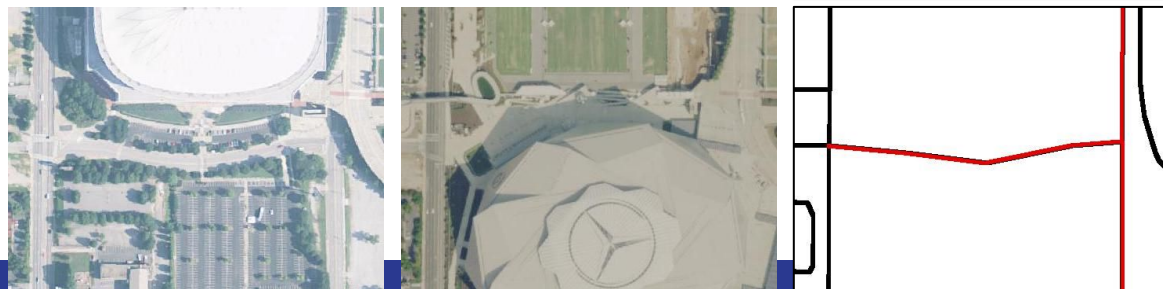
# MUNO21: A Dataset and Benchmark for Map Update

- Includes road network and imagery timeseries data spanning 8 years and 21 cities
- 1,294 map update scenarios:
  - A method inputs an outdated map + aerial image time series
  - Should update the map to reflect roads in most recent image

An example scenario



Another example





## Evaluation: Extend Map Extraction Methods for Map Update through Fusing



2012



2019



Inferred Map

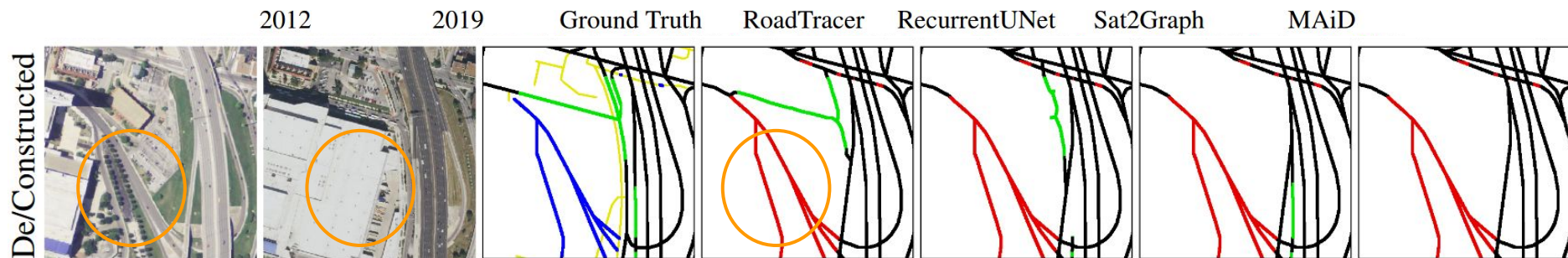


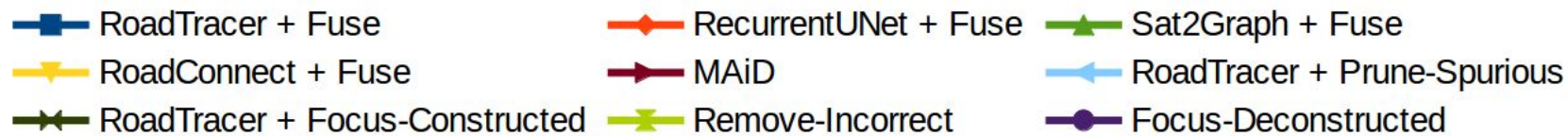
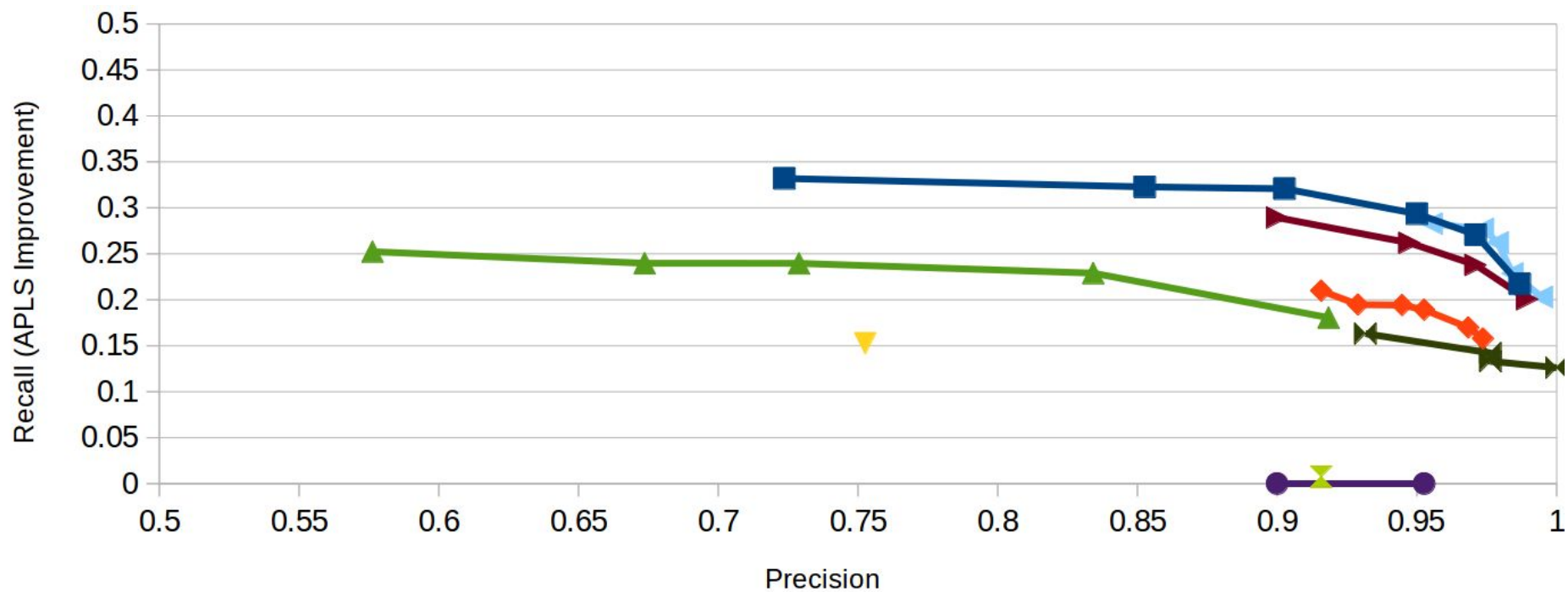
Existing Map



Fused Map

Fusing is very limited, e.g., can't handle deleting removed roads:







# Conclusion

- Our hope is that MUNO21 will spur research on the map update task
- Code and dataset: <https://favyen.com/muno21/>

