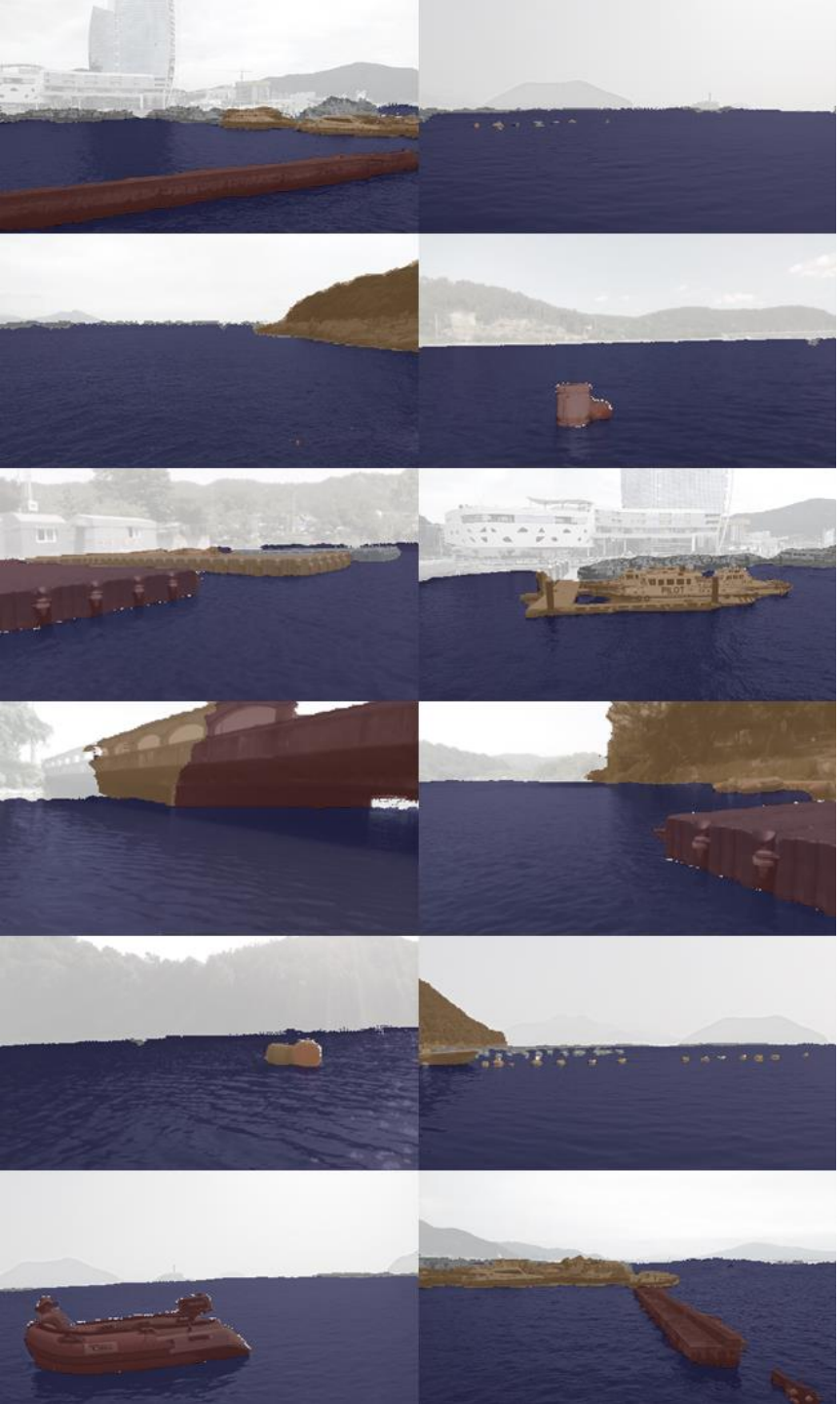
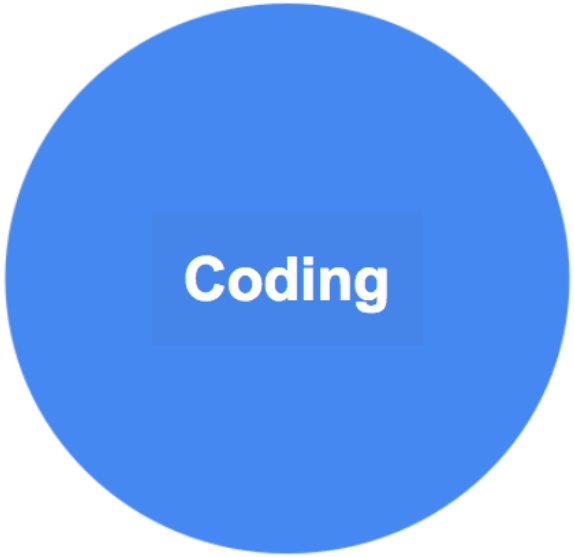


AI 기반 컴퓨터 비전 시스템의 영상처리 방식 별 응용 연구 · 기술 개발과 상용화 동향

씨드로닉스 김한근

hank05@seadronix.com

딥러닝을 이용한 영상 처리 분류
The reality of AI



What people think AI is about

The reality

이미지 출처: https://hackernoon.com/%EF%B8%8F-big-challenge-in-deep-learning-training-data-31a88b97b282

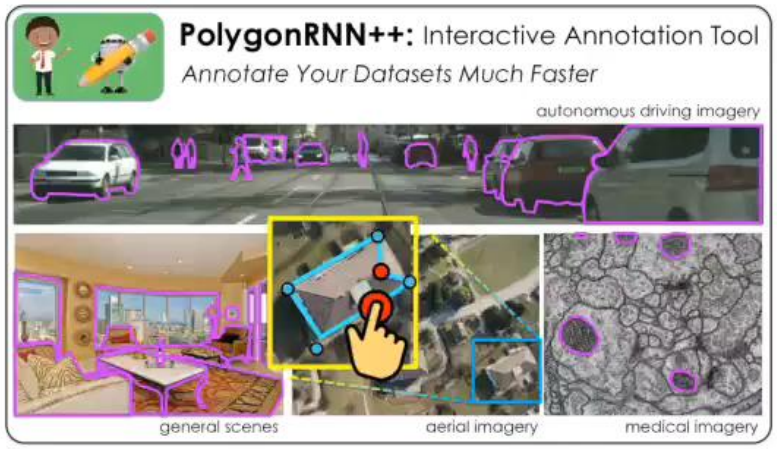
딥러닝을 이용한 영상 처리 분류
Data Annotation Tools – **Polygon-RNN++**

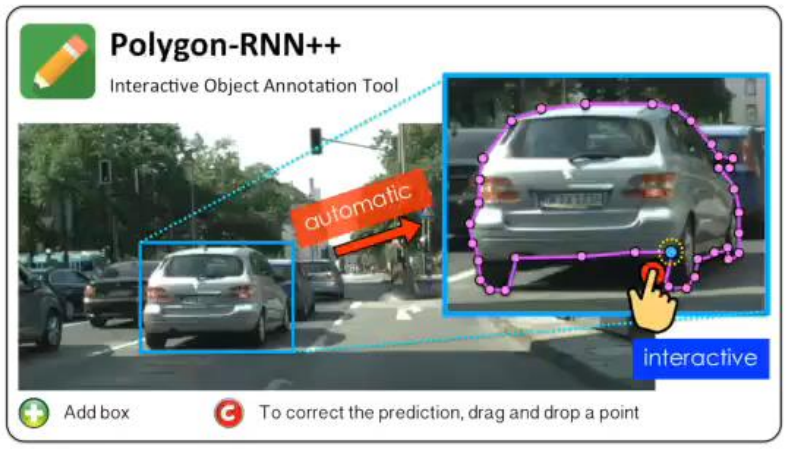
Efficient Annotation of Segmentation Datasets with Polygon-RNN++

David Acuna* [1,3] Huan Ling* [1,2] Amlan Kar* [1,2] Sanja Fidler* [1,2]

University of Toronto[1] Vector Institute[2] NVIDIA[3]

{davidj, linghuan, amlan, fidler}@cs.toronto.edu





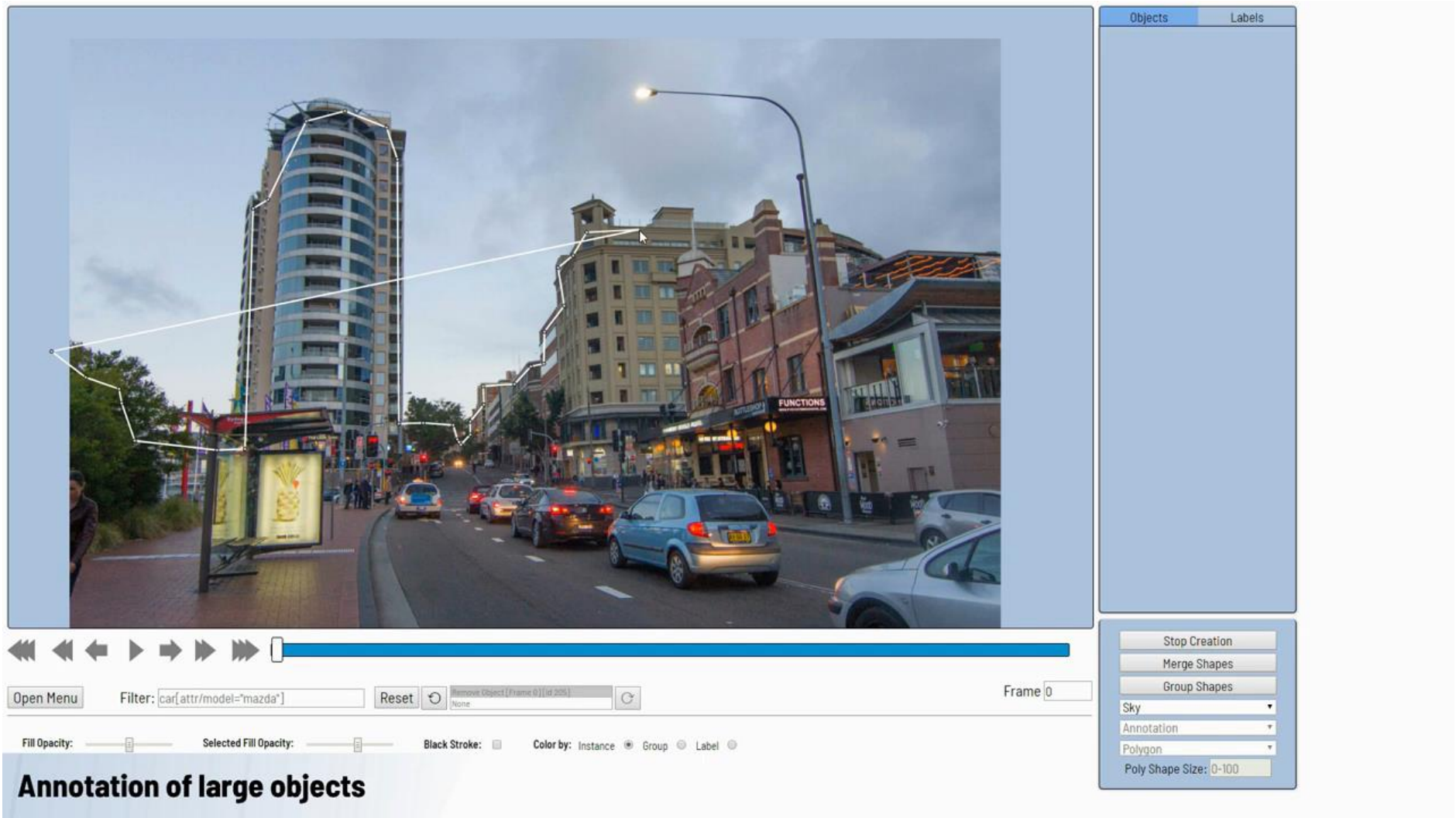
equal contribution

research done when D.A. at UofT

영상 출처: http://www.cs.toronto.edu/polyrnn/

딥러닝을 이용한 영상 처리 분류

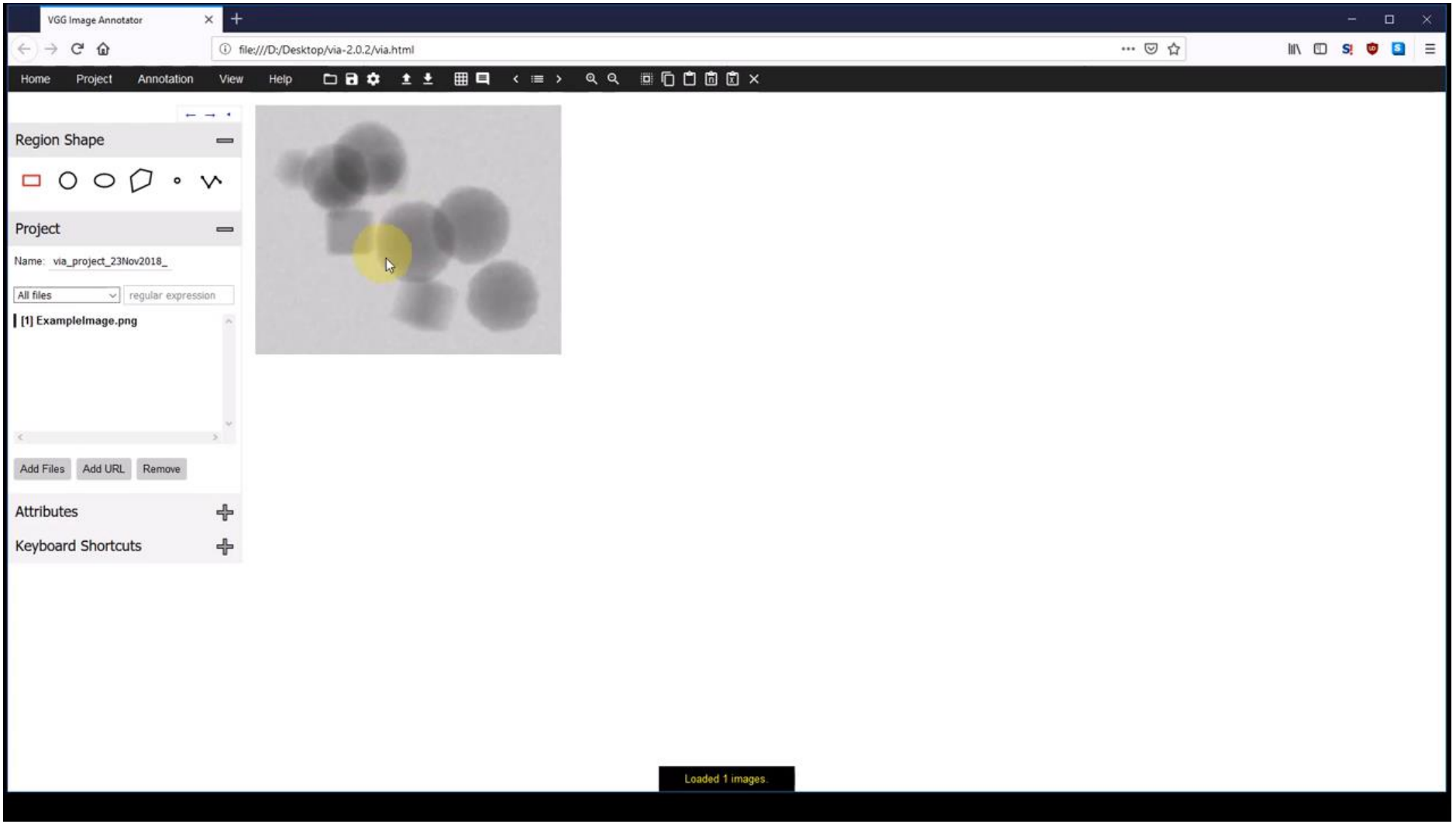
Data Annotation Tools – **Computer Vision Annotation Tool**



영상 출처: https://github.com/opencv/cvat

딥러닝을 이용한 영상 처리 분류

Data Annotation Tools – **VGG Image Annotator (VIA)**



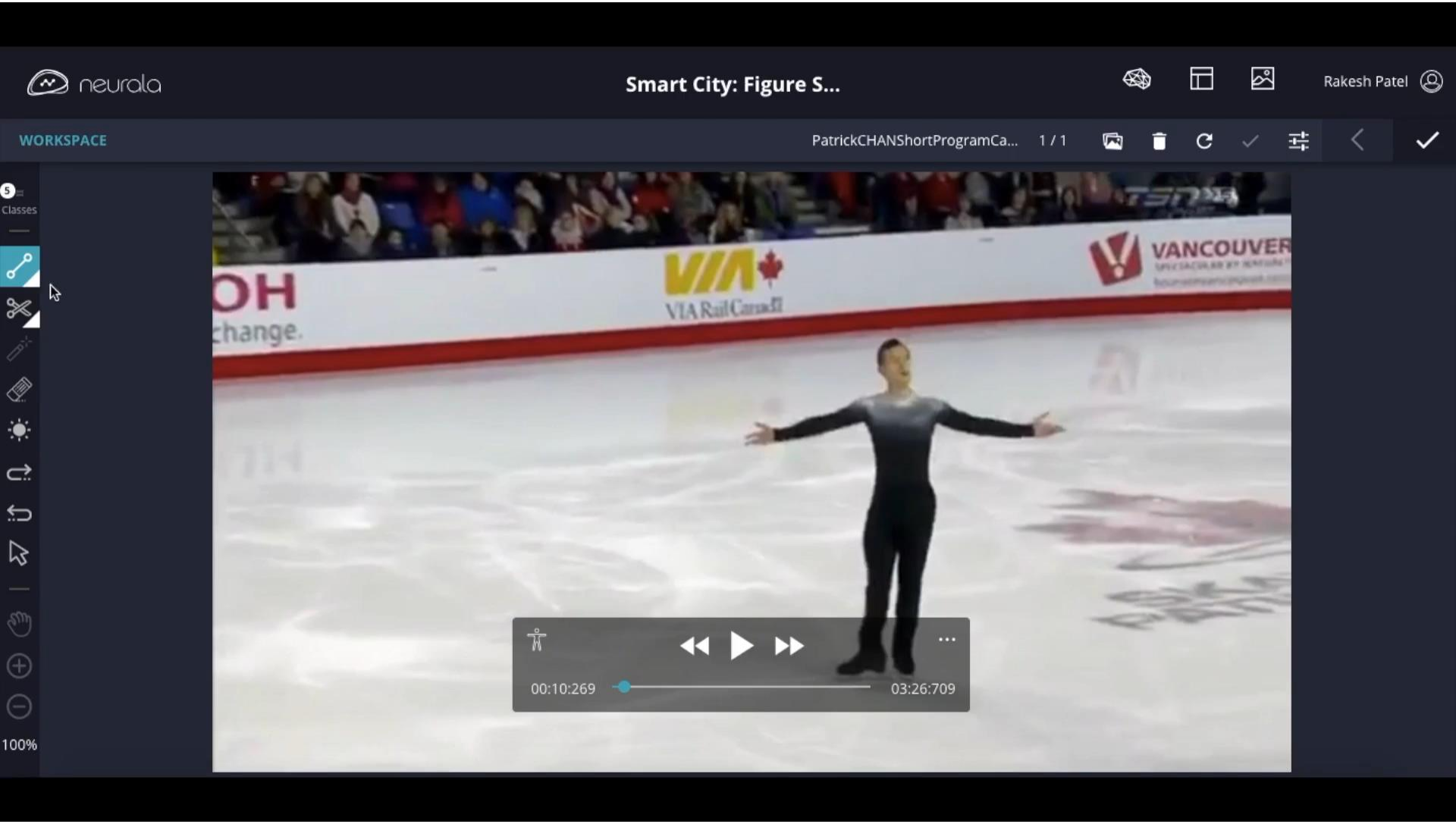
영상 출처: http://www.robots.ox.ac.uk/~vgg/software/via/

딥러닝을 이용한 영상 처리 분류
Data Annotation Tools – **Uyuni (우유니)**

영상 출처: http://www.xiilab.com/brand/uyuni

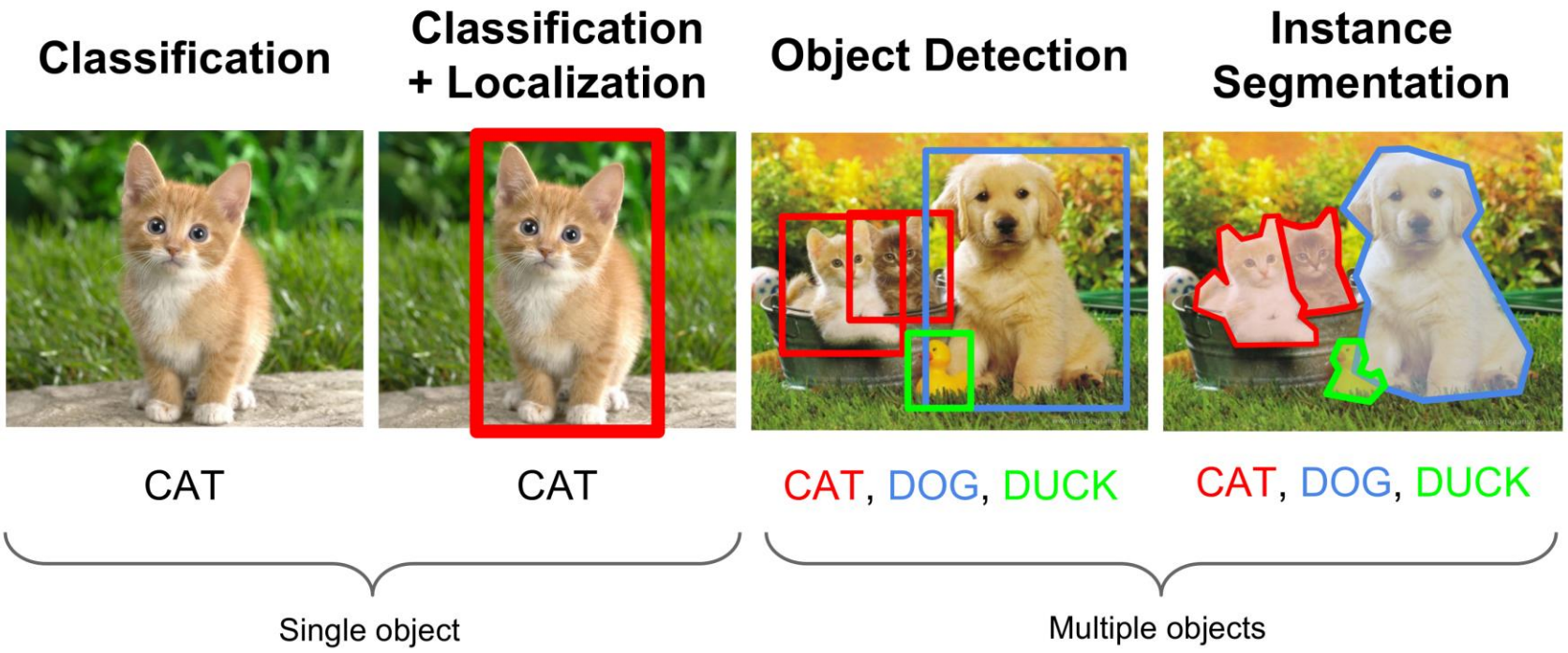
딥러닝을 이용한 영상 처리 분류

Data Annotation Tools – **Brain Builder**



영상 출처: https://www.neurala.com

딥러닝을 이용한 영상 처리 분류
3D Object Detection / Segmentation 위주 연구



이미지 출처: https://chaosmail.github.io/deeplearning/2016/10/22/intro-to-deep-learning-for-computer-vision/

딥러닝을 이용한 영상 처리 분류

Object Detection – KITTI Benchmark, 3D Object Detection

The KITTI Vision Benchmark Suite

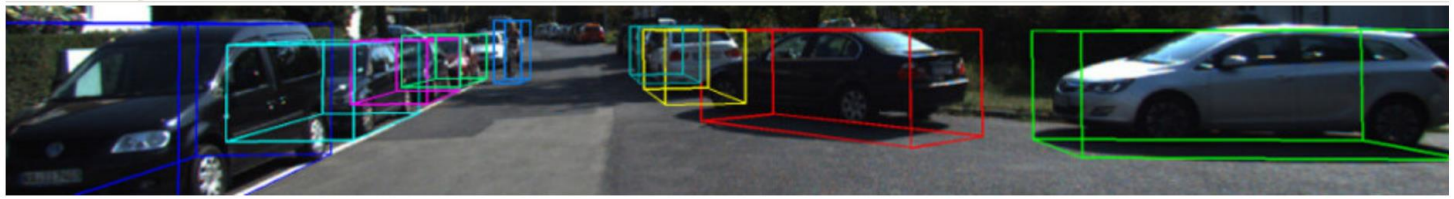
A project of Karlsruhe Institute of Technology and Toyota Technological Institute at Chicago

Karlsruhe Institute of Technology

home | setup | stereo | flow | sceneflow | depth | odometry | object | tracking | road | semantics | raw data | submit results

Andreas Geiger (MPI Tübingen) | Philip Lenz (KIT) | Christoph Stiller (KIT) | Raquel Urtasun (University of Toronto)

3D Object Detection Evaluation 2017

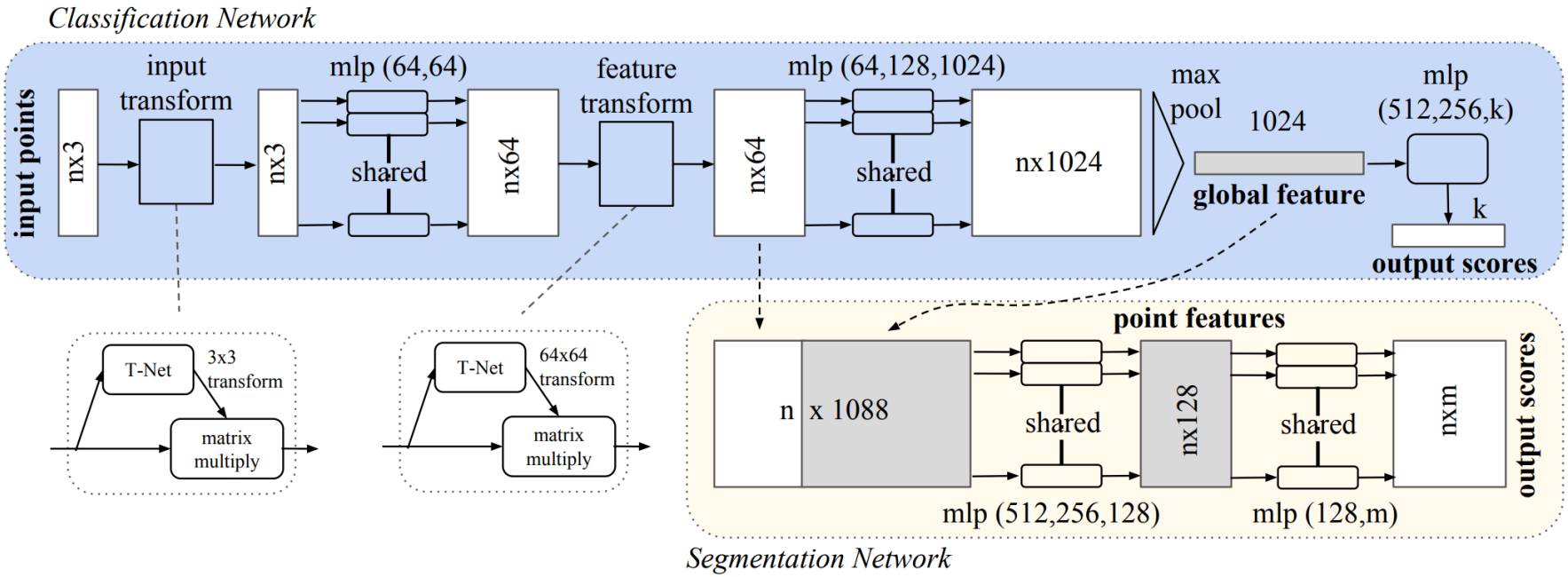


Car

	Method	Setting	Code	Moderate	Easy	Hard	Runtime	Environment	Compare
1	EMP			**77.20 %**	87.85 %	**72.78 %**	0.5 s	GPU @ 2.5 Ghz (Python)	
2	Patches			77.16 %	**87.87 %**	68.91 %	0.15 s	GPU @ 2.0 Ghz	
3	UberATG-MMF			76.75 %	86.81 %	68.41 %	0.08 s	GPU @ 2.5 Ghz (Python)	
	M. Liang*, B. Yang*, Y. Chen, R. Hu and R. Urtasun: Multi-Task Multi-Sensor Fusion for 3D Object Detection. CVPR 2019.								
4	F-ConvNet			76.51 %	85.88 %	68.08 %	0.47 s	GPU @ 2.5 Ghz (Python + C/C++)	
	Z. Wang and K. Jia: Frustum ConvNet: Sliding Frustums to Aggregate Local Point-Wise Features for Amodal 3D Object Detection. arXiv preprint arXiv:1903.01864 2019.								
5	Voxel-FPN			75.95 %	85.57 %	67.84 %	0.02 s	GPU @ 2.5 Ghz (Python + C/C++)	

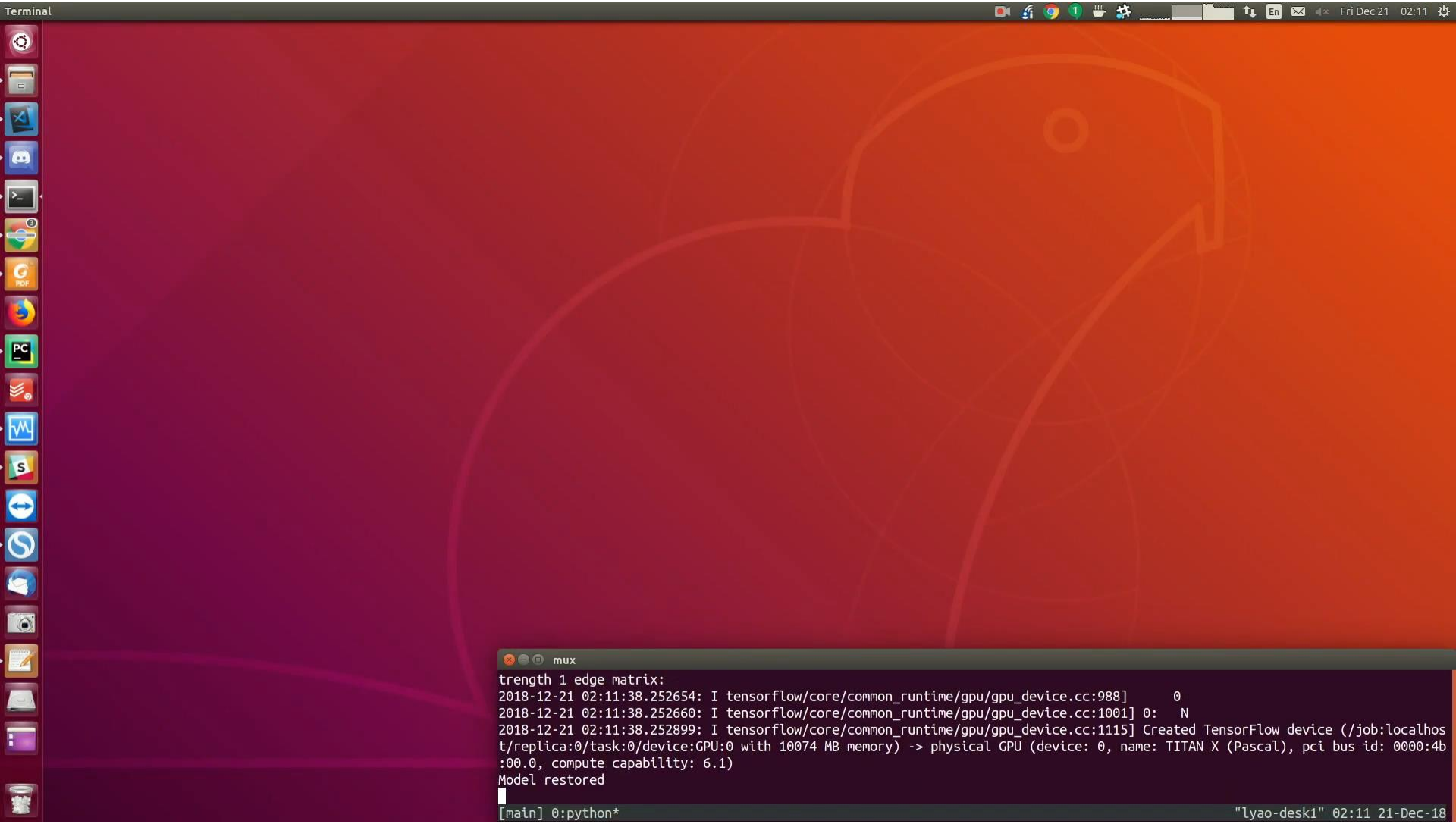
이미지 출처: http://www.cvlibs.net/datasets/kitti/eval_object.php?obj_benchmark=3d

딥러닝을 이용한 영상 처리 분류
Object Detection – PointNet



이미지 출처: https://arxiv.org/pdf/1612.00593.pdf

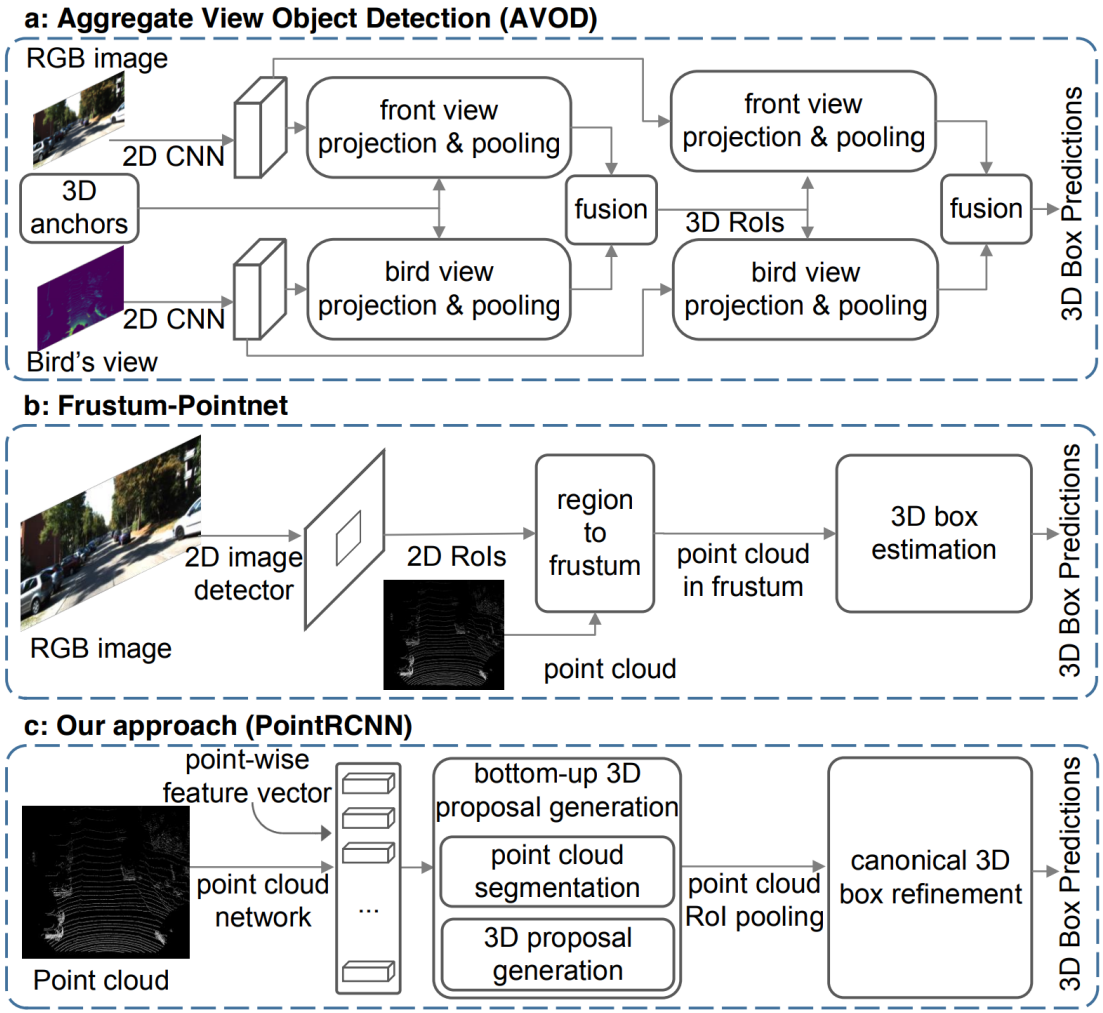
딥러닝을 이용한 영상 처리 분류
Object Detection – PointNet



영상 출처: https://www.youtube.com/watch?v=cXLG_vgXEO4

딥러닝을 이용한 영상 처리 분류

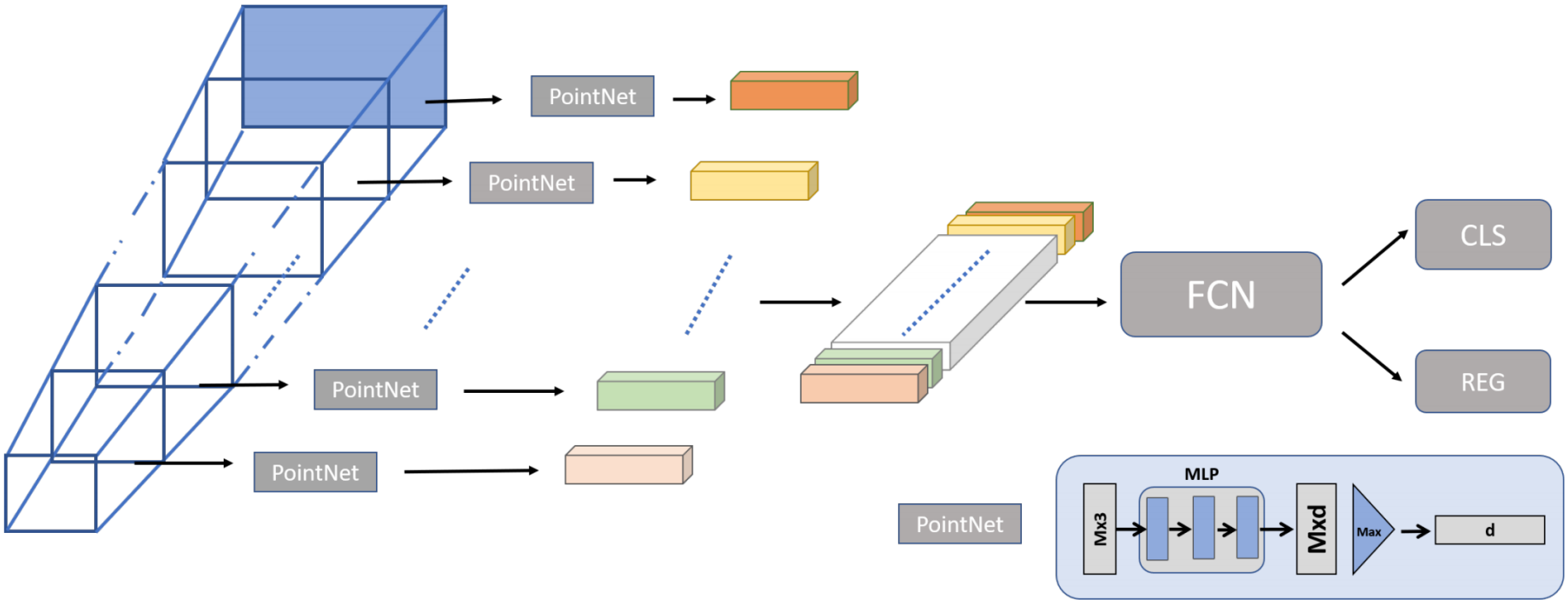
Object Detection – PointRCNN: 3D Object Proposal Generation and Detection from Point Cloud



이미지 출처: https://arxiv.org/pdf/1812.04244.pdf

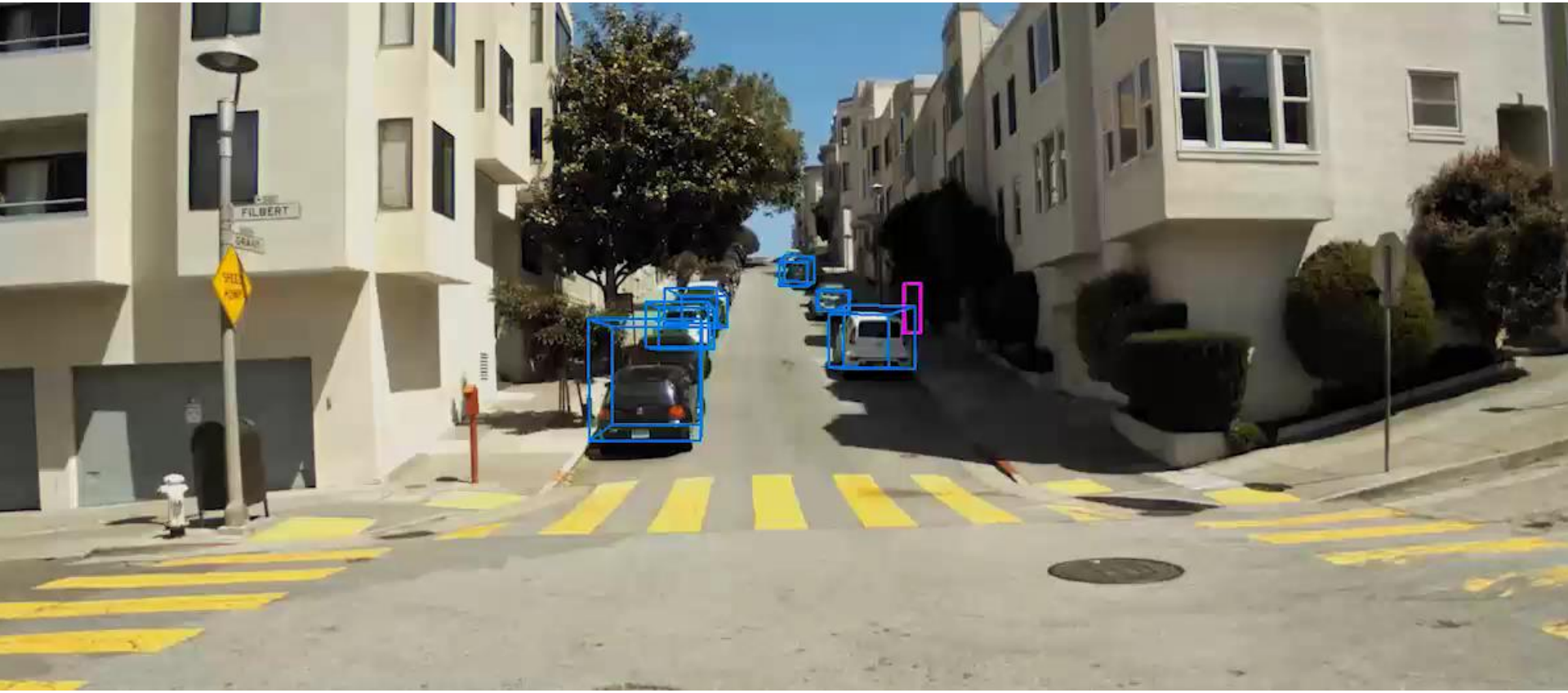
딥러닝을 이용한 영상 처리 분류

Object Detection – Frustum ConvNet: Sliding Frustums to Aggregate Local Point-Wise Features for Amodal 3D Object Detection



이미지 출처: https://arxiv.org/pdf/1903.01864.pdf

딥러닝을 이용한 영상 처리 분류
Object Detection – Zoox



영상 출처: https://zoox.com/

딥러닝을 이용한 영상 처리 분류
Pixel-level Semantic Labeling Task

이미지 출처: https://www.cityscapes-dataset.com/dataset-overview/#features

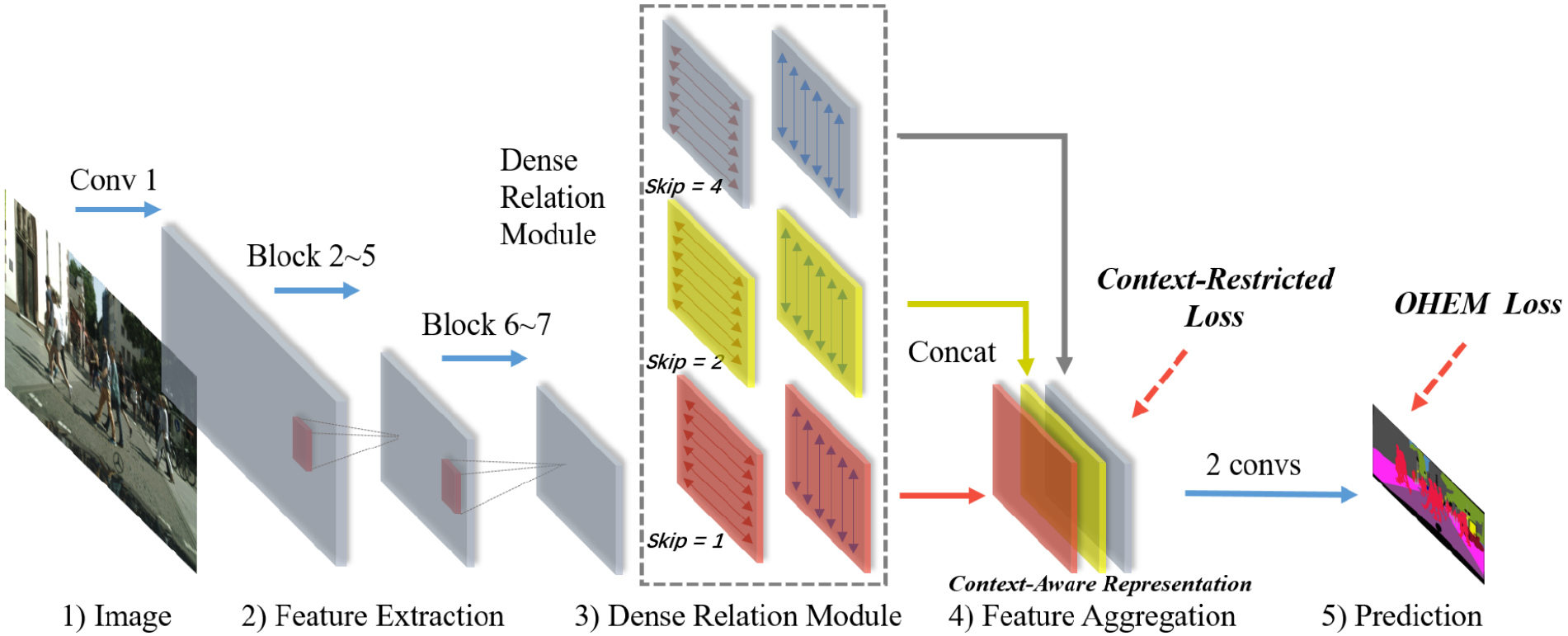
딥러닝을 이용한 영상 처리 분류
Pixel-level Semantic Labeling Task - Benchmark

name	fine	coarse	16-bit	depth	video	sub	IoU class	iIoU class	IoU category	iIoU category	Runtime [s]	code
iFLYTEK-CV	yes	yes	no	no	no	no	83.6	64.7	92.1	82.3	n/a	no
NV-ADLR	yes	yes	no	no	no	no	83.2	64.2	92.1	82.2	n/a	no
GALD-net	yes	yes	no	no	no	no	83.1	63.5	92.2	81.4	n/a	yes
Tencent AI Lab	yes	yes	no	no	no	no	82.9	63.9	91.8	80.4	n/a	no
DRN_CRL_Coarse	yes	yes	no	no	no	no	82.8	61.1	91.8	80.7	n/a	yes
DPC	yes	yes	no	no	no	no	82.7	63.3	92.0	82.5	n/a	yes
SRC-B-MachineLearningLab	yes	yes	no	no	no	no	82.5	60.7	91.8	81.5	n/a	no
RelationNet_Coarse	yes	yes	no	no	no	no	82.4	61.9	91.8	81.4	n/a	no

이미지 출처: https://www.cityscapes-dataset.com/benchmarks/#scene-labeling-task

딥러닝을 이용한 영상 처리 분류

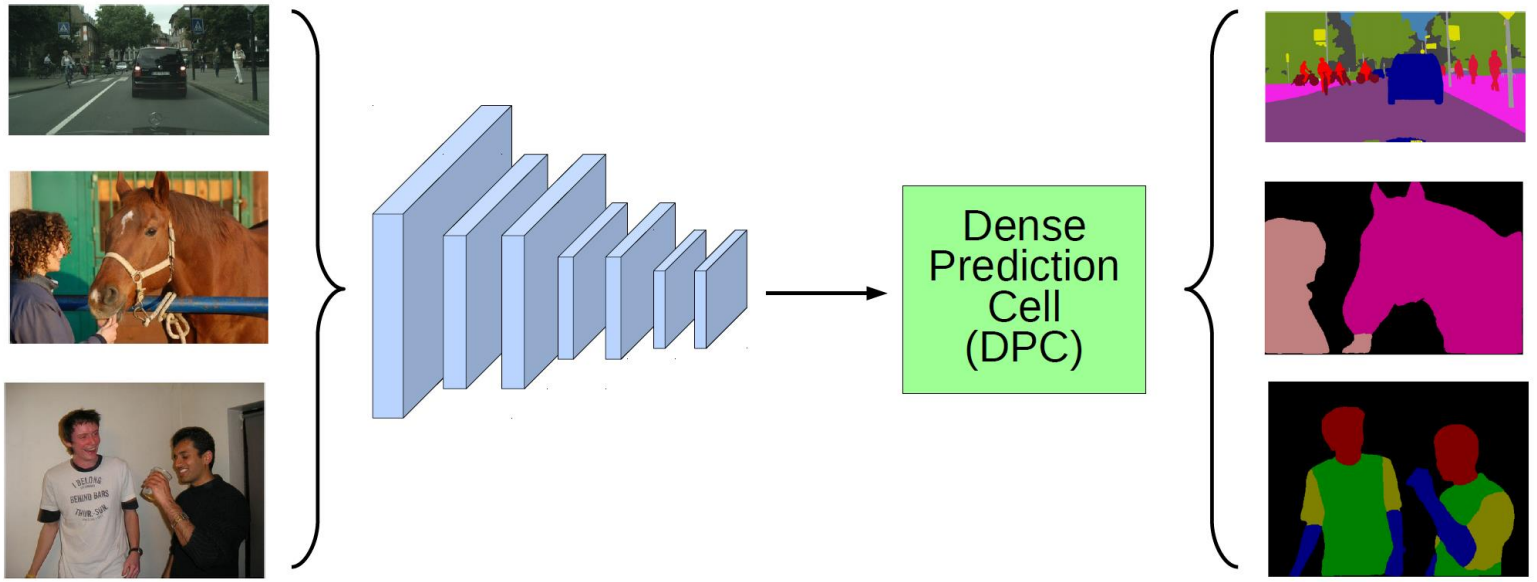
Pixel-level Semantic Labeling Task - Dense Relation Network: Learning Consistent and Context-Aware Representation For Semantic Image Segmentation

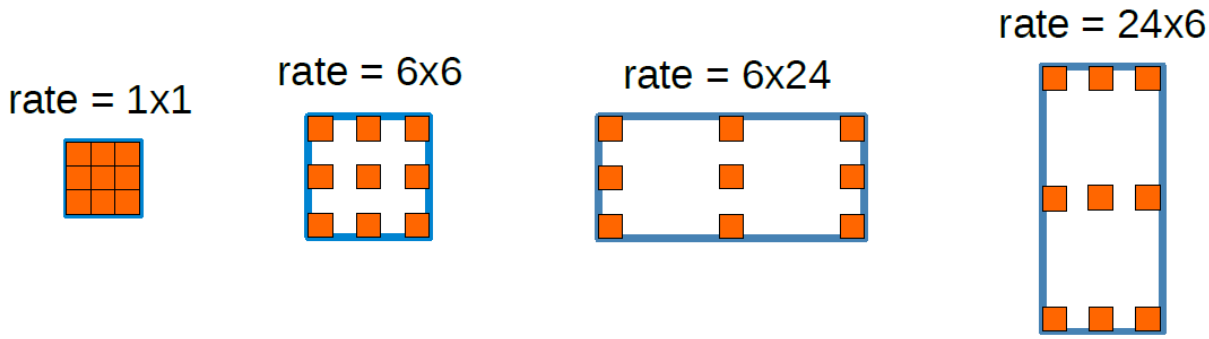


이미지 출처: https://2018.ieeeicip.org/Papers/ViewPapers.asp?PaperNum=1148

딥러닝을 이용한 영상 처리 분류

Pixel-level Semantic Labeling Task - Searching for Efficient Multi-Scale Architectures for Dense Image Prediction

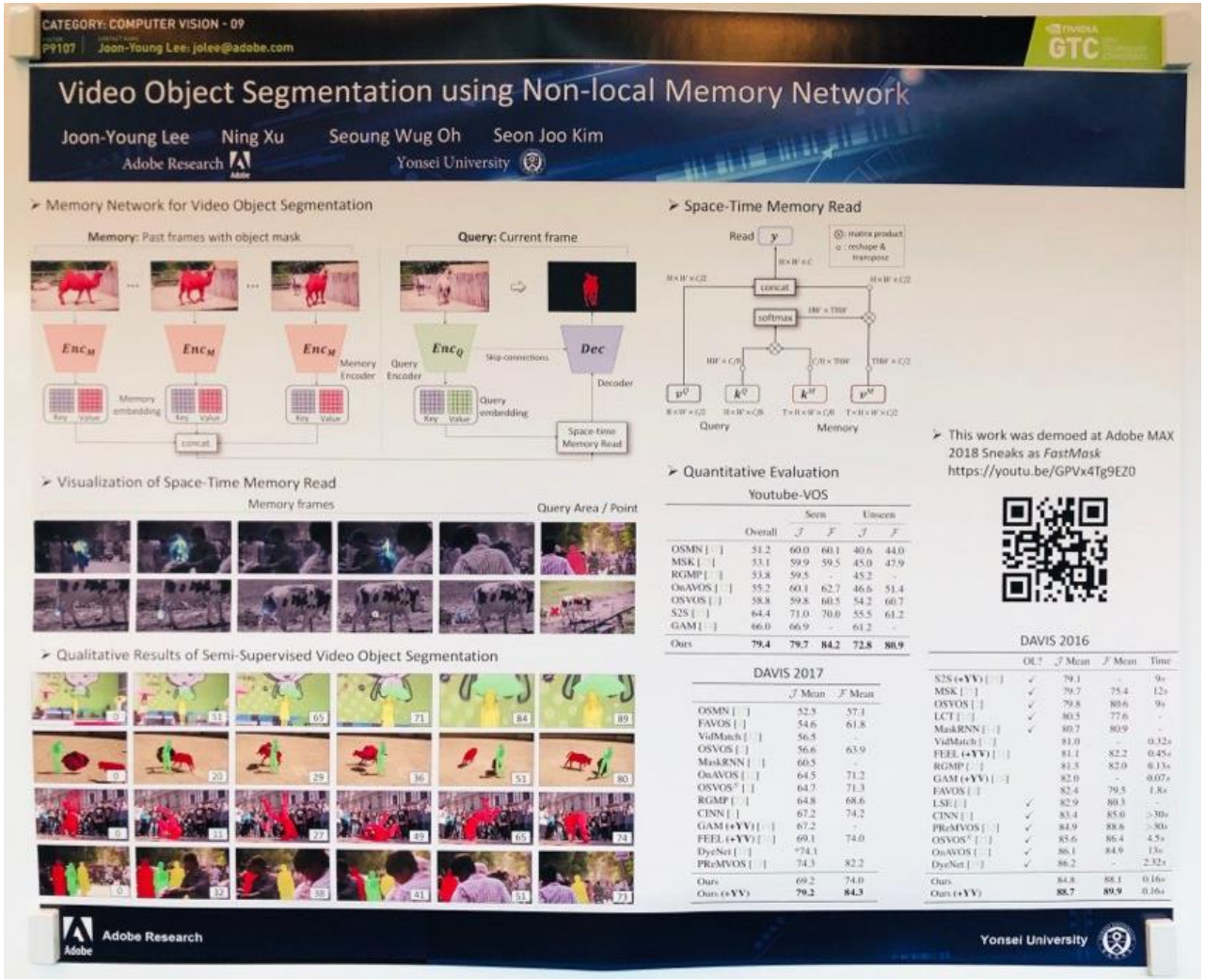




이미지 출처: https://arxiv.org/abs/1809.04184

딥러닝을 이용한 영상 처리 분류

Pixel-level Semantic Labeling Task – Video Object Segmentation using Non-local Memory Network



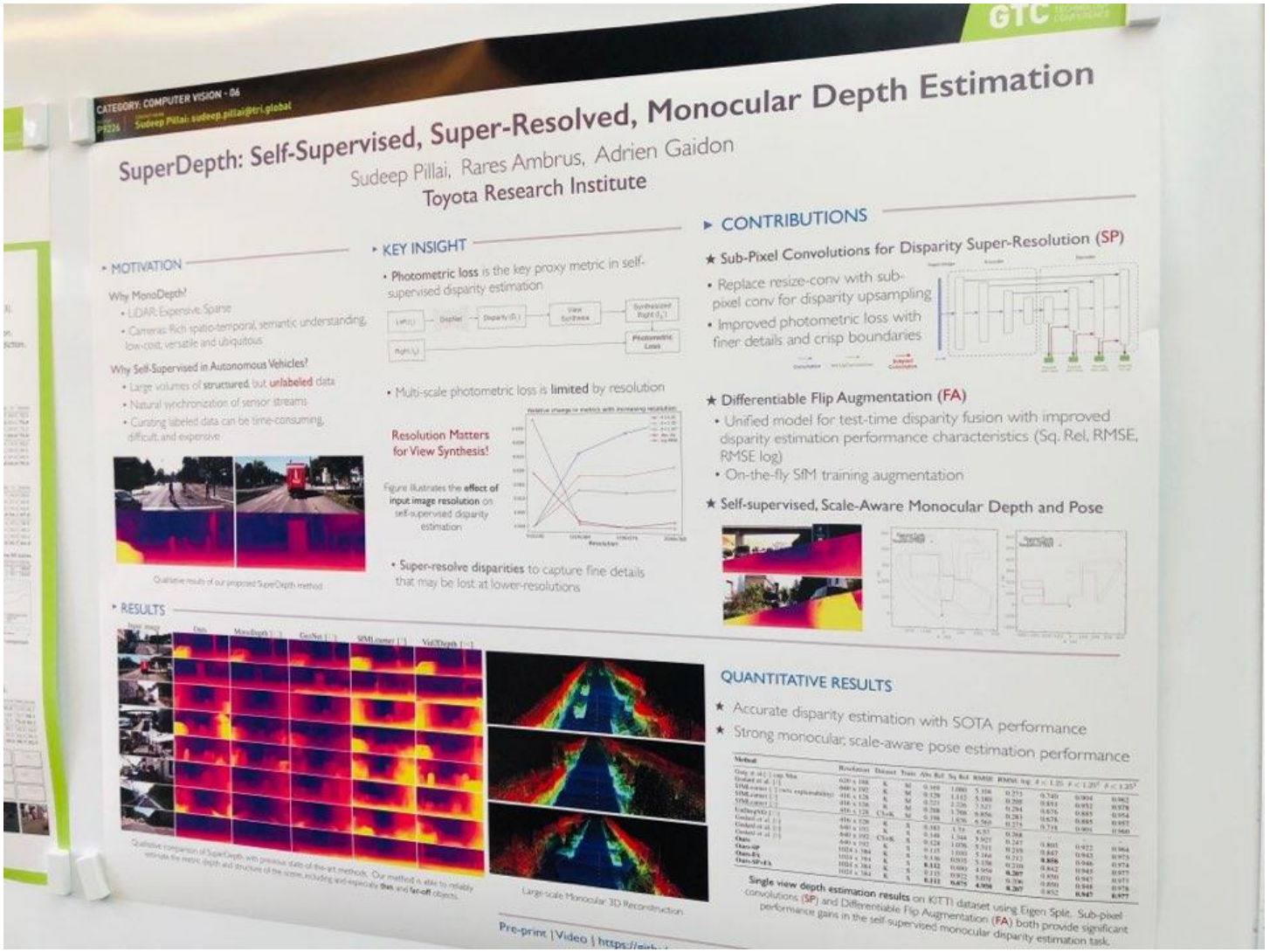
이미지 출처: GTC 2019

딥러닝을 이용한 영상 처리 분류

Pixel-level Semantic Labeling Task – Video Object Segmentation using Non-local Memory Network

영상 출처: https://www.youtube.com/watch?v=GPVx4Tg9EZ0&feature=youtu.be

딥러닝을 이용한 영상 처리 분류
ETC - SuperDepth



이미지 출처: GTC 2019

딥러닝을 이용한 영상 처리 분류
ETC - SuperDepth

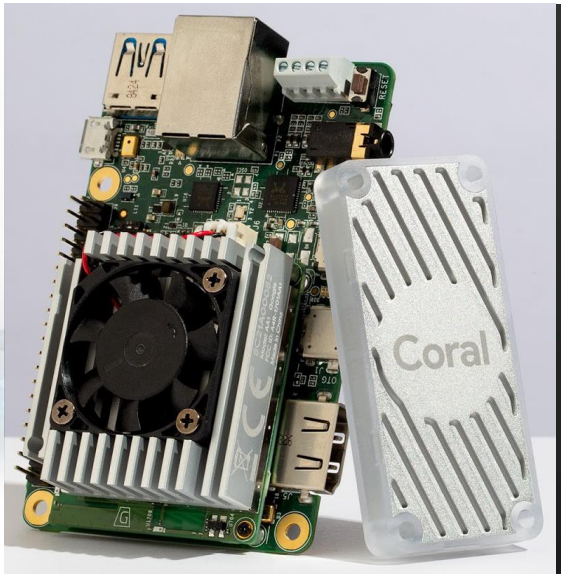
영상 출처: https://www.youtube.com/watch?v=jKNgBeBMx0I&feature=youtu.be

딥러닝을 이용한 영상 처리 분류
ETC – Noise2Noise

영상 출처: https://www.youtube.com/watch?v=dlL2bfjmSoA, Paper: https://arxiv.org/pdf/1803.04189.pdf

딥러닝 연산 하드웨어
저가화 진행

$99



$149

$99

이미지 출처: Intel Movidius, google, NVIDIA

딥러닝 연산 하드웨어
저가화 진행

영상 출처: https://www.youtube.com/watch?v=tBUIk7H9GyU&feature=youtu.be

감사합니다.