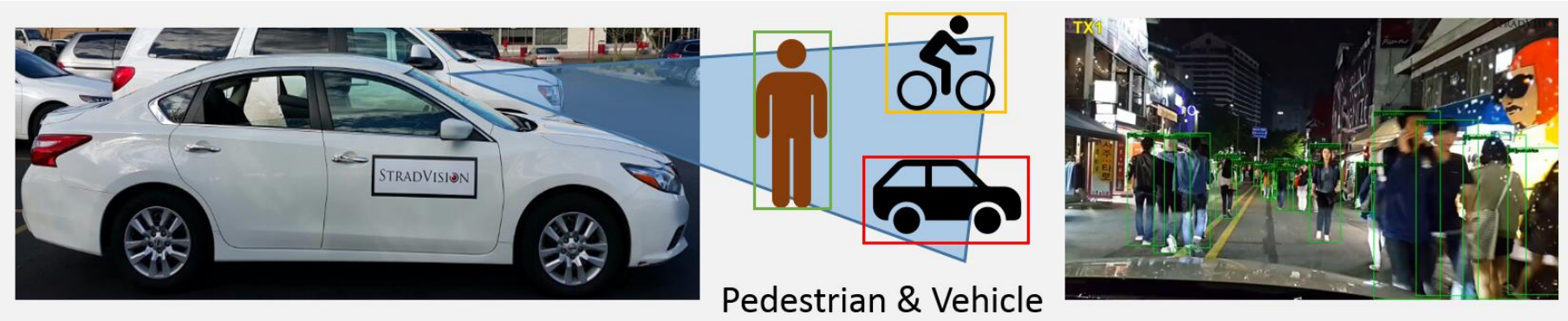
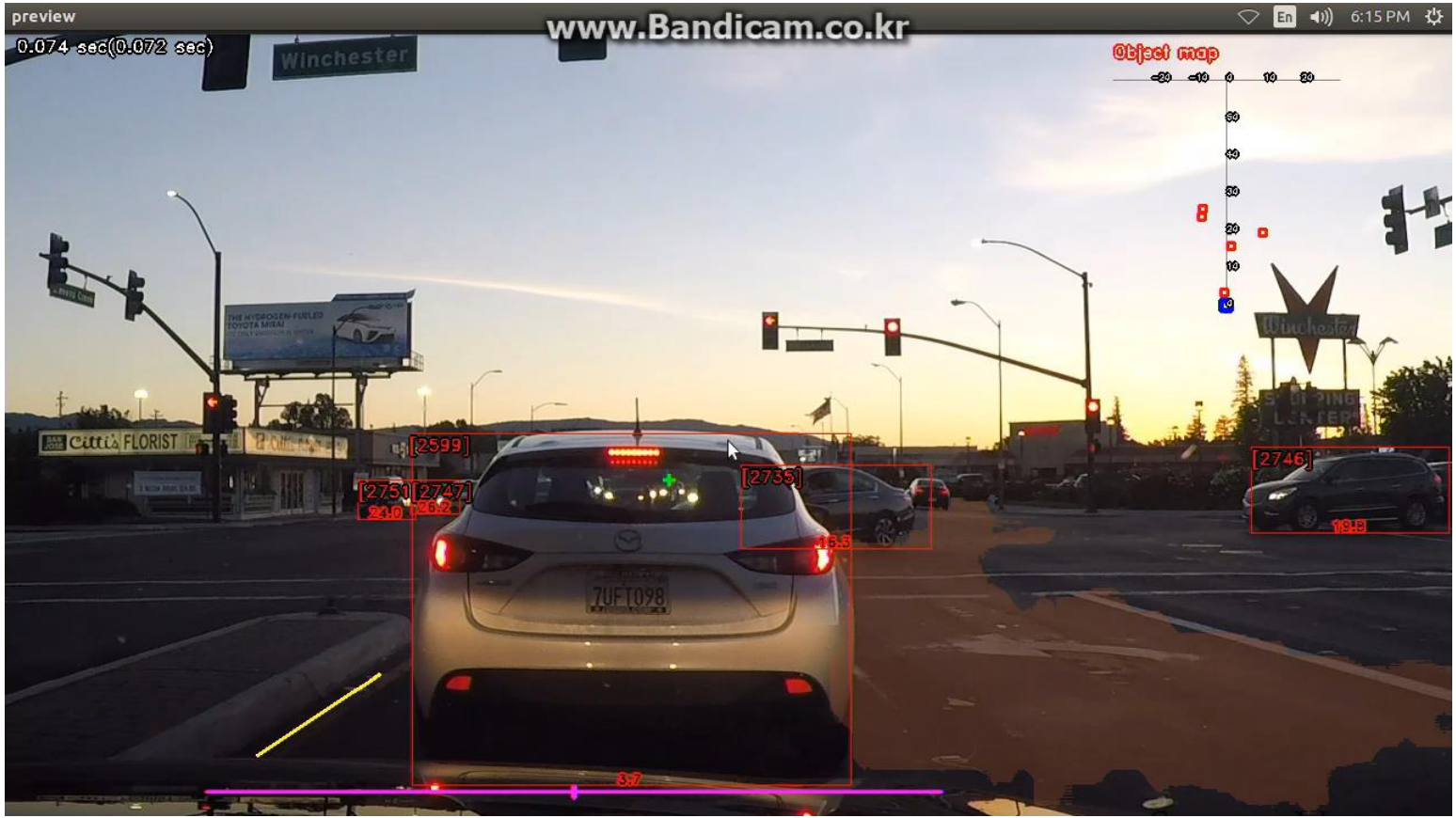
Object detection & classification for ADAS



- ✓Robust for Bad situations
- ✓Small object sizes
- ✓Robust for occlusion
- ✓Small model size

SVNet @ NVIDIA TX2



Please click
Icon for Video

Robust detection for various situations

Snow

Please click
Icon for Video

Night w/ Lamp

Please click
Icon for Video

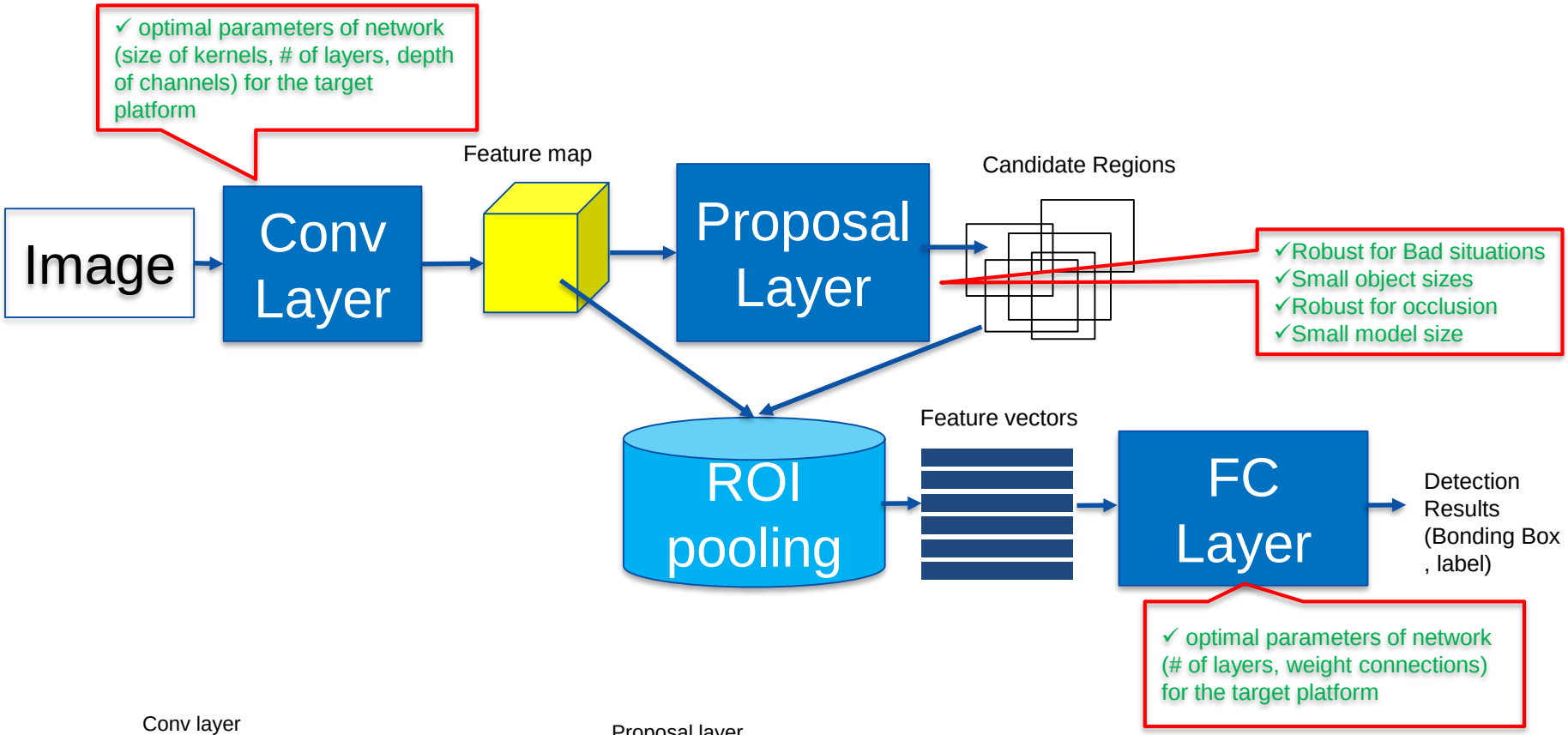
Rain

Please click
Icon for Video

Fog

Please click
Icon for Video

SVNet Algorithm Flow



Conv layer
: deep convolutional neural networks

Proposal layer
: multi-scale region proposal

FC layer :Fully Connected networks

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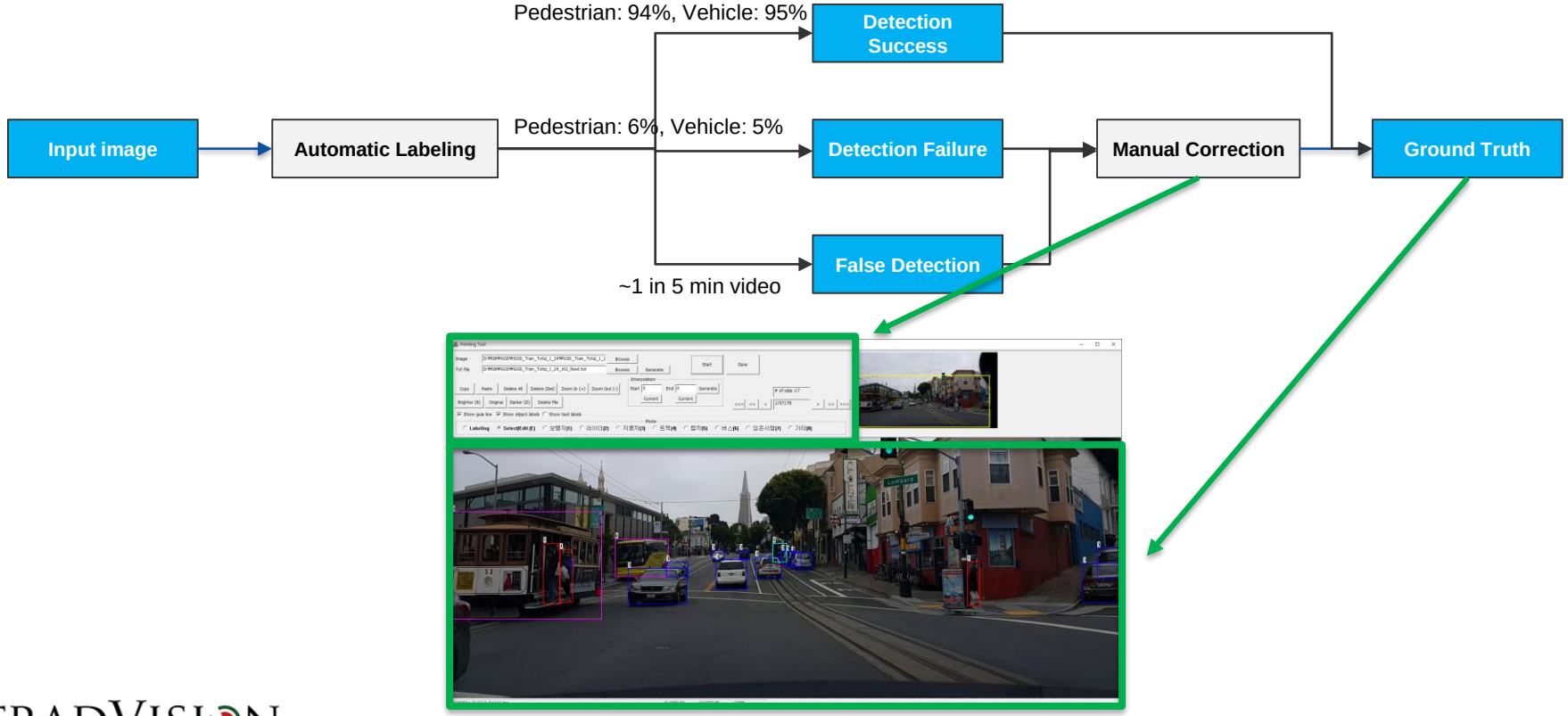
Labeling System

Manual Correction on 5% of the objects in input images



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How we use GPU (Titan X and GTX1080) for training

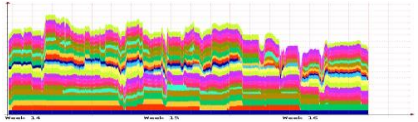
~3 hours → ~2 days → **~2 weeks** → ~2 months

Models
designed by human experts

Target H/W
where we measure speed to select candidates before training

GPUs
train candidate models & evaluate their accuracy

GPU utilization last month



Road Test

Start from
>50 prototypes

Pass ~30%

Pass <10%

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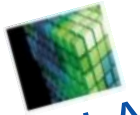
CuDNN framework

FP16 - HGEMM

cuDNN

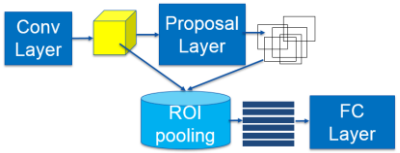


cuBLAS

FP16 Intrinsics

hadd hsub hneg hmul
hrcp hexp hgtu heq …

Lower memory bandwidth
Faster kernel execution



SVNet

NVIDIA TX2 (*)

(*) Image from https://devblogs.nvidia.com/parallelforall/jetson-tx2-delivers-twice-intelligence-edge/

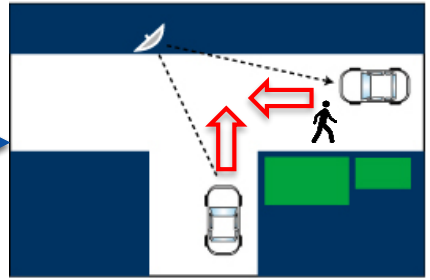
Customized Development Examples

Example: Collision Warning at Blind Corner using PD/VD on Curved Mirror

Input Scene

PD/VD on Input Scene other than the Curved Mirror

PD/VD on Curved Mirror Image



Collision Warning at Blind Corner

Publications

- **Local Decorrelation for Improved Pedestrian Detection**
- Woonhyun Nam, Piotr Dollár, and Joon Hee Han.
  Advances in Neural Information Processing Systems (NIPS), 27: 424-432, 2014.

- **Macrofeature Layout Selection for Pedestrian Localization and Its Acceleration Using GPU**
- Woonhyun Nam, Bohyung Han, and Joon Hee Han
  Computer Vision and Image Understanding (CVIU), *120: 46-58, 2014*

- **Canny Text Detector: Fast and Robust Scene Text Localization Algorithm**
- Hojin Cho, Myungchul Sung, Bongjin Jun,
- *2016 IEEE Conference on Computer Vision and Pattern Recognition (CVPR 2016), Las Vegas, USA, 2016 (to appear)*

- **Learning to Select Pre-trained Deep Representations with Bayesian Evidence Framework**
- Yong-Deok Kim, Taewoong Jang, Bohyung Han, Seungjin Choi
- *2016 IEEE Conference on Computer Vision and Pattern Recognition (CVPR 2016), Las Vegas, USA, 2016 (to appear)*

- **Scene Text Detection with Robust Character Candidate Extraction Method**
- Myung-Chul Sung, Bongjin Jun, Hojin Cho, Daijin Kim,
- *13th International Conference on Document Analysis and Recognition (ICDAR 2015), 2015.*

Plus 20+ papers @ major conference/journal from StradVision's algorithm engineers @ POSTECH

Automotive Product Roadmap

				2017								2018			
	Platform	Features	Camera	1M	2M	3M	4M	5M	6M	3Q	4Q	1Q	2Q	3Q	4Q
High Seg	NVIDIA PX2	PD/VD, LD, FSD	Frontal												
	NVIDIA TX2	PD/VD, LD, FSD	Frontal												
	NVIDIA TX1	PD/VD	Frontal												
Mid Seg		PD/VD	Frontal												
		PD/VD	Frontal												
		VD	Side												
		PD	Rear												
		PD/VD	Rear												
		PD/VD	AVM												
Low Seg	ARM	PCW, FCW, PD, VD, LD	Frontal												
	ARM	PD	Frontal												
	ARM	PD/VD	Frontal												
	ARM	POD	Internal												
Server	PC	PD/VD, Attributes	Frontal												
	PC	PD/VD, Attributes	Frontal												

Left edge = First Prototype; Right edge = Second Prototype

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Thanks for listening!

Any Questions / Comments, please contact contact@stradvision.com