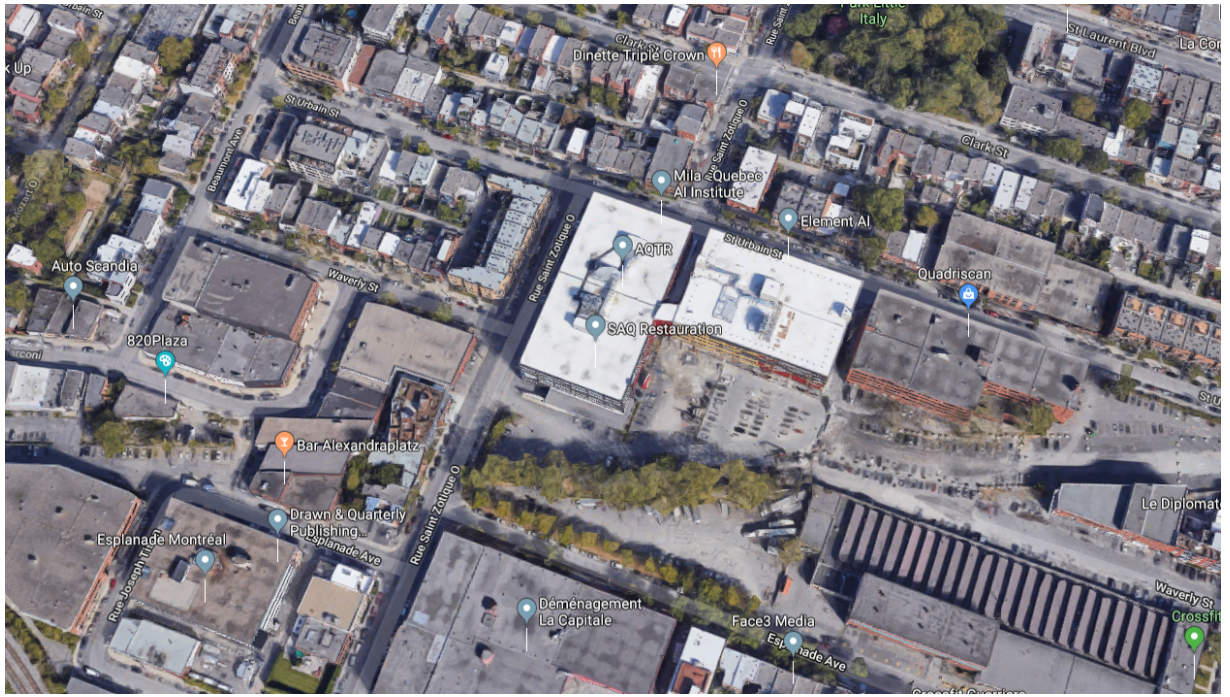

AIIA
MAIEI
Montreal NewTech
CONCORDAI
NEBULA AI
SEPTEMBER 13-15
CLIMATE CHANGE
AI HACKATHON
help make a difference
Building Inventory Attribute extraction

Building Inventory Challenge

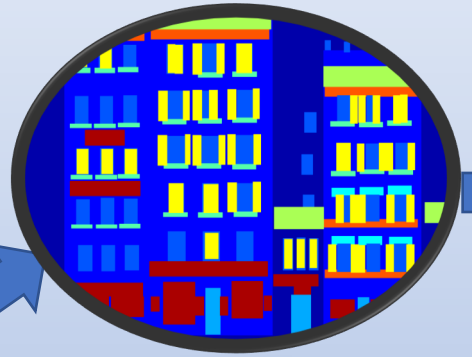
- **Example building attributes:**
  - Floor area
  - Building type
  - Construction date
  - Facade type
  - Replacement cost
  - Number of stories
  - Height
  - Window-to-wall ratio



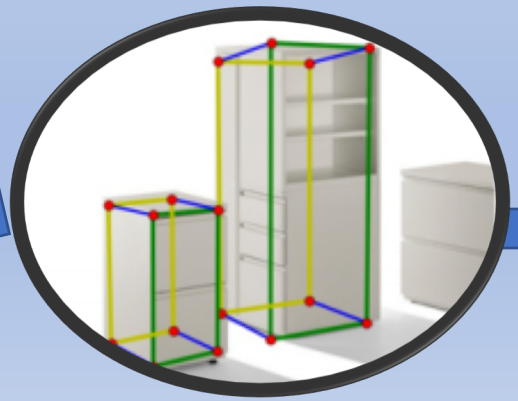
Pipeline

Latitude &
Longitude

Google Street
view images



Number of windows
Number of floors
Ratio of windows to Facade



Building height

Facade Parsing System

Facade Parsing System

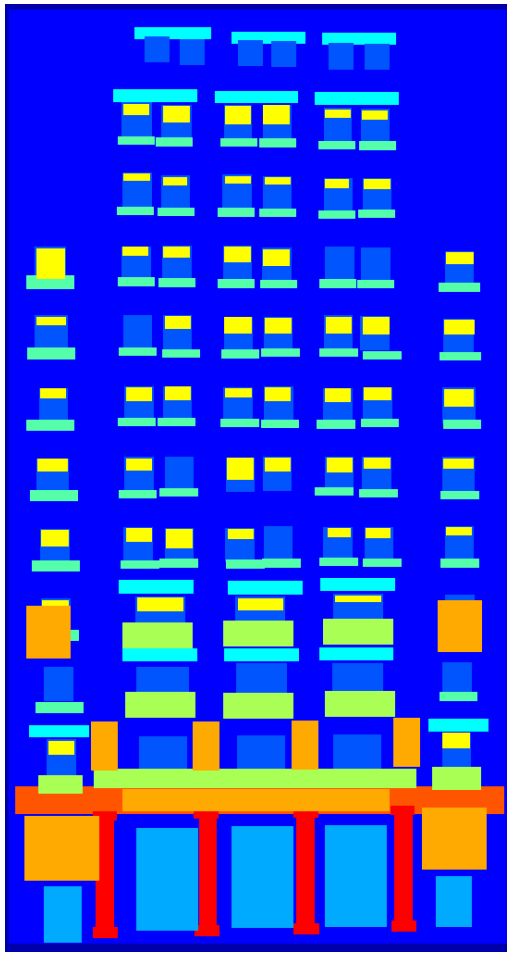
- Goals:
  - Number of floors
  - Ratio of window to wall
- Challenges:
  - Finding a dataset
  - Train the model

Facade Parsing System

- **CMP Facade Database:**

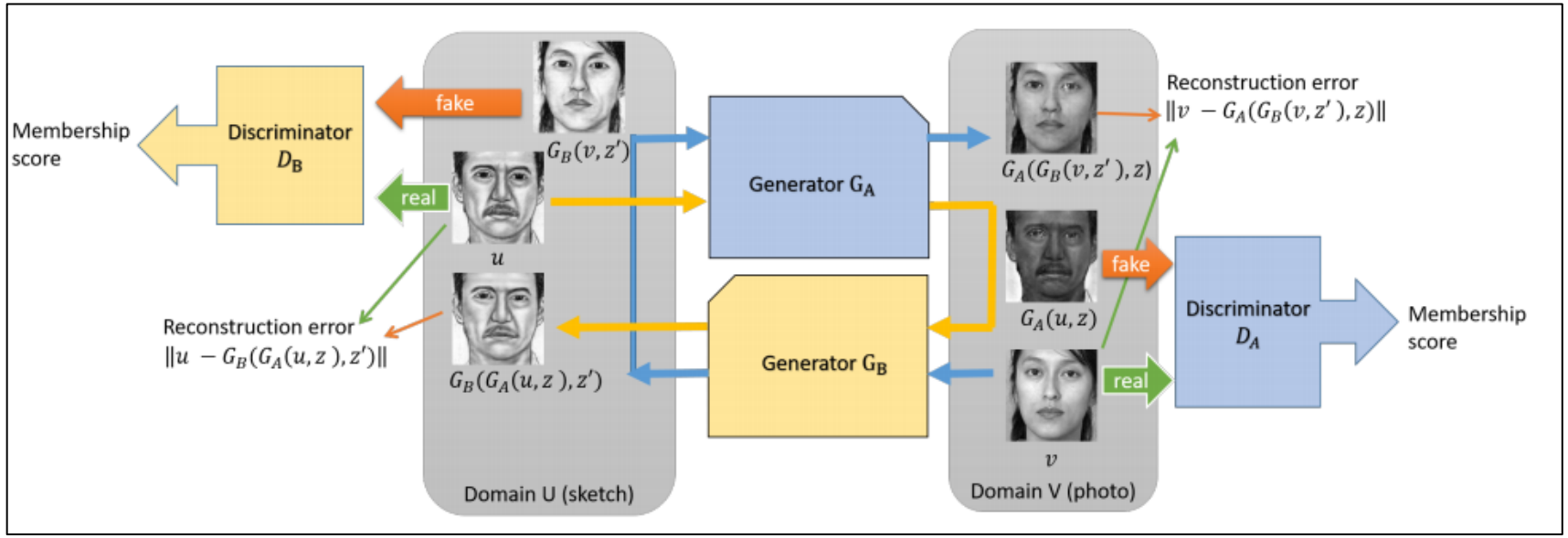
Dataset of facade images assembled at the Center for Machine Perception. Total 12 classes are annotated in this data set.

- http://cmp.felk.cvut.cz/~tylecr1/facade/
- Train: 400 images
- Validation: 100 images
- Test: 100 images



Facade Parsing System

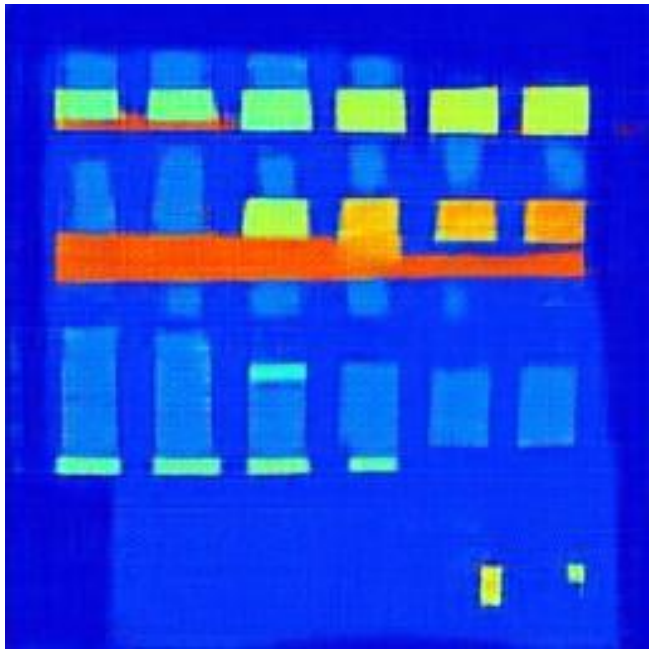
- DualGAN: Unsupervised Dual Learning for Image-to-Image Translation by Zili Yi, Hao Zhang, Ping Tan, Minglun Gong, 2018



Network architecture and data flow chart of DualGAN for image-to-image translation

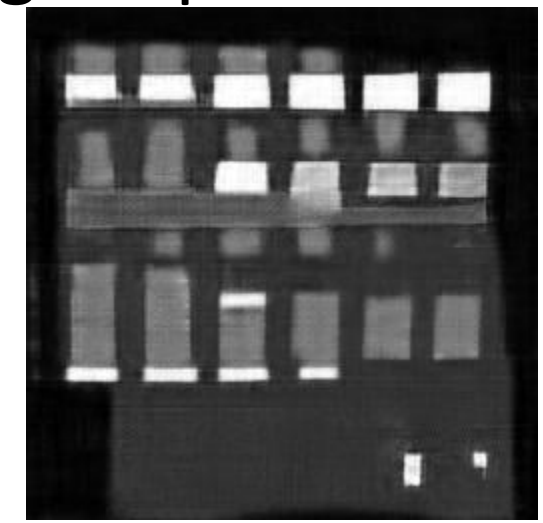
Facade Parsing System

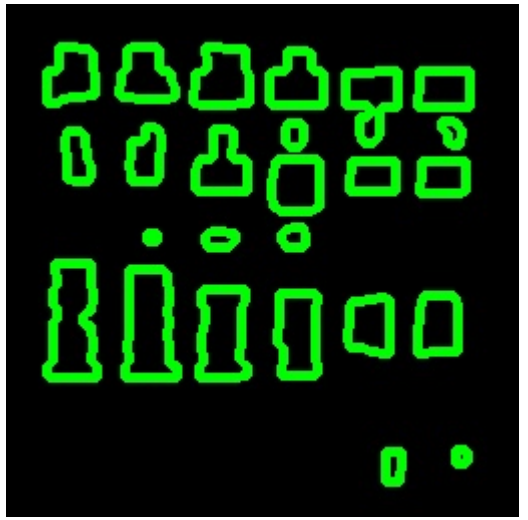
- Train system on 7 hours using NBAI cloud platform
- Gpu: GetForce GTX 1070
- System output



Facade Parsing System

- Post processing of the segmentation mask will give us number of windows and dimensions of each window
- From the location of windows we can extract the number of floors and ratio of window to walls
- Post processing output:

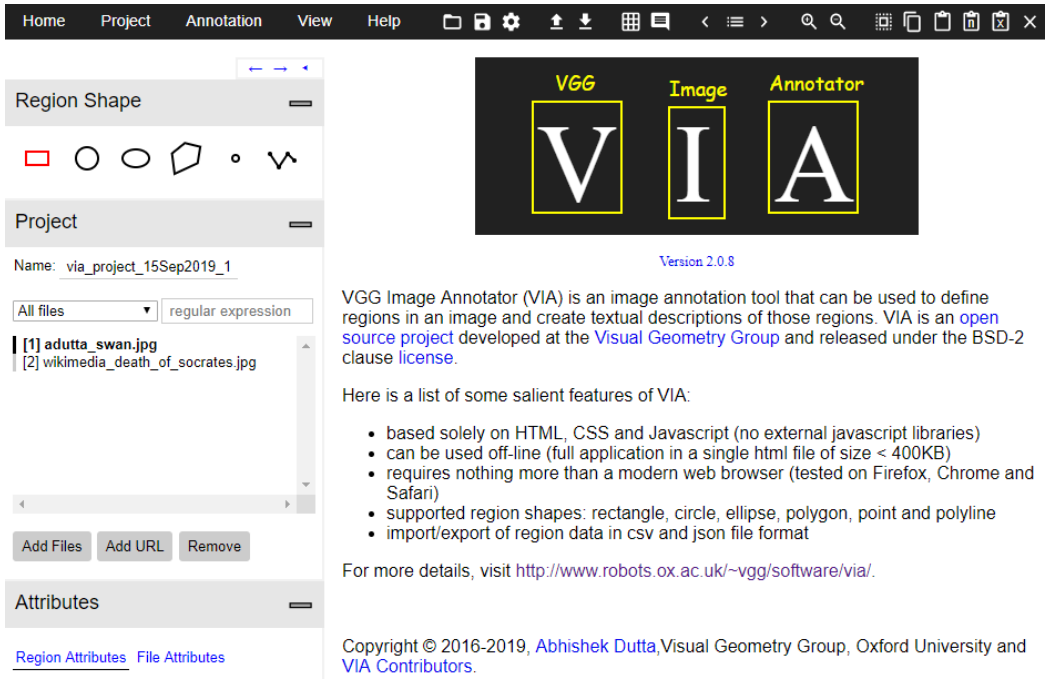


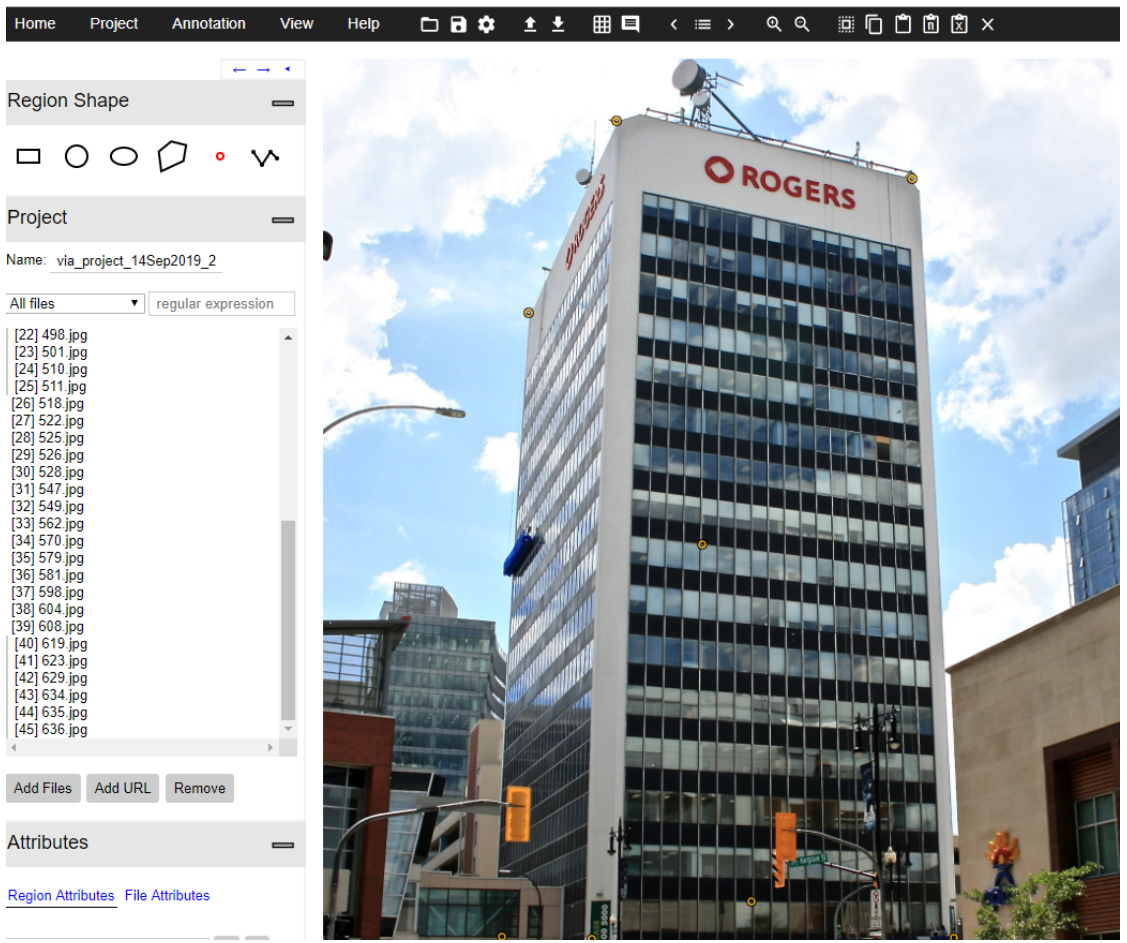
Building Height Detection System

Building Height Detection System

- Goals:
  - Precisely estimate the height of building
- Challenges:
  - Input to the models – Google Street View Images, Pipeline for floor data of buildings from Microsoft Data
  - Update the models progressively with more data

Building Height Detection System





- 400 google Montreal images

Building Height Detection System

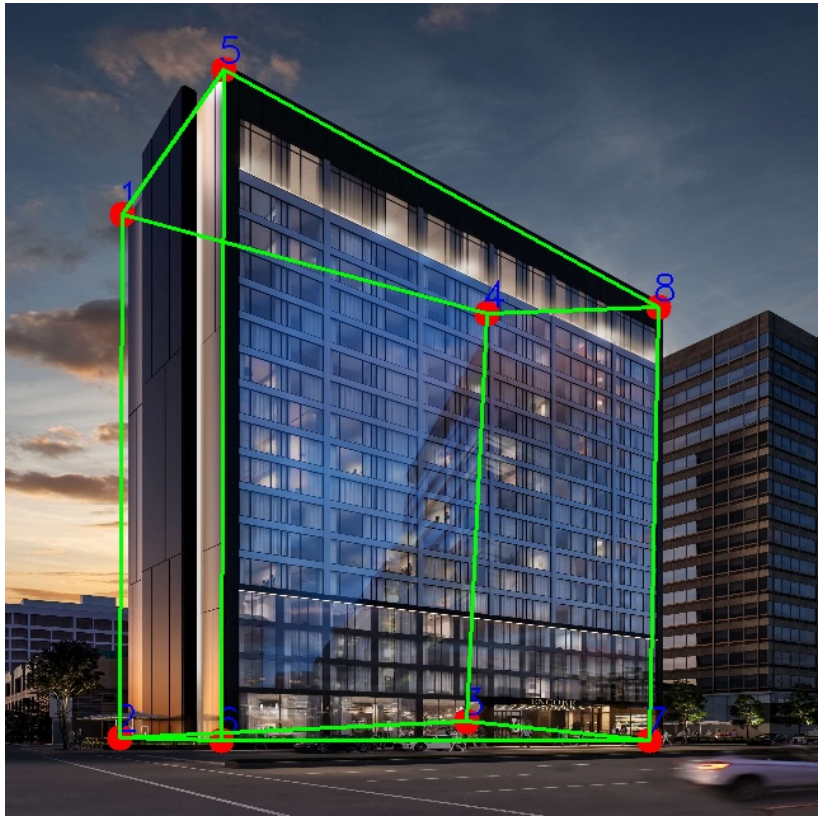
- **Implementation of the code is done in DLIB (One Millisecond Face Alignment with an Ensemble of Regression Trees)** by Vahid Kazemi and Josephine Sullivan, CVPR 2014
- 3D point cloud estimation of Landmark Points on Buildings like 68 Landmarks on Face.
- We use an ensemble of randomized regression trees to detect 8 corners of a building

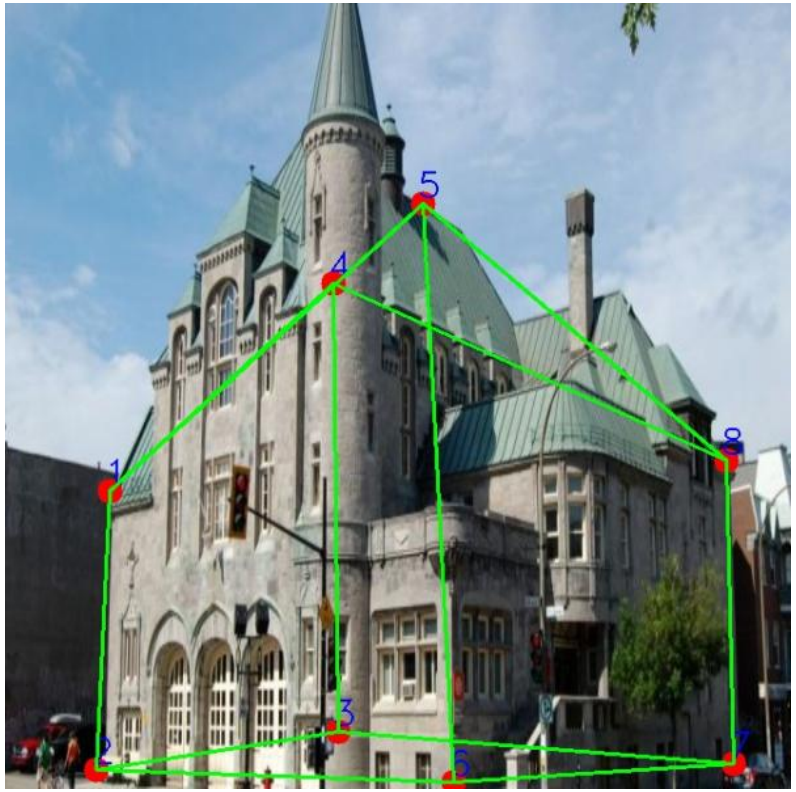
- Idea:

  Through 3D projection of cuboids on 2D images of street view of buildings we can extract the height of the building

Building Height Detection System

- System Output





Building Height Detection System

- Post processing of the points will give us the height of the building
- By floor data information from MS database we can get length and width of the floor

- [x1,y1,x2,y2….x8,y8,LengthBuilding,WidthBuilding] -> regression model -> HeightBuilding

- Train a regression model on the 8 points and the floor dimensions we can extract height

- Questions?