VCA for live and/or recorded video

The VCA may be applied to live or recorded video.

It may **take some time** to process large recorded material.

Once processed though, the search would be quick, as the results are stored as metadata in a database.

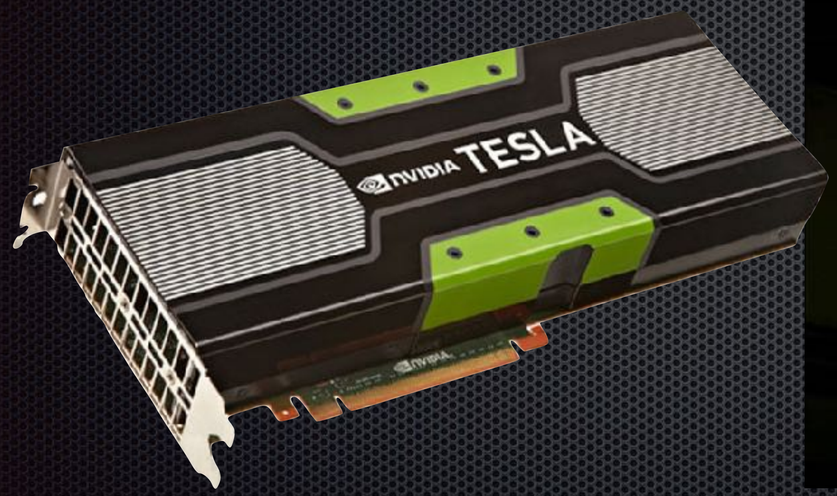
Example (live): large casino system, traffic accidents control,…

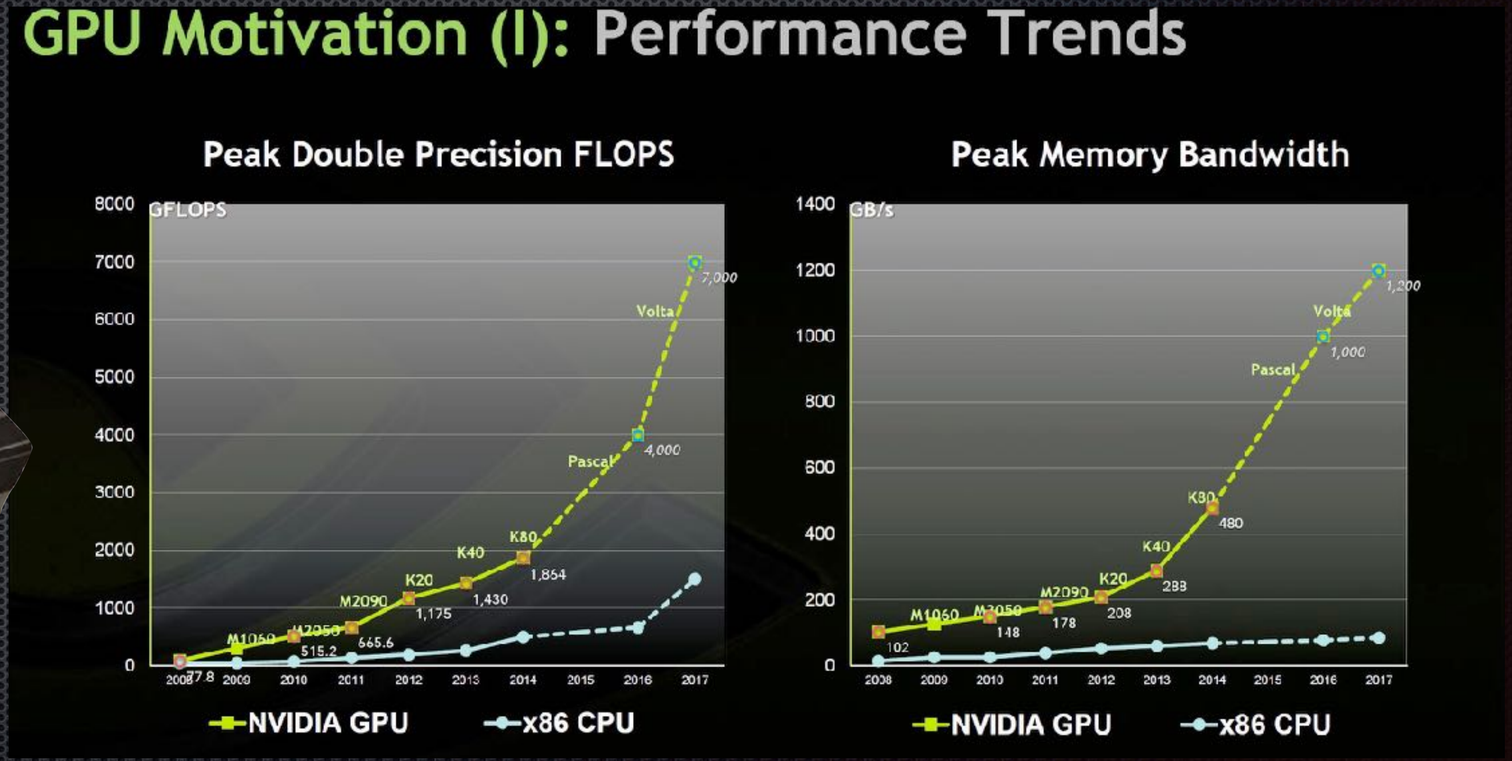
Example (recorded): slip and fall incidents in shopping centres; break in and enter, stolen car, etc…

VCA requires heavy image processing

Deep-learning algorithms are more efficient and quicker when using more processing power = CPU + GPU.

FLOPS =
Floating Point Operations per second



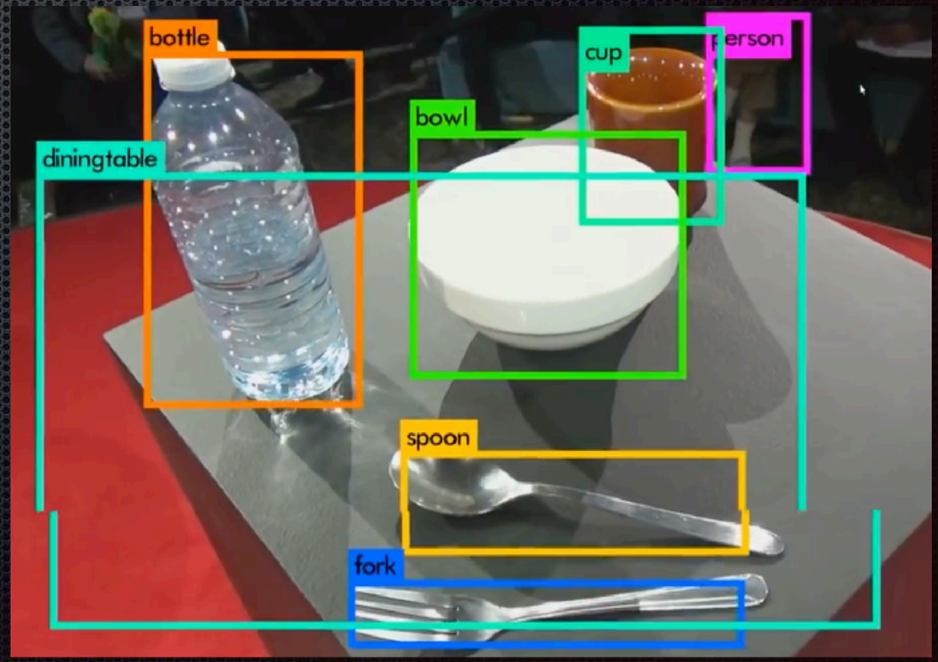


High inference accuracy

A deep learning algorithm can be **trained to quickly solve complex problems with high accuracy**, providing it learned from a large amounts of input data.

Once a neural network is trained, it can be deployed and used to identify and classify objects or patterns in a process known as *inference*.

Although **algorithmically simple**, the learning and training needs a lot of CPU + GPU power, and constantly improves by referencing to the "Ground truth".

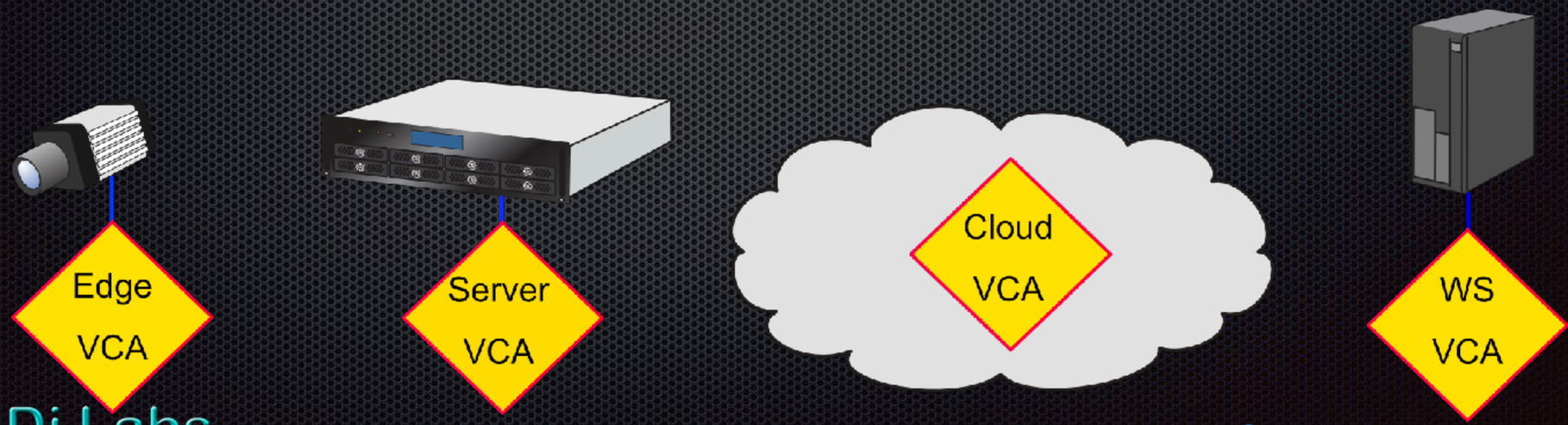


VCA executed in various locations…

If VCA is chosen to be performed by the CCTV recording server, **large chunks of the CPU power** will be engaged for this purpose (VCA).

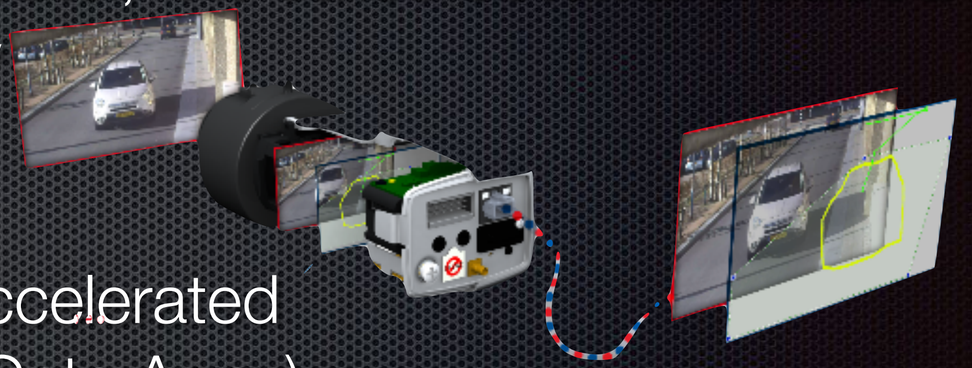
The **maximum number** of streaming channels a server may record **will get reduced** due to VCA activity on the server.

Also, VCA at the camera could be considered, or VCA in the cloud, by external processors, or even the viewing client (workstation).



Software or hardware based analytics ?

If the VCA runs in the VMS software of a computer, it is called **software based analytics**. Computer performance can greatly vary, but such VCA is easily **upgradeable**.



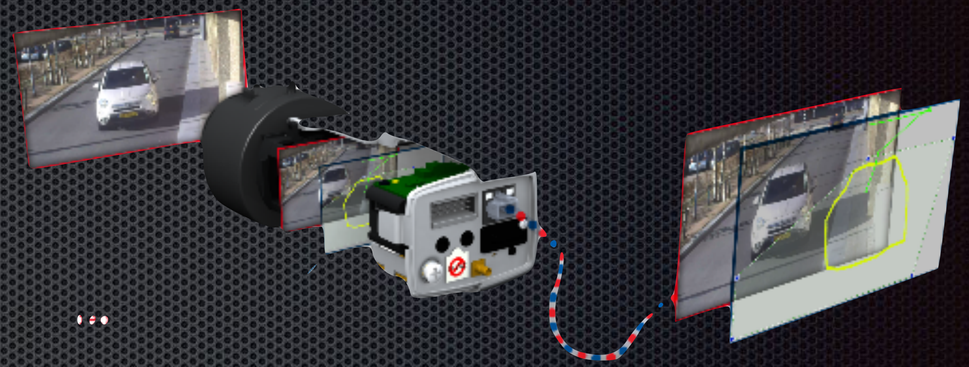
VCA may also run on a dedicated hardware accelerated processor called **FPGA** (Field Programmable Gate Array), specifically designed for the VCA. **This is hardware based analytics.**

FPGA is an **integrated circuit designed** to be programmed by a customer or a designer after manufacturing – hence “field-programmable".
FPGAs programmable logic blocks are executed with the same speed as they don’t depend on the OS or CPU. Since they do nothing else but what they are programmed to so - they are dedicated and **fast**.

Can I design my own VCA ?

Yes.

Some manufacturers allow users to create their own algorithms for VCA.



...

Others, give you a bunch of pre-programmed analytics in the camera to choose from.

You would typically pay a licence depending upon what do you want to use.

It is very important to consider extracting such a VCA information from a camera, i.e. it's interoperability.

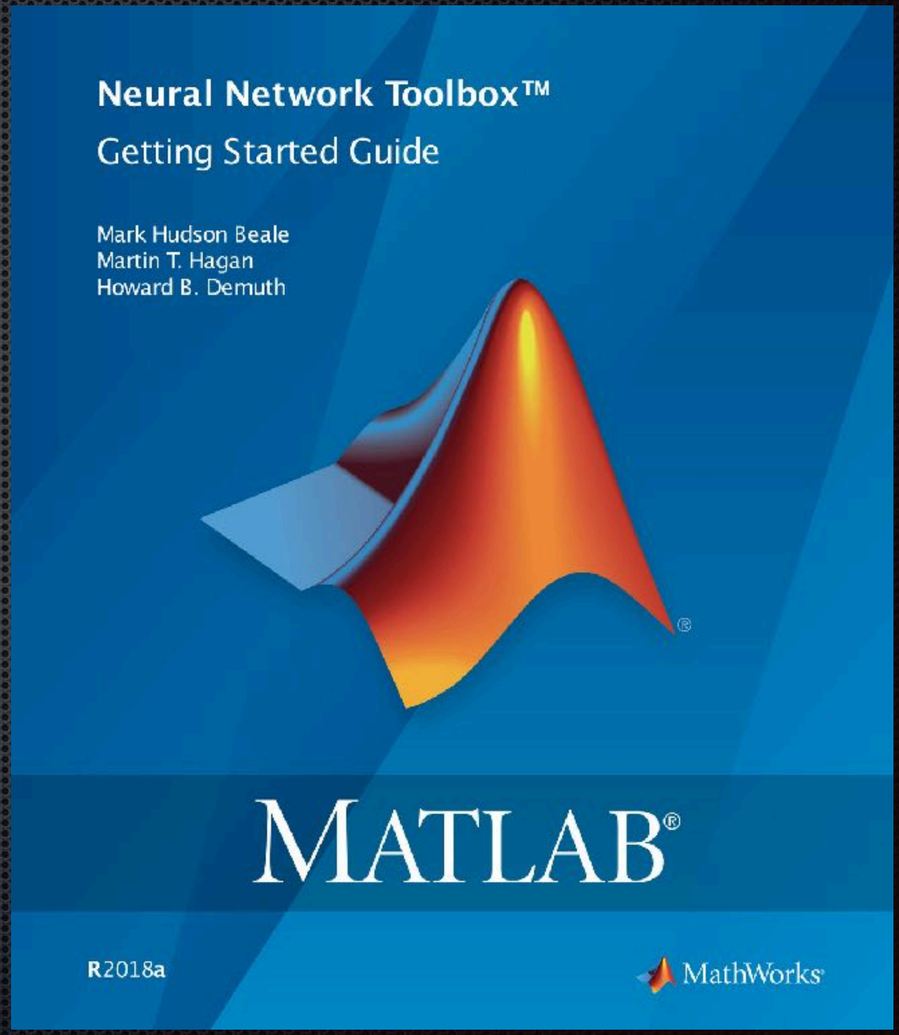
Maths is in the foundation

Mathematics is in the foundation of all Deep Learning algorithms.

MatLab from MathWorks is a popular software that delivers various deep learning algorithms.

It is also used to teach developers.

Many developers use Matlab's library of programming codes for various VCA.



How intelligent?

How intelligent can the VCA be?

It depends on the smartness of the analytic algorithm, which depends on the programmers creativity.

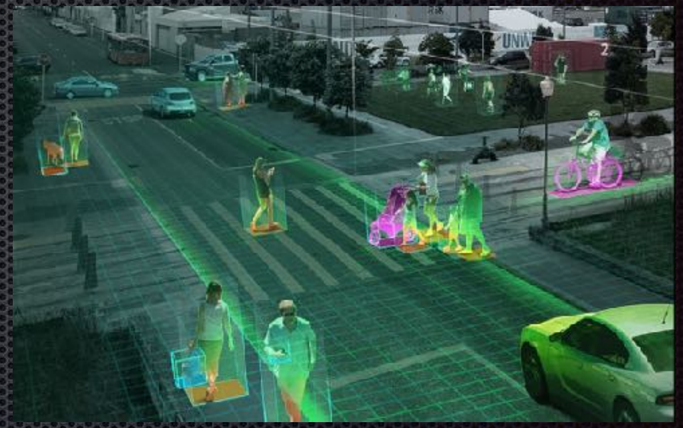
Initially, we are happy to get **objects** or **actions** recognised, but eventually we will come to a stage of recognising complete **scenarios**.

For CCTV - **even a little help is better then no help at all**.

In some cases in surveillance it is sufficient to draw the operators attention to what might seems to be a street fight for example, but let the operator decide based on what he sees => **situational awareness**.

Current VCA uses in CCTV

These are some of the many specific uses of VCA today:



- Face Identification
- Licence Plates Recognition
- Line crossing and direction
- Counting and speed detection (people/vehicles)
- Loitering
- Abandoned object (appearance and disappearance)
- Object classification (people, animals, cars, trucks, busses…)
- People fighting or running
- Heat mapping (Areas of higher attendance)
- Money and playing cards recognition
- User defined/specified

Video quality - still the most important

In all VCA applications, the camera and its video signal play the most important role. **Without a good video - no good VCA is possible.**

- Pixel density for the required identification.
- Sensor size (pixels)
- Optical quality (f & f-stop, resolution, distortions,…)
- Frames per second
- S/N & DR
- Electronic shutter / exposure
- Video/image format
- Light conditions
- Camera position (distance, height, tilt, …).
- Reference image or condition to match.

Camera testing, optimisation and certification

The Outputs (Actions) expected from a VCA

In order for the VCA to be useful, it needs to produce some kind of **output** or initiate **action**.

Depending on the VCA type and purpose, there could be several outputs:

- Spot monitor/alarm activation
- Physical relay switch
- PTZ preset or tracking
- Motor or sensor actuation
- Software alarm/notification
- E-mail/SMS notification
- Data-base update
- Spread-sheet (csv) table

The VCA process flow