



Machine Learning in Intelligent Visual Analytics



Albert Alexander

CEO - Founder

Glueck Technologies



Google unleashes deep learning tech on language with Neural Machine Translation

Posted Sep 27, 2016 by Devin Coldewey

The resulting system is highly accurate, beating phrase-based translators and approaching human levels of quality. You know it has to be good when Google just deploys it to its public website and app for a difficult process like Chinese to English.

Long Short Term Memory RNN

Google claims its 'FaceNet' system has almost perfected recognising human faces - and is accurate 99.96% of the time

In the paper, titled 'FaceNet: A Unified Embedding for Face Recognition and Clustering', Google claims the system achieved nearly 100-percent accuracy rate on the facial recognition dataset Labeled Faces in the Wild.

CNN

Microsoft's speech recognition system hits a new accuracy milestone

Posted Aug 20, 2017 by Catherine Shu (@catherineshu)

Microsoft announced today that its conversational speech recognition system has reached a 5.1% error rate, its lowest so far. This surpasses the 5.9% error rate reached last year by a group of researchers from Microsoft Artificial Intelligence and Research and puts its accuracy on par with professional human transcribers who have advantages like the ability to listen to text several times.

Bidirectional Long Short Term Memory RNN

The Revolutionary Technique That Quietly Changed Machine Vision Forever

This was the first time that a deep convolutional neural network had won the competition, and it was a clear victory. In 2010, the winning entry had an error rate of 28.2 percent, in 2011 the error rate had dropped to 25.8 percent. But SuperVision won with an error rate of only 16.4 percent in 2012 (the second best entry had an error rate of 26.2 percent). That clear victory ensured that this approach has been widely copied since then.

CNN

Deep Learning



- In 1980s ,Kunihiko Fukushima proposed a hierarchical, multilayered artificial neural network called Neocognitron which inspired the convolution operation in modern CNN.

Then why now since 2012?

- Availability of massive data due to social networking, IOT devices and so on.
- Increased computing power due to parallel computing technology like GPUs.
- Improvement in network architecture and learning algorithm.

Fukushima: "Neocognitron: A self-organizing neural network model for a mechanism of pattern recognition unaffected by shift in position", Biological Cybernetics, 36[4], pp. 193-202 (April 1980).

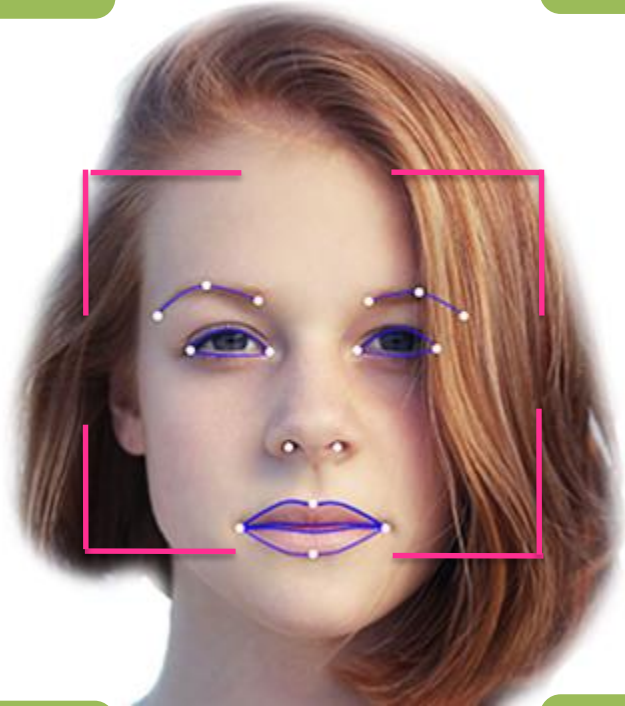
Srinivas, S.; Sarvadevabhatla, R. K.; Mopuri, K. R.; Prabhu, N.; Kruthiventi, S. S. S. & Babu, R. V. A Taxonomy of Deep Convolutional Neural Nets for Computer Vision CoRR, 2016, abs/1601.06615

What we do?



Gender
Female

Face Identification
Unique ID



Emotions
Neutral

Age Group
Young Adult

Emotions
Neutral, Sad, Happy, Surprise,
Contempt, Angry, Fear and Disgust

Face Identification
Unique ID

Gender
Male or Female

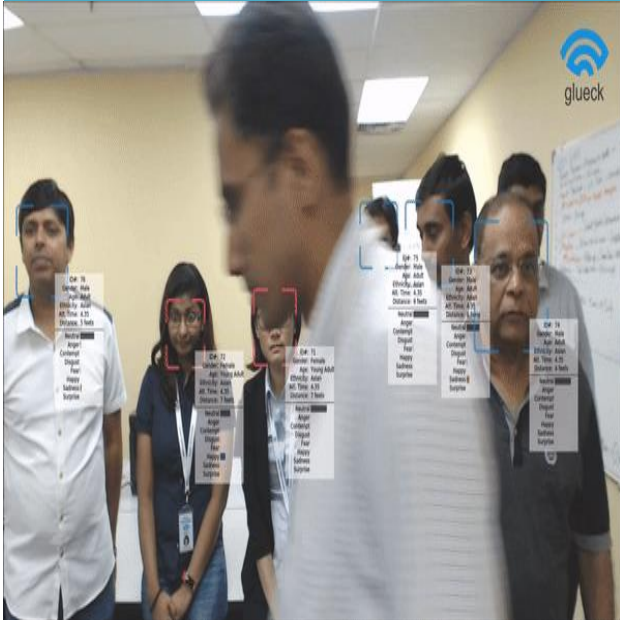
Age Group
Child, Young Adult, Adult, Senior

Face Analysis for Retail Industries

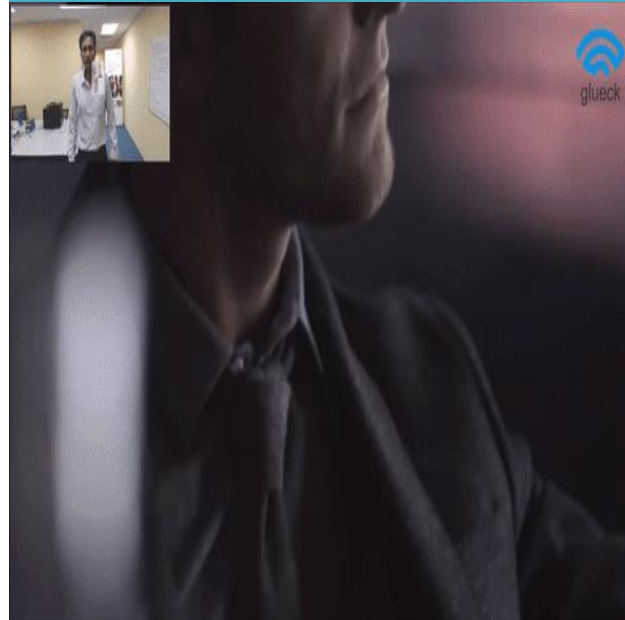
How do machines understand & perceive the environment around us?



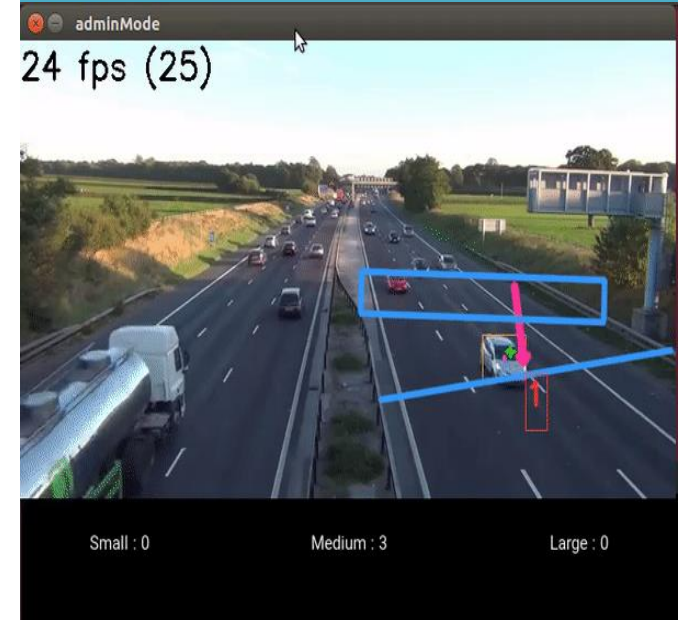
Glueck Analytics



Glueck Media



Glueck Traffic



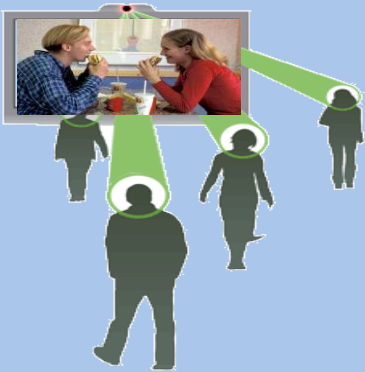
Any Time – Any Place – Real Time

Glueck Media

Delivers media on rule based audience demographics and/or emotions



Inference

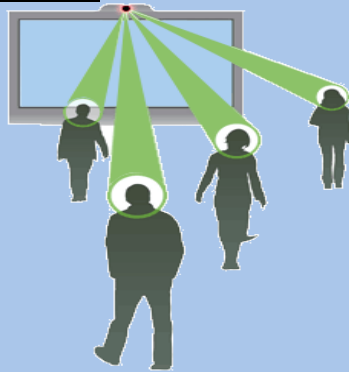


Glueck Analytics

Measures audience demographics, emotions, OTS and dwell time

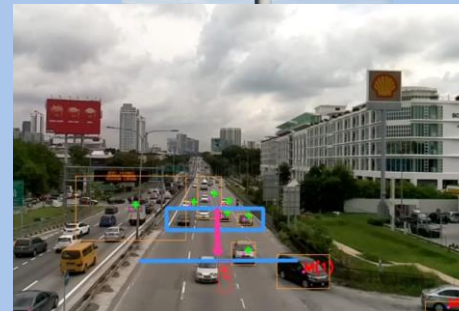


Inference



Glueck Traffic

Measures the traffic and vehicle classifications like Truck, Car and Motor Cycle.

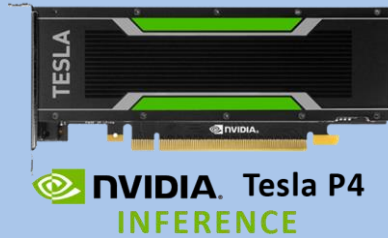


Analytics done at cloud Infrastructure



Glueck Customer Experience

Delivers insights about your customers and business.



Measures Customers' Demographics.



Analyses the number of daily visitors.



Measures customers' facial Emotions.



Track Productivity by monitoring daily visitors served.



Analyze the trend for all above attributes in terms of Peak Hour, Peak Day, Peak Week and Peak Month.



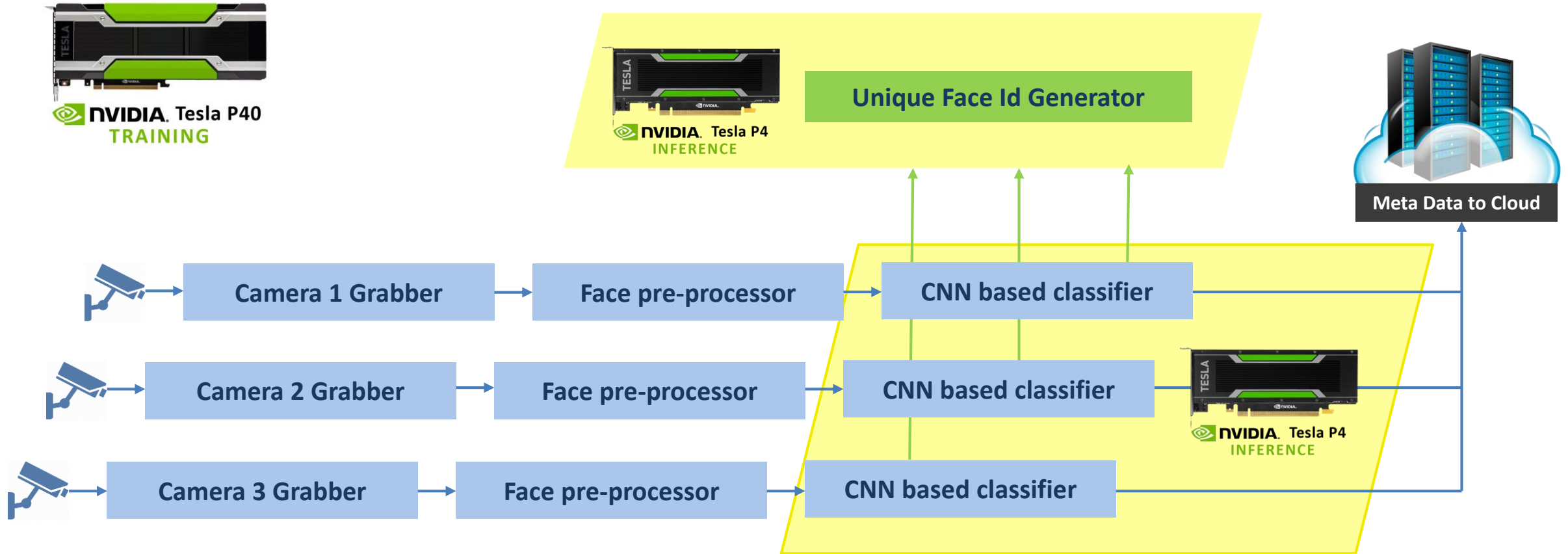
Giving all the above attributes as reports



Glueck CE at POS Counter

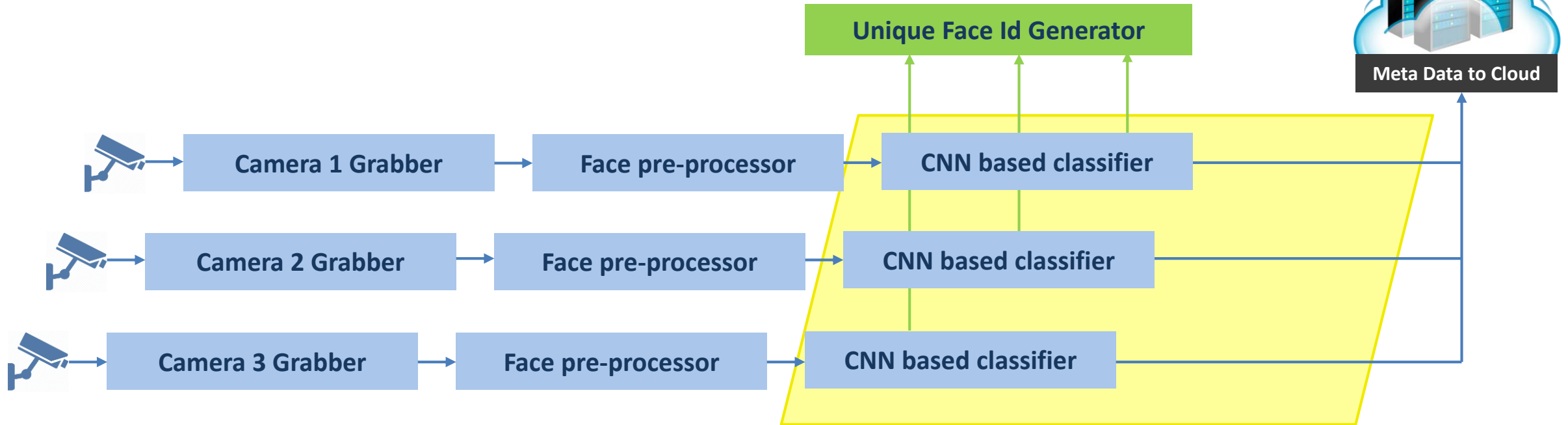
Glueck Customer Experience

- All DNN models of our products are trained using Tesla P40.



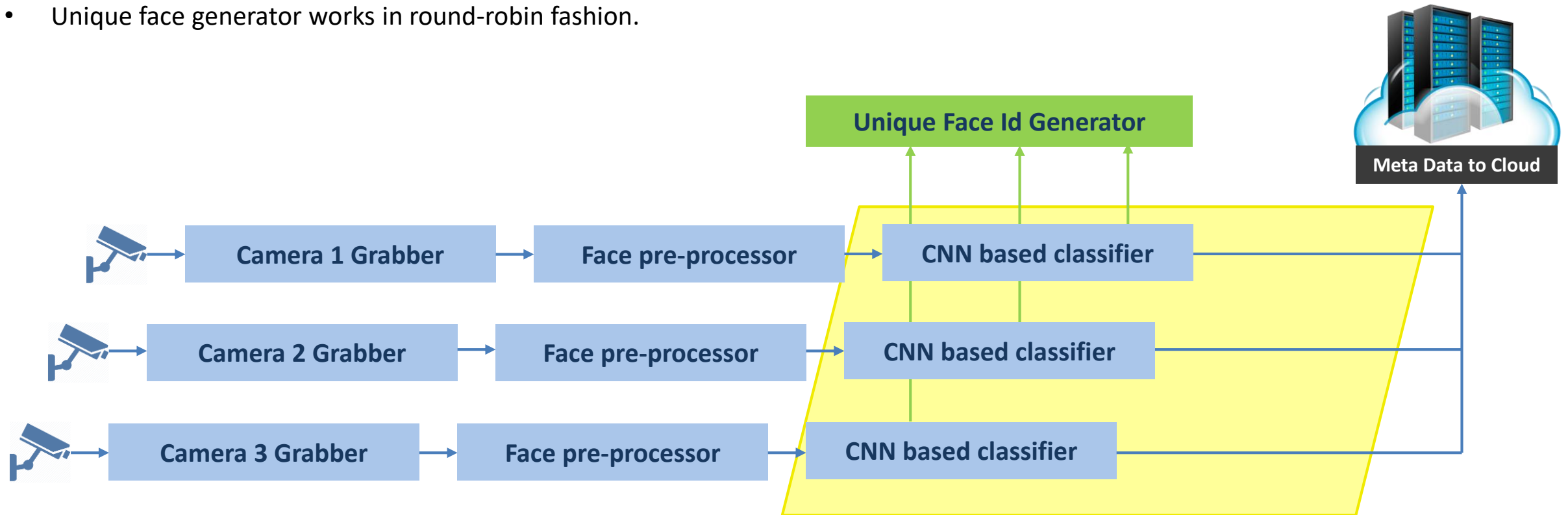
Glueck Customer Experience

- Classifier uses Deep Learning CNN for each classification type such as **gender, emotion and age group for each face in the scene.**
- Each Camera has one instance of pipeline with classifier.
- **Unique face ID Generator** uses DL as well.



Glueck Customer Experience

- If 5 faces in a scene, 15 classifiers are executed and frames are processed continuously.
- Using NVidia's P4, we are able to run up to 12 channels with unique face ID generator.
- Unique face generator works in round-robin fashion.



Glueck Customer Experience

- See the output for 10 channels.
- Volatile GPU Utilization went up to max of 17% and GPU memory usage is 74.19%.



```
glueckce@glueckce:~$ nvidia-smi
+-----+-----+-----+-----+-----+-----+-----+-----+
| GPU   | Name      | Persistence-M| Bus-Id  | Disp.A | Volatile Uncorr. ECC |
| Fan   | Temp      | Perf         | Pwr:Usage/Cap| Memory-Usage | GPU-Util  | Compute M. |
+-----+-----+-----+-----+-----+-----+-----+-----+
| 0     | Tesla P4  | Off          | 00000000:08:00:00ff | 5643MiB / 7686MiB | 8%      | Default    |
+-----+-----+-----+-----+-----+-----+-----+-----+
                                Upto 17%
```

```
Processes:
GPU      PID  Type  Process name      GPU Memory Usage
-----
0        11435 C      python             107MiB
0        16185 C      ./MultiFaceClassifier 552MiB
0        16247 C      ./MultiFaceClassifier 552MiB
0        16306 C      ./MultiFaceClassifier 552MiB
0        16365 C      ./MultiFaceClassifier 552MiB
0        16424 C      ./MultiFaceClassifier 552MiB
0        16483 C      ./MultiFaceClassifier 552MiB
0        16544 C      ./MultiFaceClassifier 552MiB
0        16616 C      ./MultiFaceClassifier 552MiB
0        16686 C      ./MultiFaceClassifier 552MiB
0        16751 C      ./MultiFaceClassifier 552MiB
```

Glueck Customer Experience

- See the output for 12 channels.
- Volatile GPU Utilization went up to max of 24% and GPU memory usage is 88.73%.
- Still there is a room for accommodating more channels since GPU utility is relatively low with our current version.
- We are exploring **DeepStream SDK** to support a higher of number of channels than currently supported.



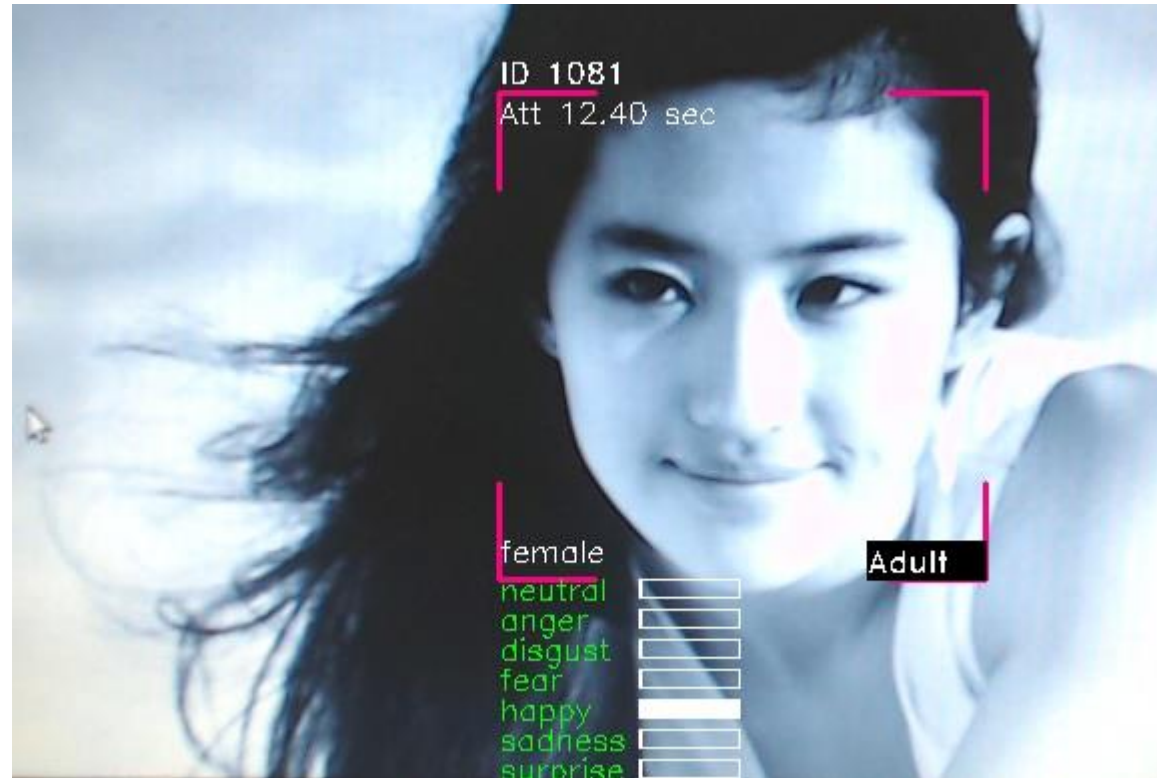
```
glueckce@glueckce: ~
-----
0 Tesla P4 Off 00:00:00:08:00.0 Off 0
N/A 47C P8 28W / 75W 6749MiB / 7696MiB 14% Default
-----
Upto 24%
Processes:
GPU PID Type Process name GPU Memory Usage
-----
0 14251 C python 107MiB
0 19116 C ./MultiFaceClassifier 552MiB
0 19180 C ./MultiFaceClassifier 552MiB
0 19239 C ./MultiFaceClassifier 552MiB
0 19298 C ./MultiFaceClassifier 552MiB
0 19357 C ./MultiFaceClassifier 552MiB
0 19417 C ./MultiFaceClassifier 552MiB
0 19481 C ./MultiFaceClassifier 552MiB
0 19552 C ./MultiFaceClassifier 552MiB
0 19619 C ./MultiFaceClassifier 552MiB
0 19692 C ./MultiFaceClassifier 552MiB
0 19767 C ./MultiFaceClassifier 552MiB
0 19826 C ./MultiFaceClassifier 552MiB
-----
```

Glueck Analytics

- Glueck Analytics is ported to **Tegra TX** platform.
- Uses **Tensor RT** for DL based classification.
- Getting up to 7 FPS based on number of faces available in the scene.

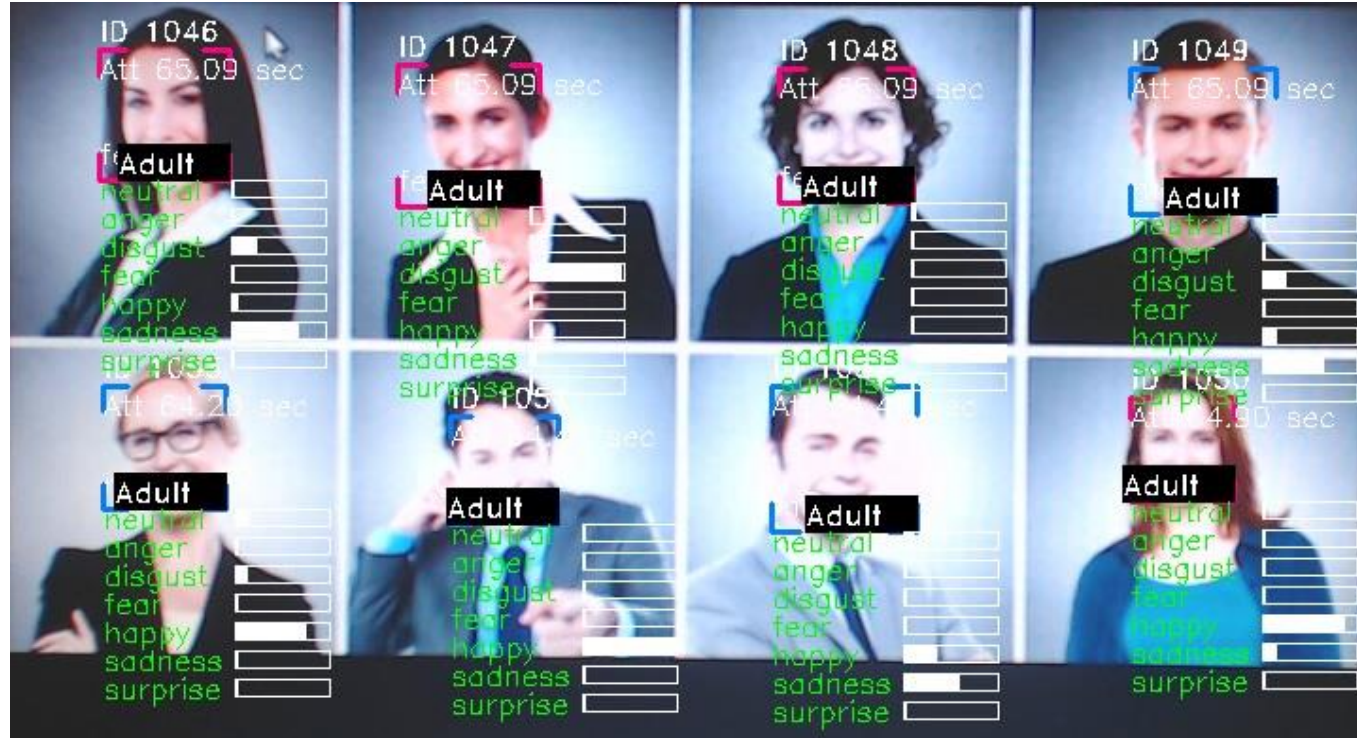
Glueck Analytics

It is capturing one face.



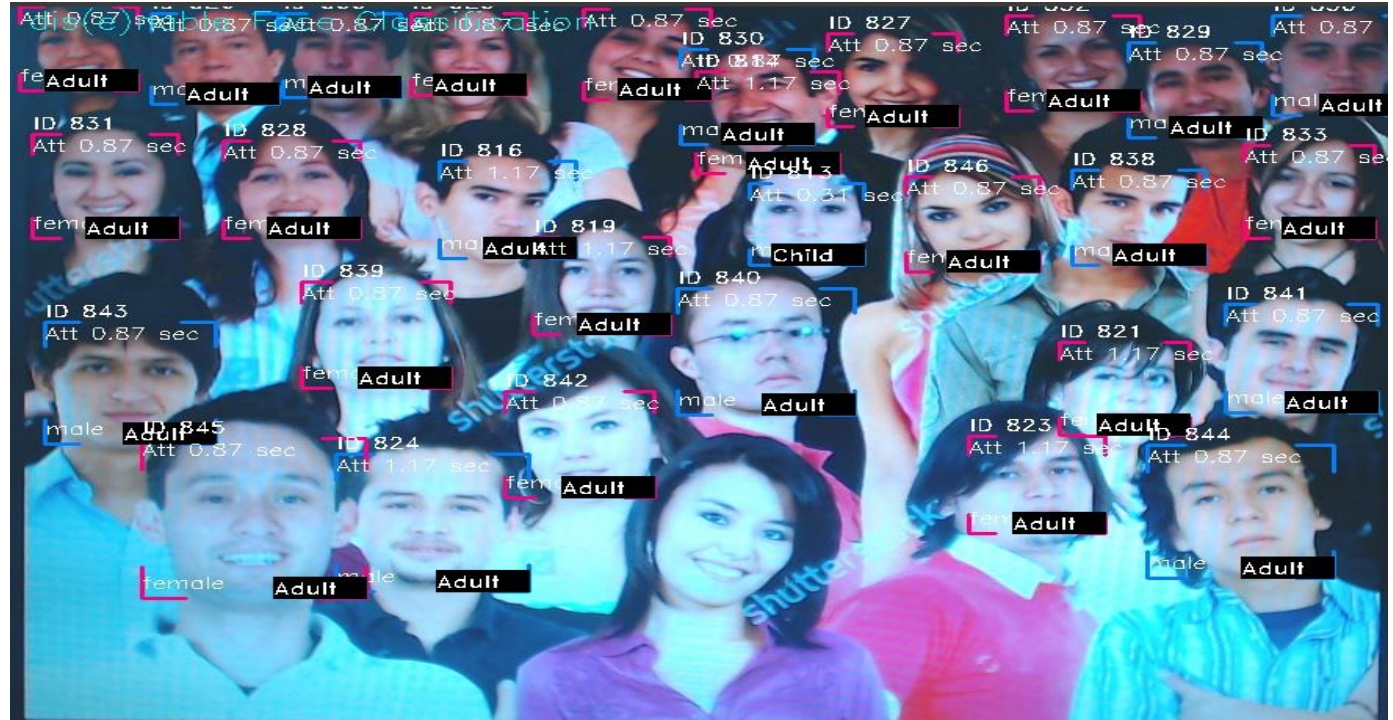
Glueck Analytics

At the same time it is capturing 8 faces simultaneously.



Glueck Analytics

At the same time it is capturing almost 25 faces simultaneously



Our Key Takeaway?



- Yes, DL is giving impressive result even though it is black box.
- Using latest P40, Our model training is accelerated 2x faster with 10x increase in training set images.
- **NVIDIA's Tegra** embedded platform enables us to achieve production deployment of highly intensive computing task such as DL classifier up to 7FPS at edge with small footprint and less cost.
- **Tesla P4** card makes our **Glueck Customer Experience** more scalable.
- Tesla P4 card makes possible to scale our **Glueck Customer Experience** deployed at Binus University's Ai R & D Centre in Jakarta



Thank you



Our Headquarters

Glueck Technologies

1 Tech Park, Bandar Utama,
47800 Petaling Jaya,
Malaysia.

Contact

Alberrrt Alexander

Phone

+6012 2082317

Email

alberrrt@gluecktech.com



<https://www.facebook.com/gluecktech/>



@gluecktech



linkedin.com
Glueck Technologies

www.gluecktech.com