DOTPly: Semi-automatic Framework for Semantic Annotation of 3D Point Cloud

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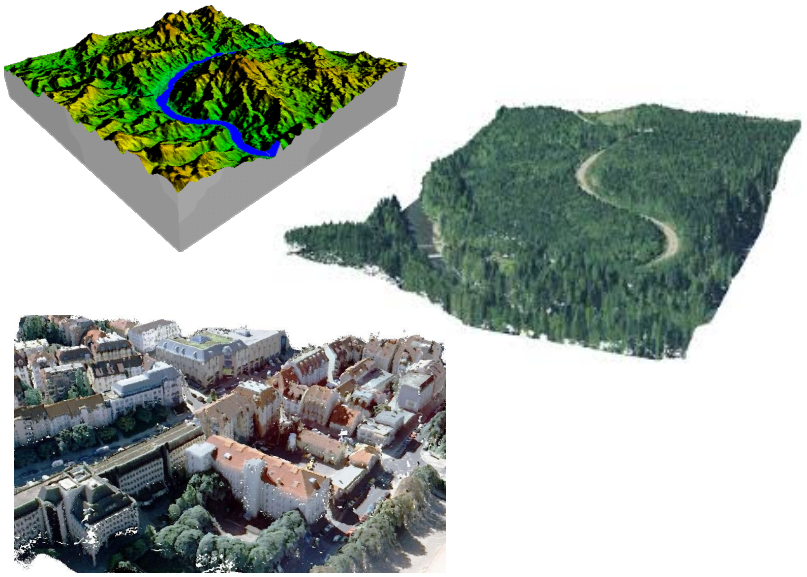
Background

- **Development of IoT Sensing Technology for Capturing the Real World**

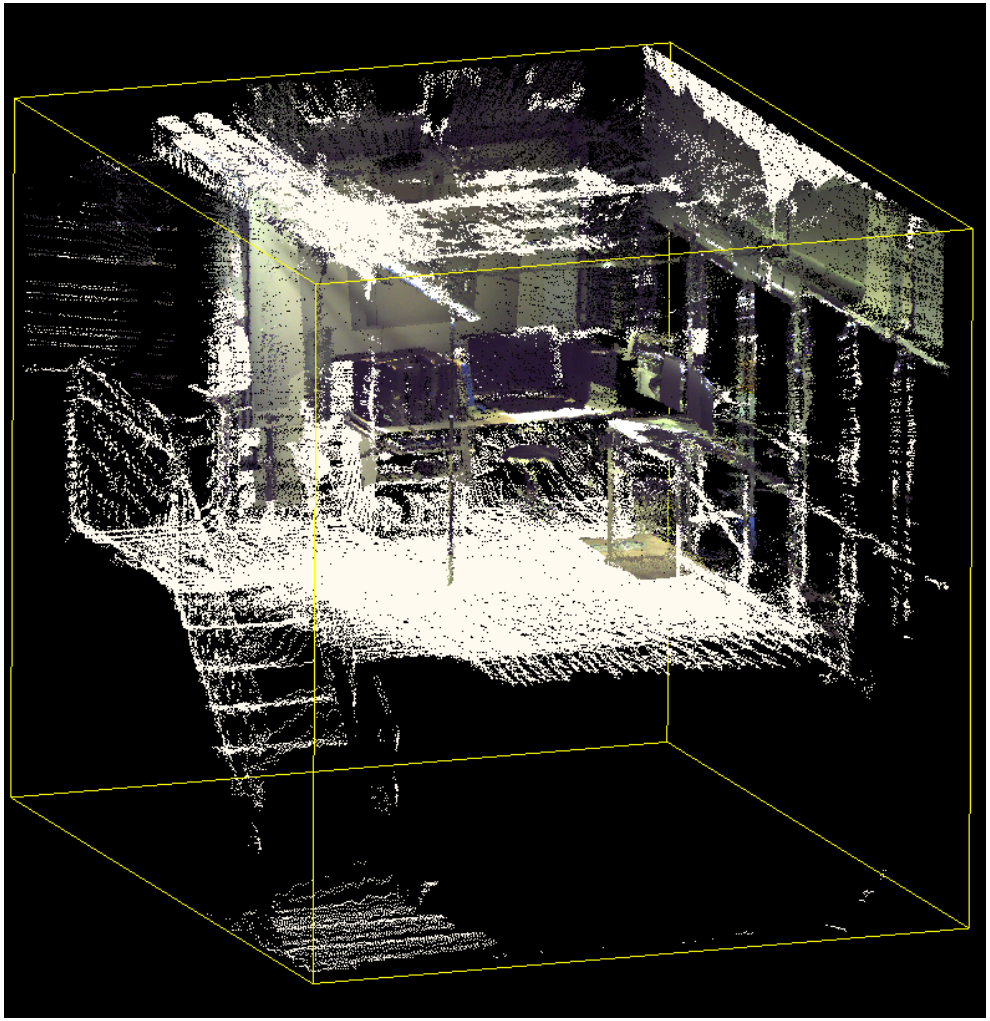
State-of-the-art Sensing Devices



3D High Definition Data

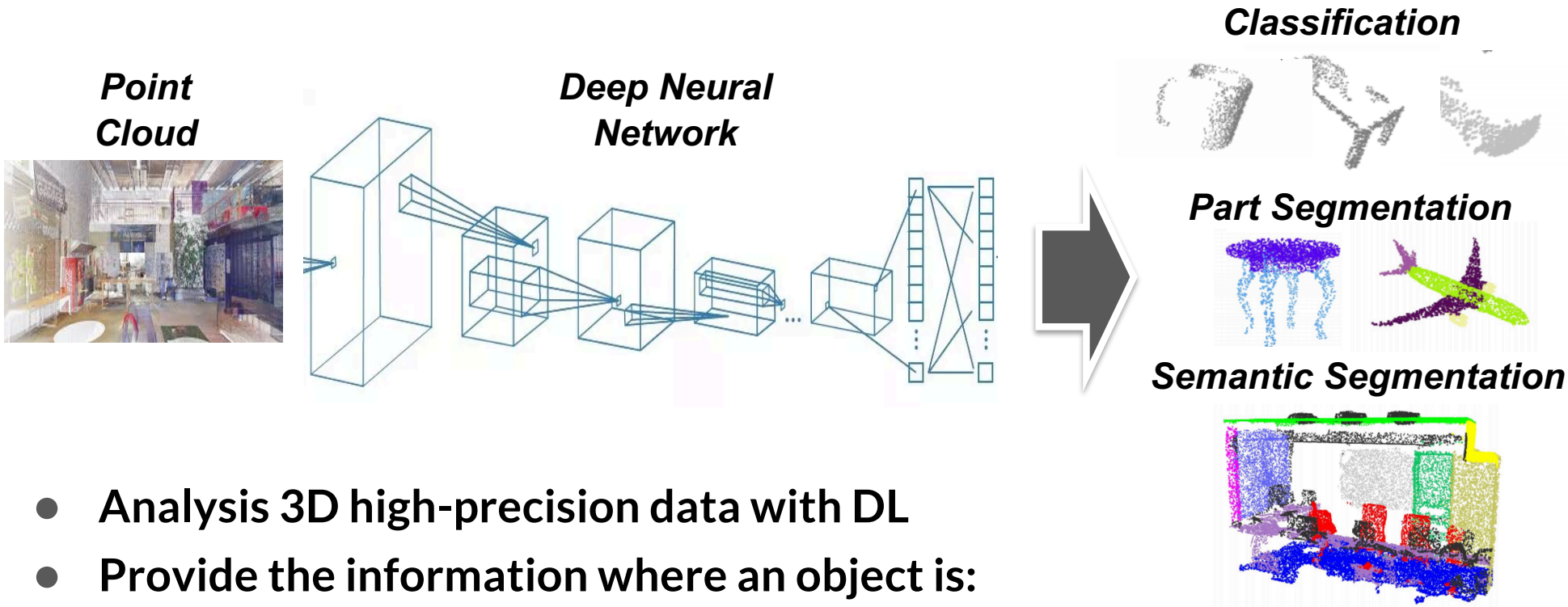
- Recently, there is a tremendous increase in the point cloud data due to the increase in the use of ***3D scanners***.
- 3D data is usually generated as a stream of points by mounting 3D scanners on drones, cars or on some stationary platform.

Example: Colored Point Clouds



AIST waterfront Annex2 Building Laboratory PC Room (1.5 floor)

Deep Learning with Point Cloud Data



- **Analysis 3D high-precision data with DL**
- **Provide the information where an object is:**
  - City modeling
    - Forest planning and management, Digital Elevation Models construction
  - Disaster management
    - Forest fire management, Flood modeling, River surveying
  - Autonomous driving
    - Traffic monitoring, Transport management

Motivation

- **Lack of Supervised Training Data**
  - To exploit deep learning techniques into point cloud data
    - ***Training data is always essential*** for applying DL
  - However,
    - There are <u>not many annotated (supervised) point cloud data</u>
      - Only for autonomous driving: car, pedestrian, cyclist, and so on.
      - Ex) KITTI[1], Ford Campus LiDAR dataset[2], Stanford Track Collection[3]
    - It is very <u>difficult to make supervised data</u> using traditional method
      - Too huge size (i.e., hard to control)
      - Complex to control 3-dimension axis (i.e., costly works)
      - Difficult to employ machine learning techniques (i.e., low accuracy)

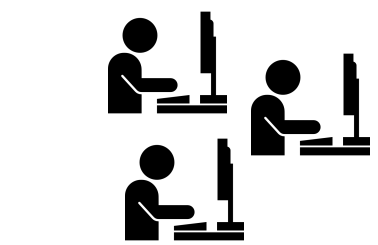
[1]KITTI (Karlsruhe Institute of Technology and Toyota Technological Institute), http://www.cvlibs.net/datasets/kitti/

[2]Ford Campus LiDAR dataset, http://robots.engin.umich.edu/SoftwareData/Ford

[3]Stanford Track Collection, http://www.youtube.com/embed/bIif9hSR1O4?rel=0

Annotation of Point Cloud Data

- **What is annotation?**
  - The process by which a computer system automatically/manually assigns metadata in the form of captioning or keywords
  - This is most essential task for utilizing point cloud data

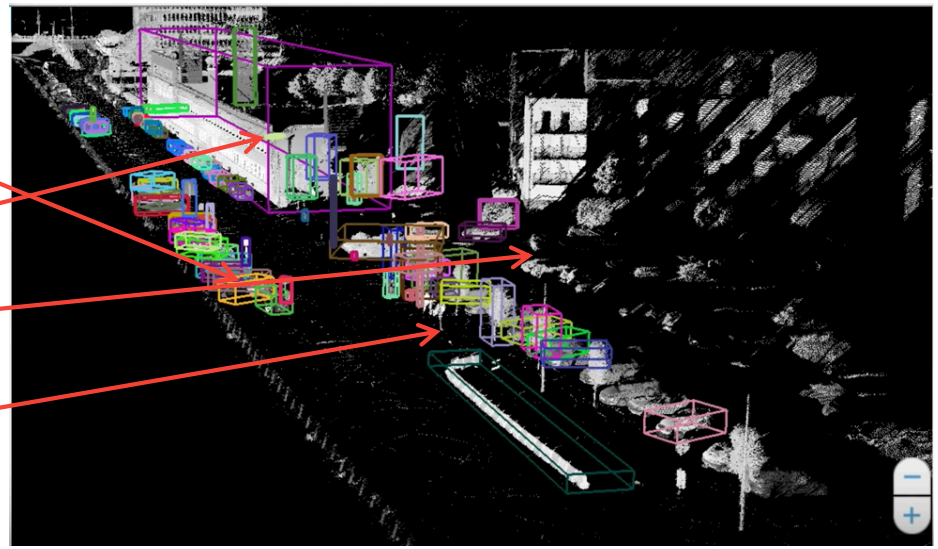


Human-based Annotation

➔ *Manual operation*
➔ *Tool with user interface*
➔ *Most accurate annotating*

Slow and long haul task

Car
Building
Tree
Bicycle



Machine-based Annotation

➔ *Automatically operation*
➔ *Deep neural network*
➔ *Provide border with label*

Need supervised training data

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Data Platform Research Team

Artificial Intelligence Research Center

National Institute of Advanced Industrial Science and Technology (AIST)

Thank you for your attention!