Cars* are getting smarter ...

(*) Car Computers
Today’s Computer Vision Pipeline

Data Gathering
- Petabytes of video
- 10,000 hours of video
- 100 thousands of images

Pre-Processing

Off-line Training
- Positive and Negative samples
- Data Crunching
- Decision Tree

Object Detection
- Image Processing
- Detection
- Visualization

**Offline**

**Real-time**
VisionWorks

- Highly accelerated Vision primitives
- Framework
  - Assemble primitives, efficient pipelining
  - Memory access optimizations, locality
  - Schedule across different HW modules
  - Multimedia and graphics access abstraction
- Set of sample pipelines
- Training tools for classifiers
  - Speedup by desktop GPU
VisionWorks Software Stack

Application Code
- Sample Pipelines
- Feature Tracking
- SLAM

VisionWorks Framework
- Classifier
- Corner Detection

OpenVX

CUDA

Tegra/Kepler dGPU
Example : Feature Tracking

VisionWorks

Grab
- OpenCV Framesource
- NVMedia

Find
- Harris corners

Track
- Pyramidal Lucas-Kanade

Display
- OpenCV imshow
- OpenGL
Feature Tracking Speedup

Speedup (x) GPU vs ARM code on Tegra TK1*

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Maxwell The Most Advanced GPU Ever Made

5 TFLOPS 2048 Cores
One is a photo,
One is CG ...
Evolution

Driver

Software Designer

Self Learning Machines
Questions?