



MAIEI



AI LAUNCHPAD

CONCORDAI

A NEBULA AI

SEPTEMBER 13-15

# CLIMATE CHANGE AI HACKTHON

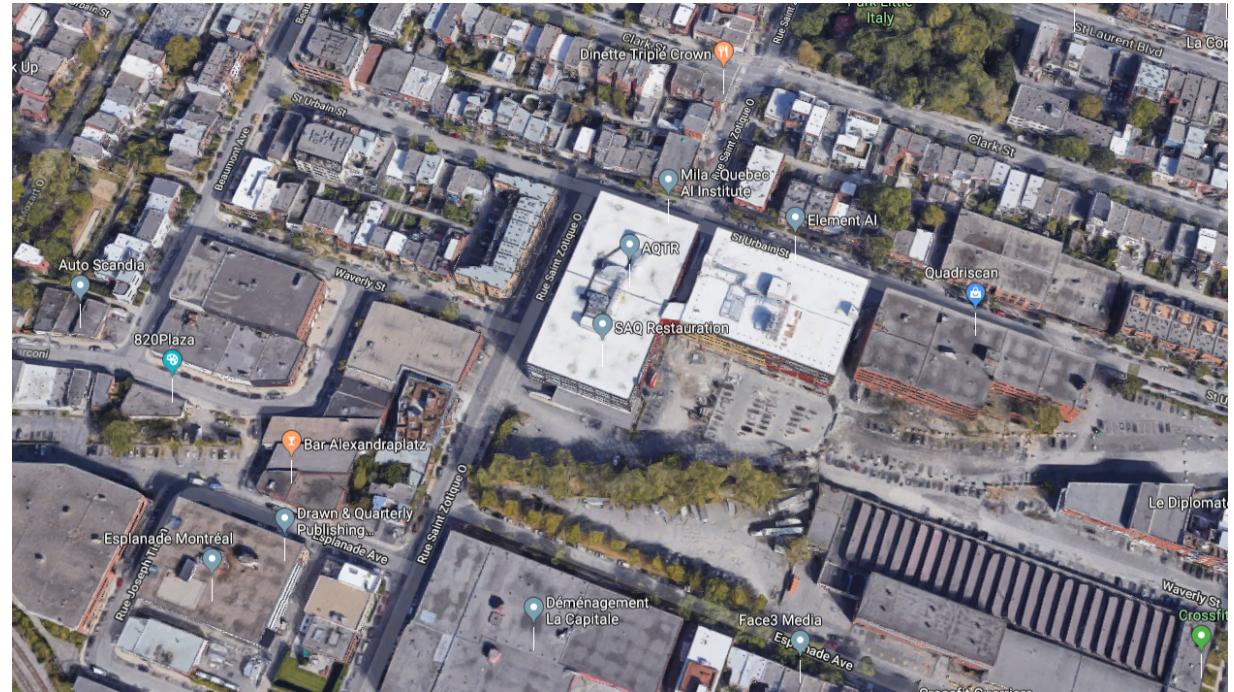
help make a difference

**Building Inventory Attribute extraction**

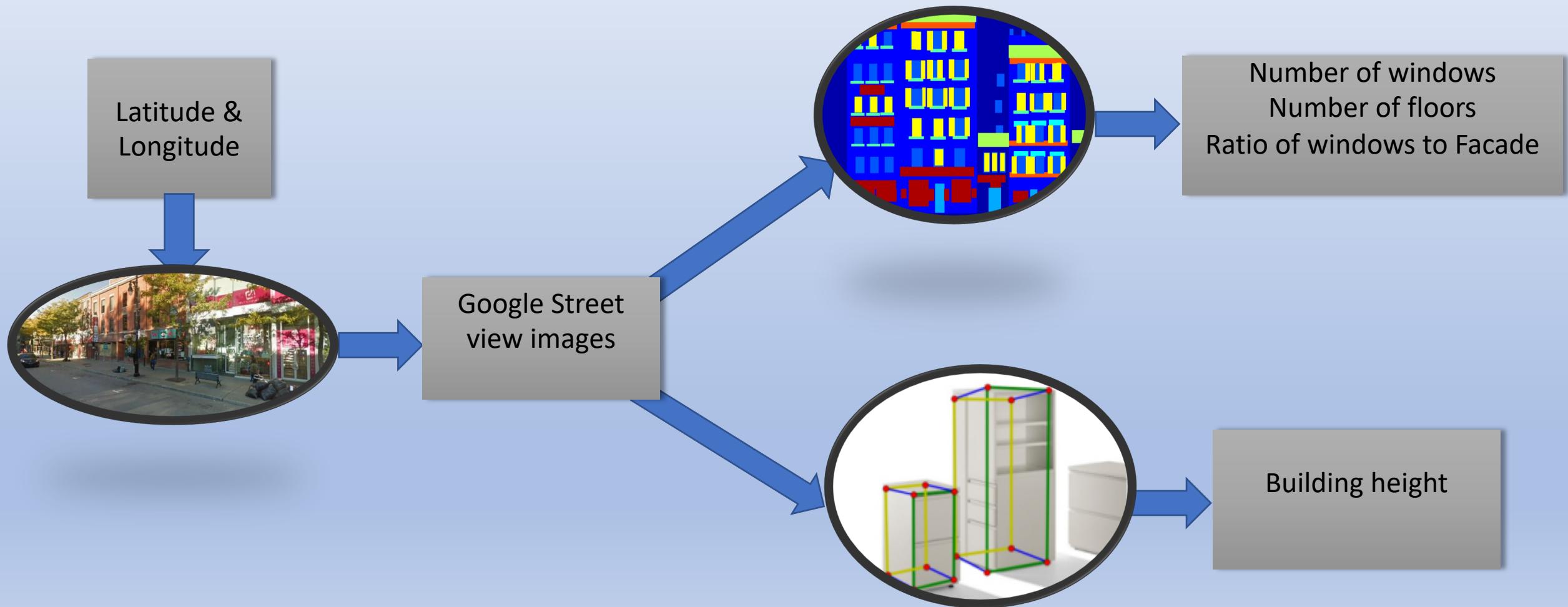
# **Building Inventory Challenge**

- # • Example building attributes:

- Floor area
  - Building type
  - Construction date
  - Facade type
  - Replacement cost
  - Number of stories
  - Height
  - Window-to-wall ratio



# Pipeline



# **Facade Parsing System**

# **Facade Parsing System**

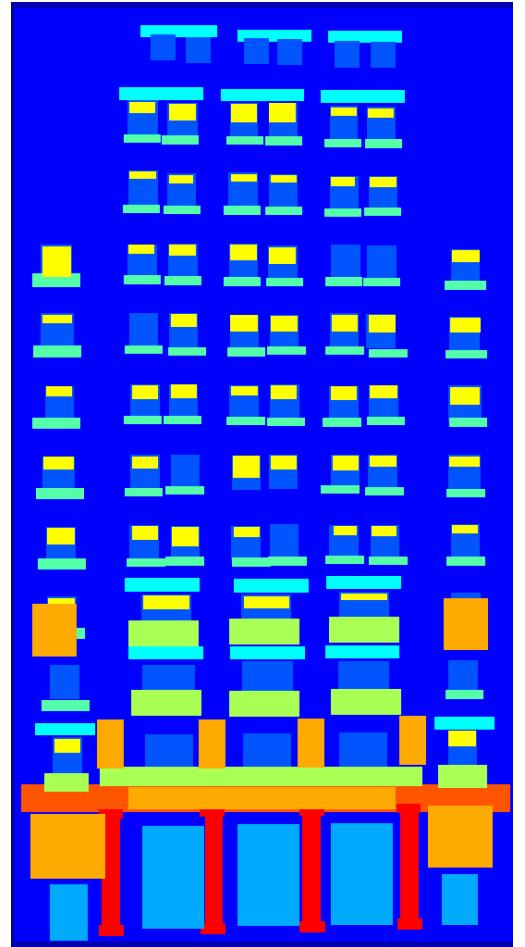
- Goals:
  - Number of floors
  - Ratio of window to wall
- Challenges:
  - Finding a dataset
  - Train the model

# Facade Parsing System

- **CMP Facade Database:**

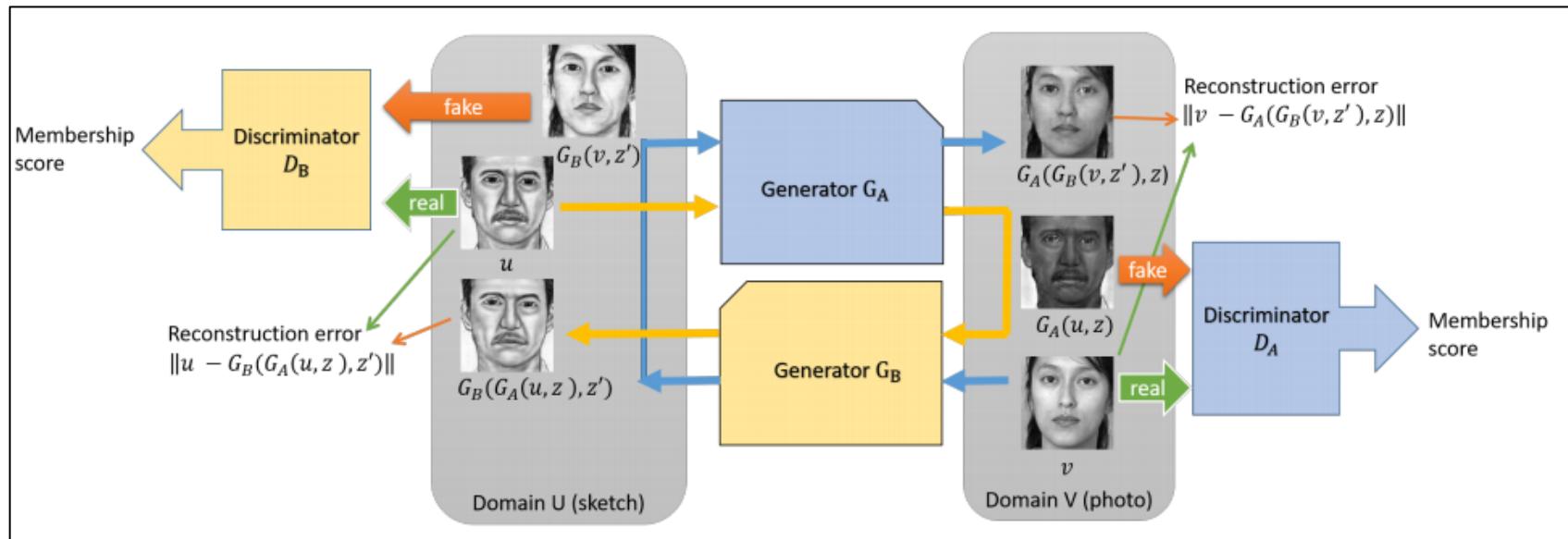
Dataset of facade images assembled at the Center for Machine Perception. Total 12 classes are annotated in this data set.

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



# Facade Parsing System

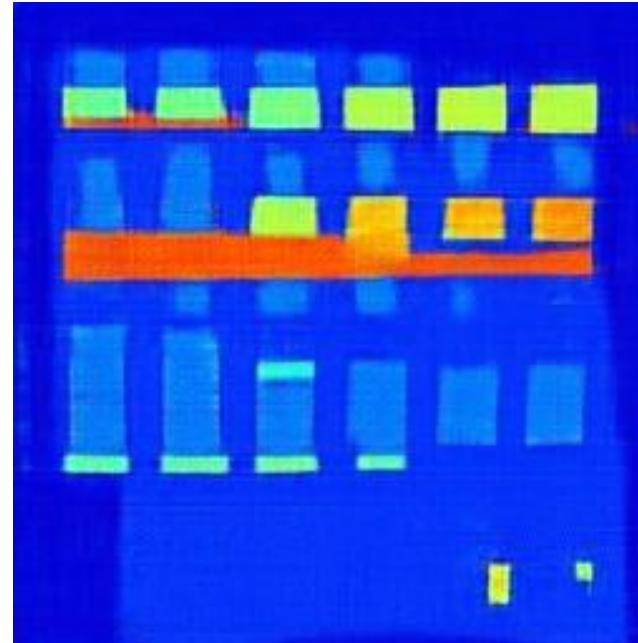
- DualGAN: Unsupervised Dual Learning for Image-to-Image Translation by Zili Yi, Hao Zhang, Ping Tan, Minglun Gong, 2018



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

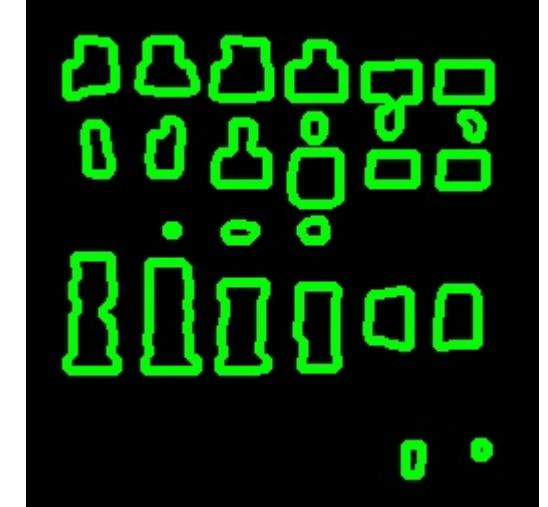
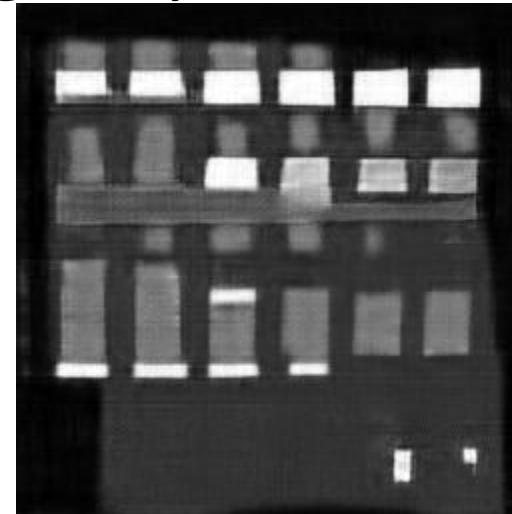
# Facade Parsing System

- 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:

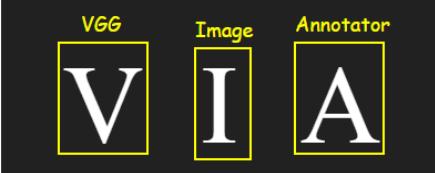


# **Building Height Detection System**

# **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

Home Project Annotation View Help  Version 2.0.8

VGG Image Annotator (VIA) is an image annotation tool that can be used to define regions in an image and create textual descriptions of those regions. VIA is an [open source project](#) developed at the [Visual Geometry Group](#) and released under the BSD-2 clause license.

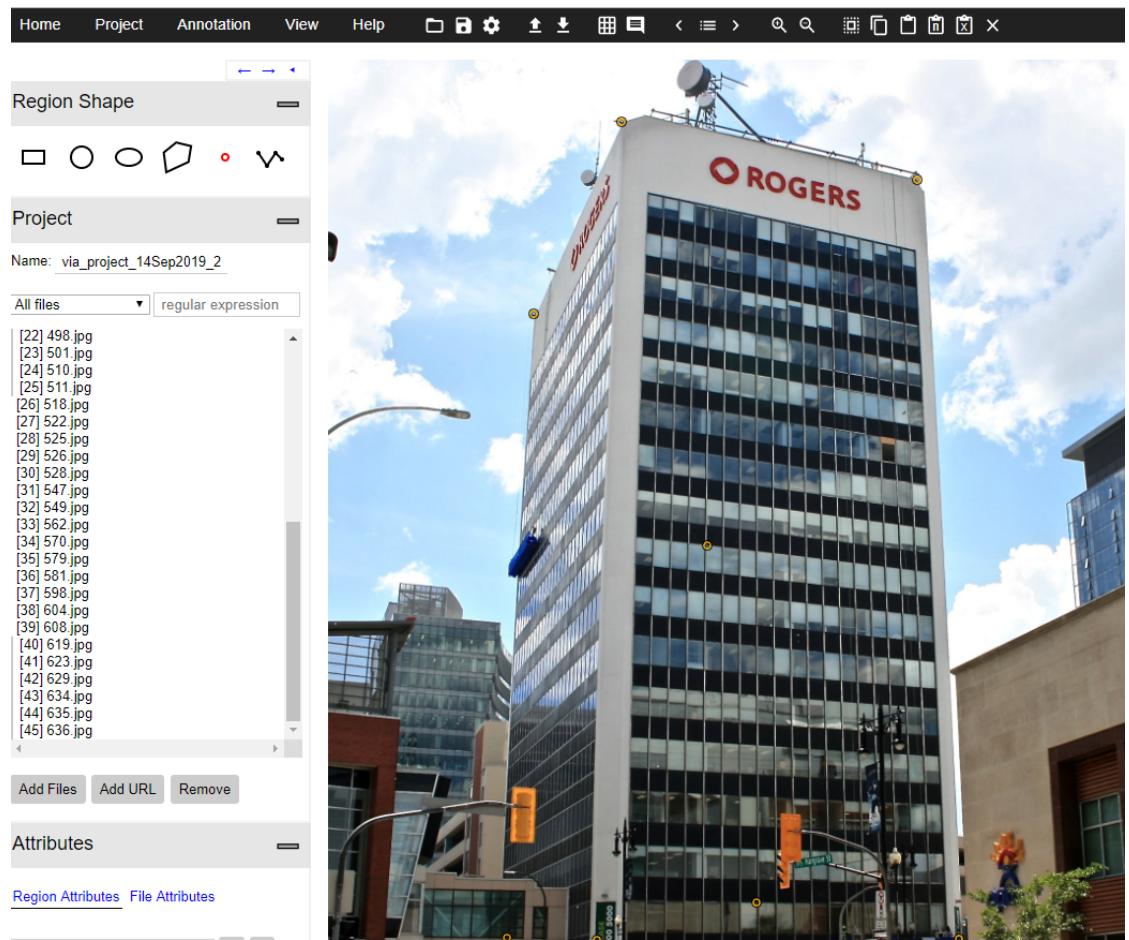
Here is a list of some salient features of VIA:

- based solely on HTML, CSS and Javascript (no external javascript libraries)
- can be used off-line (full application in a single html file of size < 400KB)
- requires nothing more than a modern web browser (tested on Firefox, Chrome and Safari)
- supported region shapes: rectangle, circle, ellipse, polygon, point and polyline
- import/export of region data in csv and json file format

For more details, visit <http://www.robots.ox.ac.uk/~vgg/software/via/>.

Copyright © 2016-2019, [Abhishek Dutta](#), Visual Geometry Group, Oxford University and [VIA Contributors](#).

- 400 google Montreal images

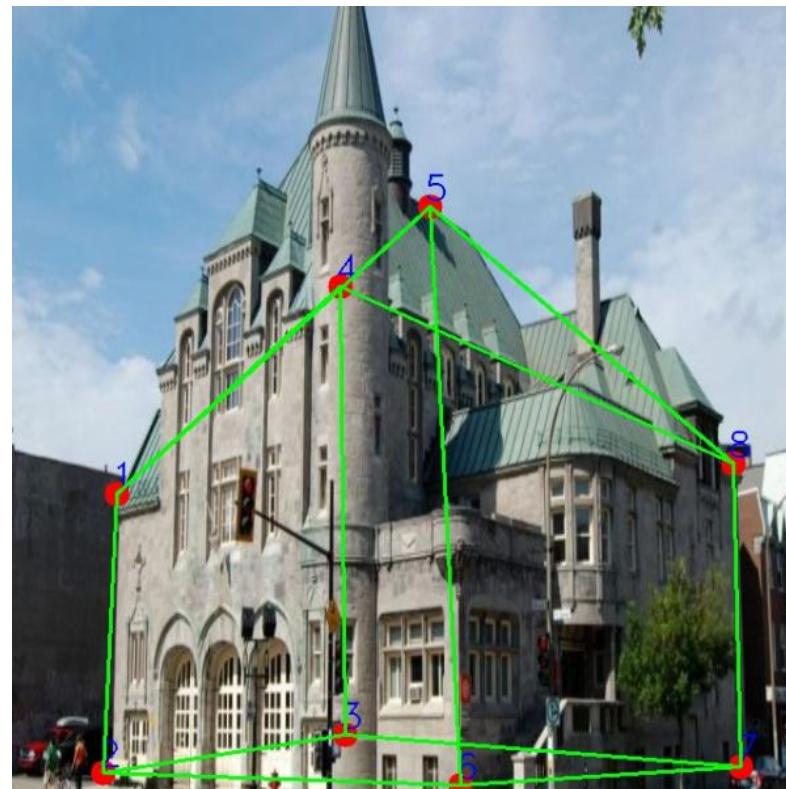
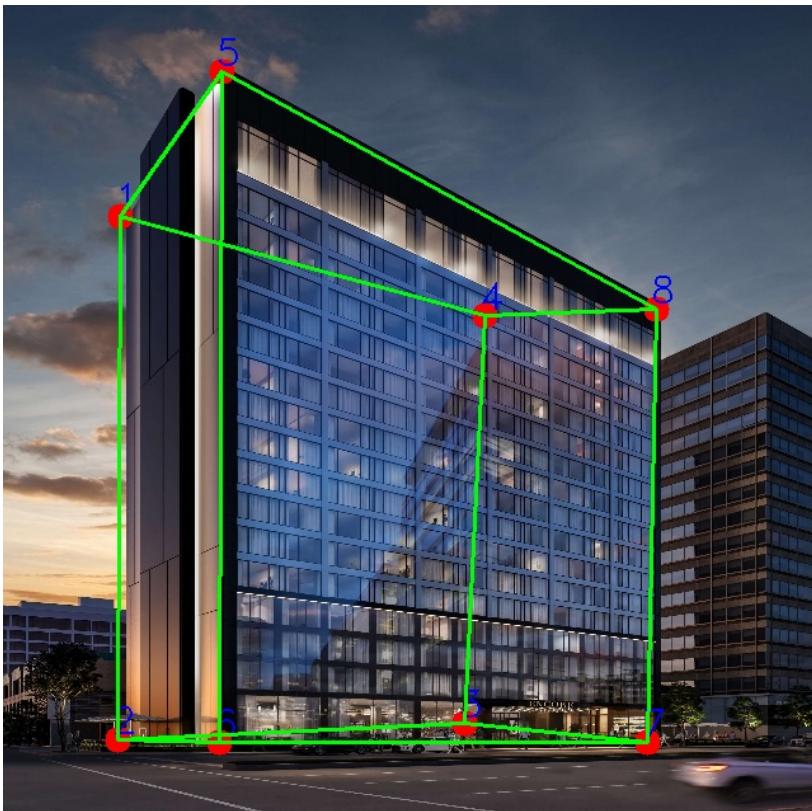


# **Building Height Detection System**

- **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
- $[x_1, y_1, x_2, y_2, \dots, x_8, y_8, \text{LengthBuilding}, \text{WidthBuilding}] \rightarrow \text{regression model} \rightarrow \text{HeightBuilding}$
- Train a regression model on the 8 points and the floor dimensions we can extract height



• **Questions?**