

CDVA/VCM: LANGUAGE FOR INTELLIGENT AND AUTONOMOUS VEHICLES

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(Session: Advanced Image/Video Coding for Machine Vision)

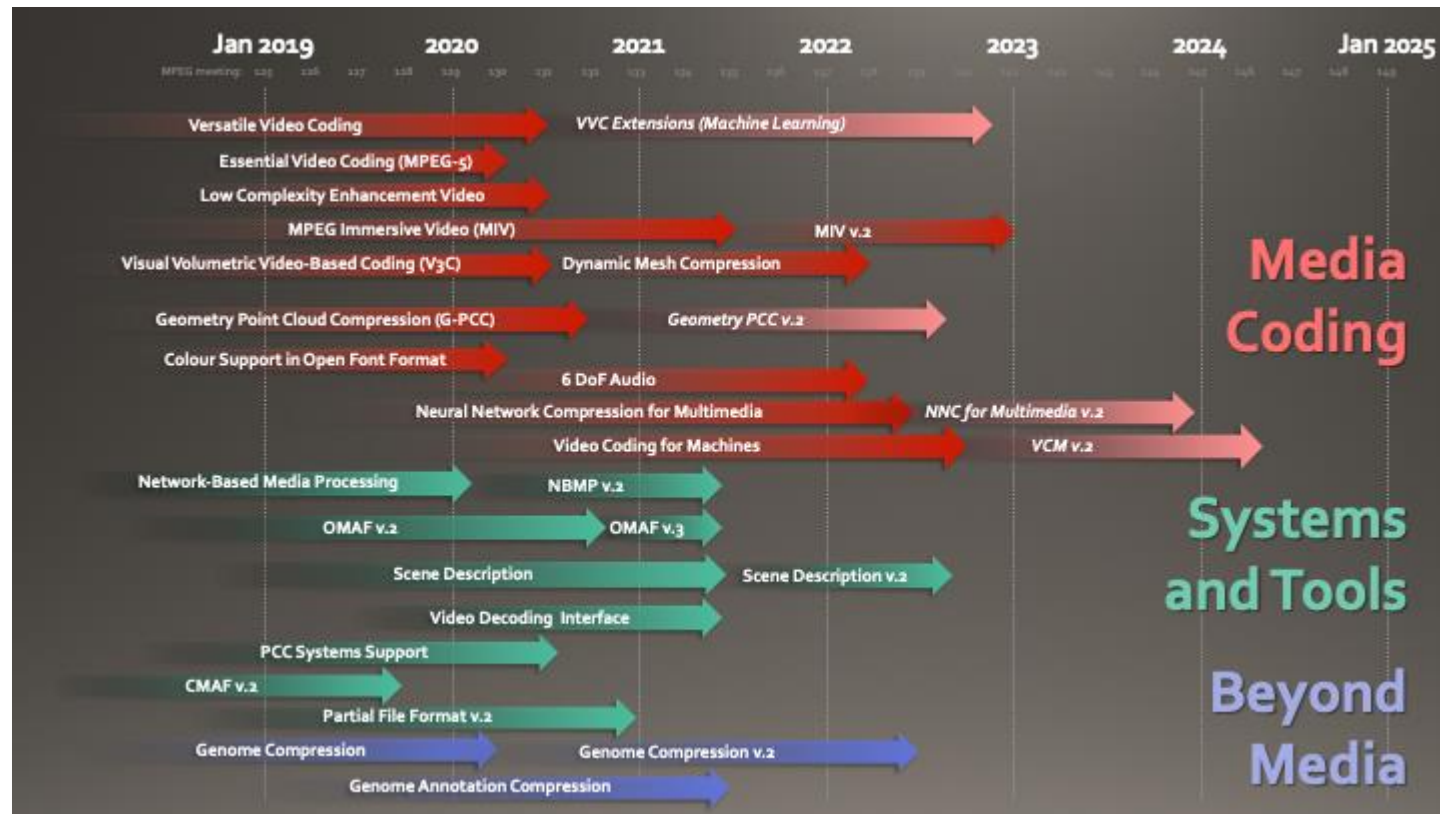
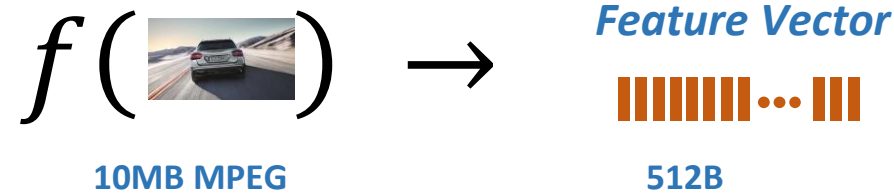
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Gyrfalcon Technology Inc.



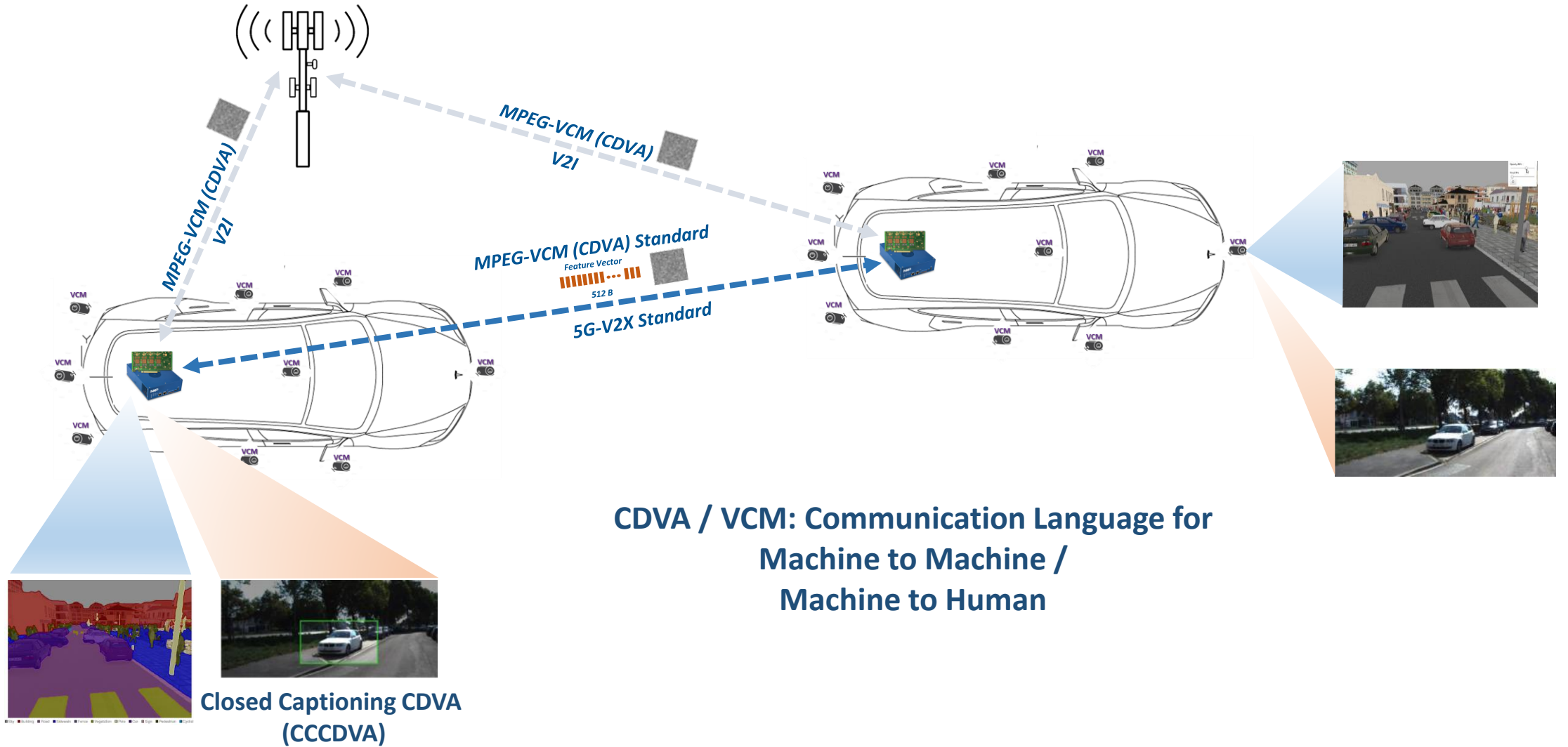
Video Coding for Machines (VCM)

VCM – Feature extraction & Compression → CDVA, SuperCDVA, CCCVDA, TiledCDVA, BayerCDVA (Smart Sensors)



← VCM

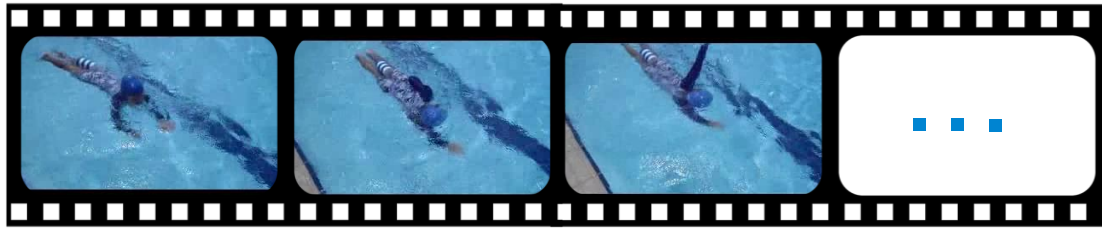
Robotic Vehicles - Cooperative V2X-VCM



**CDVA / VCM: Communication Language for
Machine to Machine /
Machine to Human**

Video Understanding v.s. Natural Language Understanding

Video Understanding interprets a sequence of frames



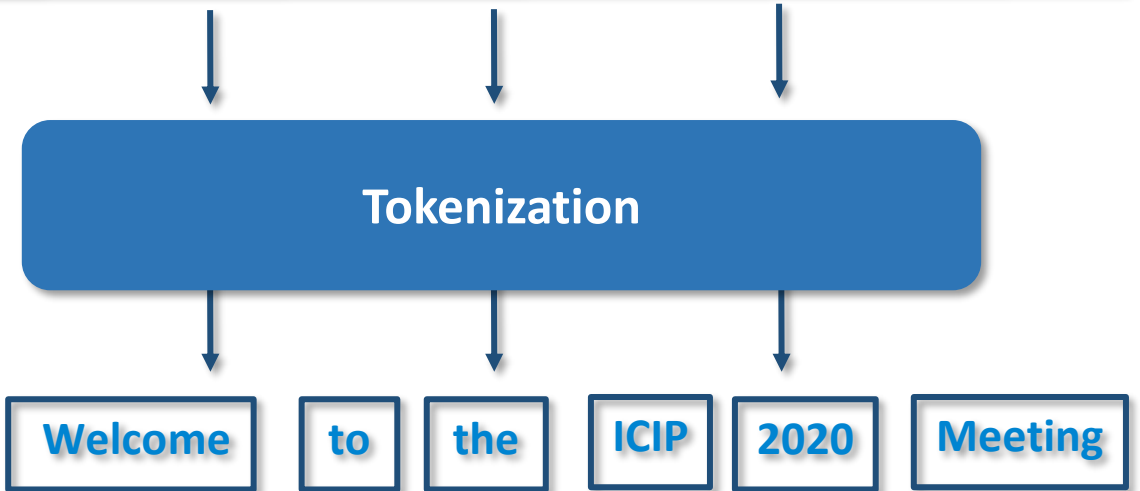
Compact Descriptor for Video Analysis (CDVA)



0.06, -0.1, 0.21, ... 0.19 -0.2, 0.15, 0.22, ... 0.11 0.14, -0.1, 0.13, ... 0.07

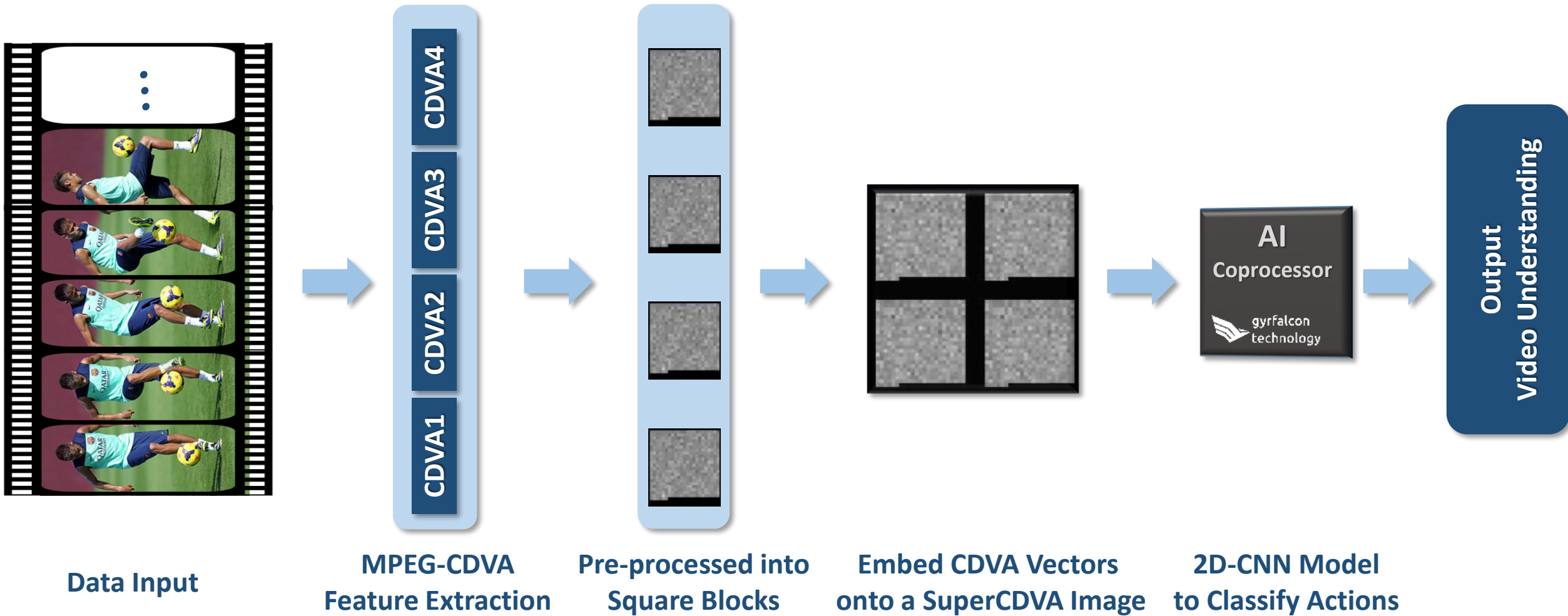
NLU interprets a sequence of words

Welcome to the ICIP 2020 Meeting ...

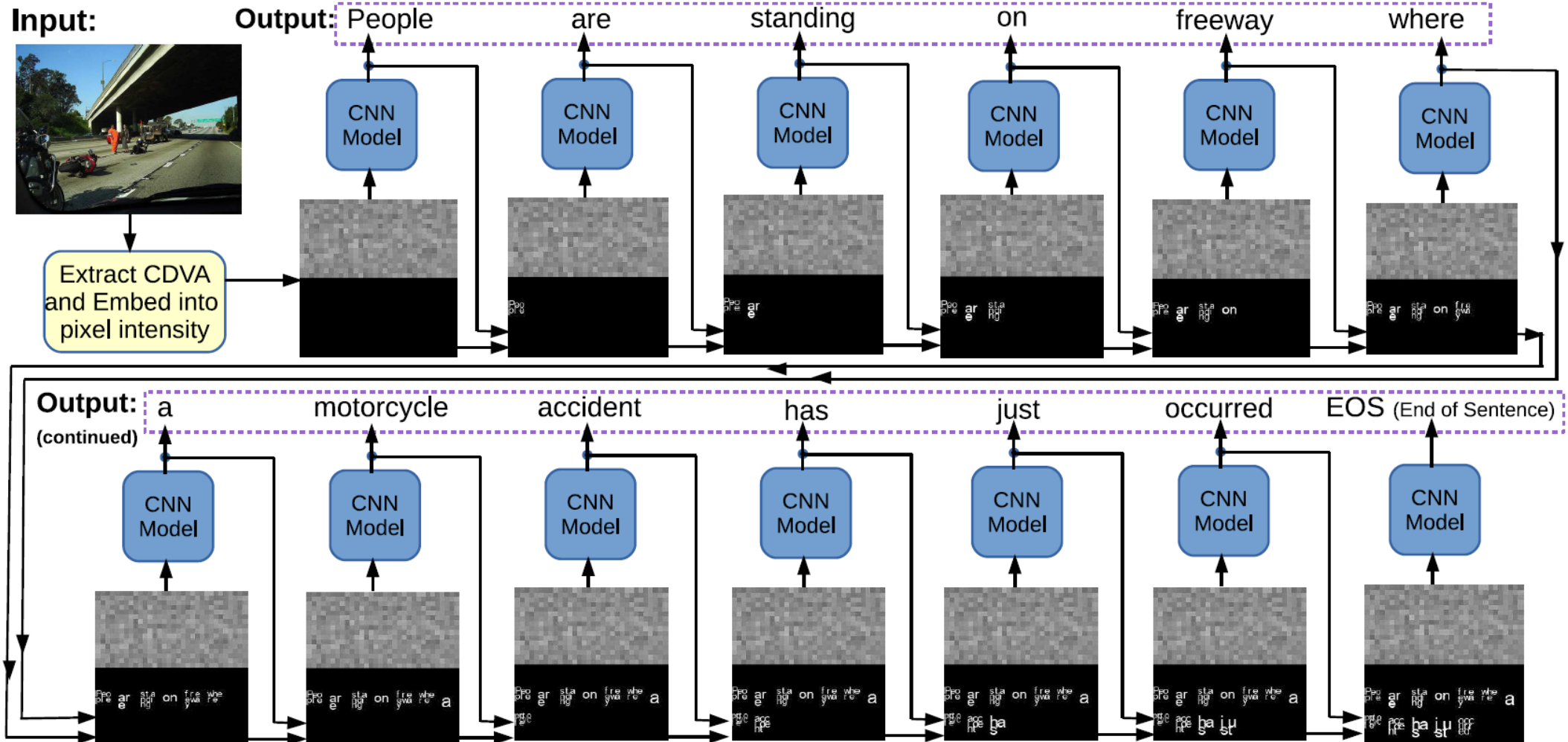


Welcome to the ICIP 2020 Meeting

Proposed SuperCDVA Workflow



Closed Caption CDVA (CCCDVA)



- 512 CDVA vector \rightarrow 16 x 32 (numbers) \rightarrow each entry 7x7 pixels \rightarrow 112 x 224 image \rightarrow 224 x 224 (combined embedded word & image)

Indoor / Outdoor Robotic Vehicles

- Robotic vehicles
 - ADAS, autonomous cars, security robot, warehouse robot, lawn mower, vacuum cleaner, ...



- Seven trips along the same trajectory collected
 - Six used for training and one for testing
- Video clips of continuous 64 frames labeled with the next action
 - “Go Forward”, “Turn Left”, and “Turn Right”
 - 64 frames @30FPS for 2sec

Super-CC.CDVA Indoor / Outdoor Navigation

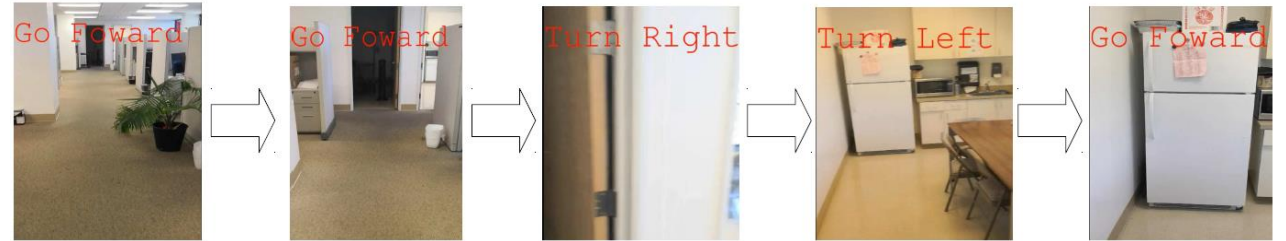
- Outdoor Navigation

- GnetFC model, response time 20ms for CNN chip
- Incorrect labels mostly at transition time from forward to turnings
- Test accuracy 94.3%



- Indoor Navigation

- Resnet50
- Test accuracy 96.5%



| Datasize | Foward | Left | Right | Accuracy |
|-----------------|---------------|-------------|--------------|-----------------|
| Outdoor Train | 12,937 | 1,739 | 2,683 | 98.3% |
| Outdoor Test | 1,707 | 278 | 631 | 94.3% |
| Indoor Train | 3,460 | 236 | 427 | 100% |
| Indoor Test | 536 | 50 | 77 | 96.5% |

SuperCDVA for Indoor / Outdoor Applications

Autonomous Driving



Lane Change Detection



Indoor Navigation



Video Understanding

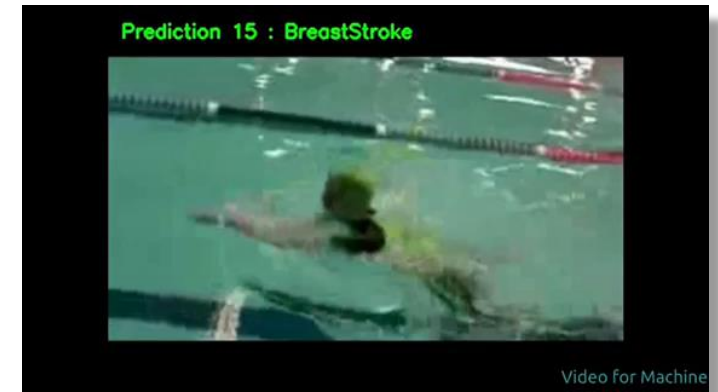


Image Captioning



Input Image



"A boy in a green striped shirt is running through the sand"

Output Caption



gyrfalcon
technology

Thank You!

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