Hacking for Human Rights: Team Presentation

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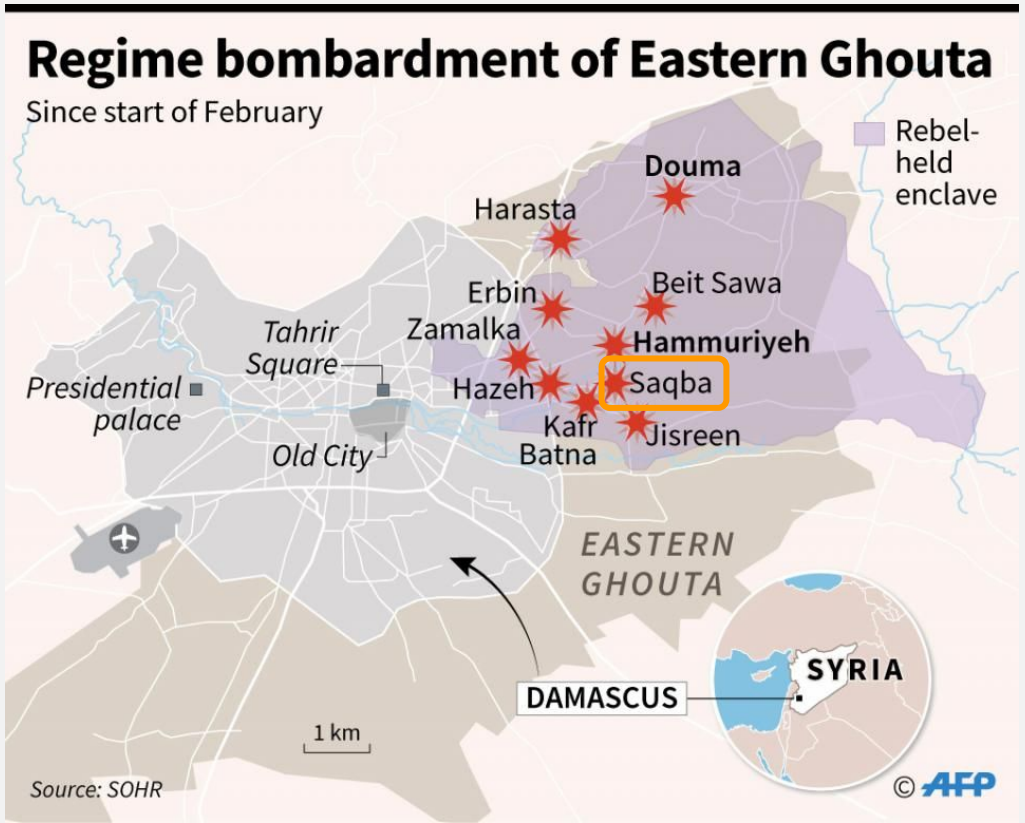
Background

- Syrian War (2011-present) from Arab Spring protests
- UN estimated 13.5m displaced persons, 2.6m are children
  - Disappeared, Child Labour, Abused

- Eastern Ghouta Attack
  - Near Damascus
  - 5 year long siege on rebel areas
    - (April 2013-April 2018)
  - Almost 100k displaced overall
  - 3,853 buildings were destroyed, 5,141 severely damaged and 3,547 moderately damaged in the western parts of the enclave
  - One such airstrike on April 04, 2017



What did you do?

- Took GIS data from before (March 27, 2017) and after the airstrike (April 26, 2017)
  - Similar weather conditions, same time of day
- PyQt5 library generated satellite images
- CV2 library calculated edges in images
- Difference in edges used as indicator of destruction in an area.

Satellite Images

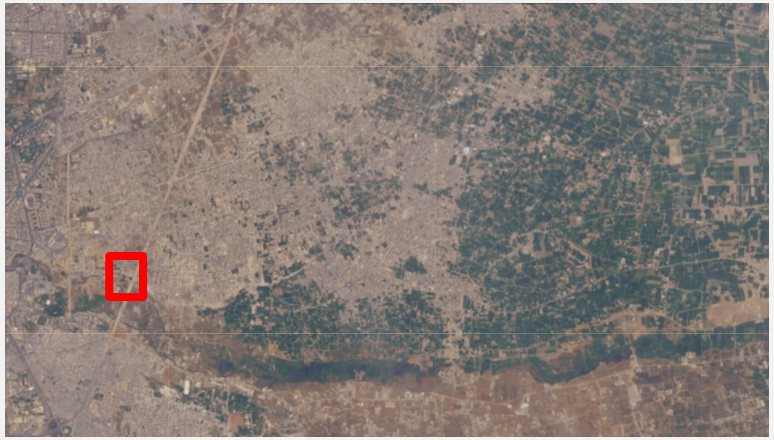
Before: March 27th, 2017

After: April 26th, 2017

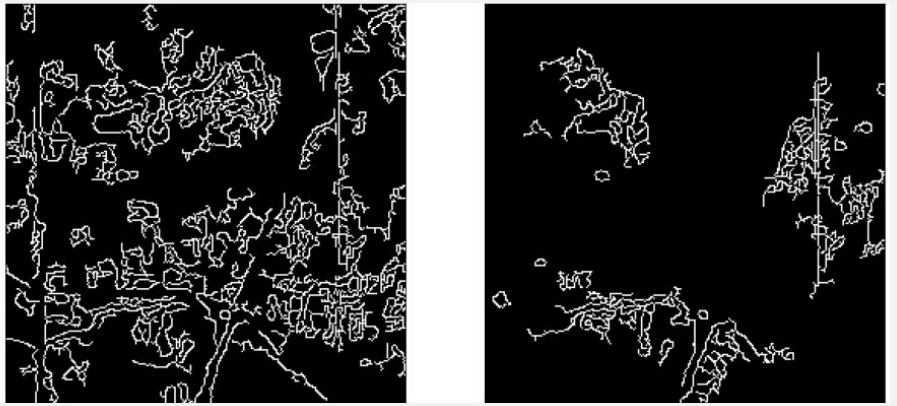
Approach

- Randomly sample 256 x 256 pixel sub-images from satellite image
- Manually grade infrastructure damage
  - 0-5
  - Clouds
  - Natural
  - Skip
- Output to Excel before and after event
  - Features
    - Determinant
    - Eigenvalues
    - Average pixel change
    - Average red pixel change
    - Average blue pixel change
    - Average green pixel change
    - Edge count change
  - Output
    - Damage grade

Before



After



What challenges did you face?

- Most of our group members struggled in some way with getting the packages loaded and working on our devices
- Narrowing down scope was also difficult
- Inexperience with image analysis
- Artifacts in images create noise in our analysis

How would you take this work forward?

- Apply Machine Learning models to output Excel file
  - Features: RGB avg. pixel change, edge count change
- Adding additional features
  - Average edge length difference
- Improving data generation
  - Higher resolution images
    - Specify criteria for infrastructure damage
  - Satellite image edge lines
- Incorporate the xBD dataset

References and Acknowledgments

- A Dataset for Assessing Building Damage from Satellite Imagery https://arxiv.org/abs/1911.09296v1
- https://www.thedailystar.net/world/bombing-kills-94-eastern-ghouta-day-syrian-observatory-1537435
- https://www.cfr.org/global-conflict-tracker/conflict/civil-war-syria

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