TF Dev Summit 2018 Recap

Tianjin GDG

linsong

Google Developers Experts 2017

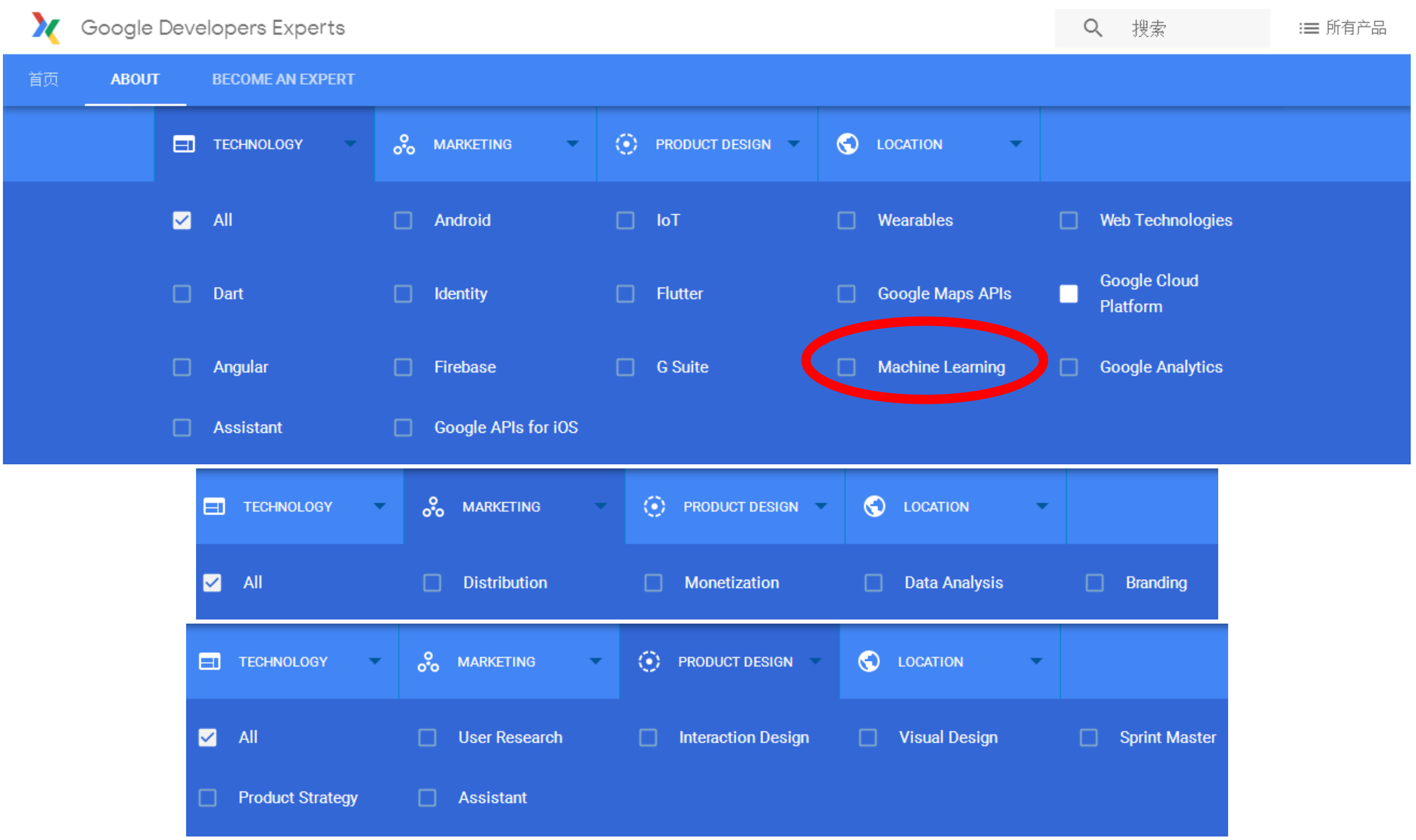
Machine Learning GDE

GDE了解一下？

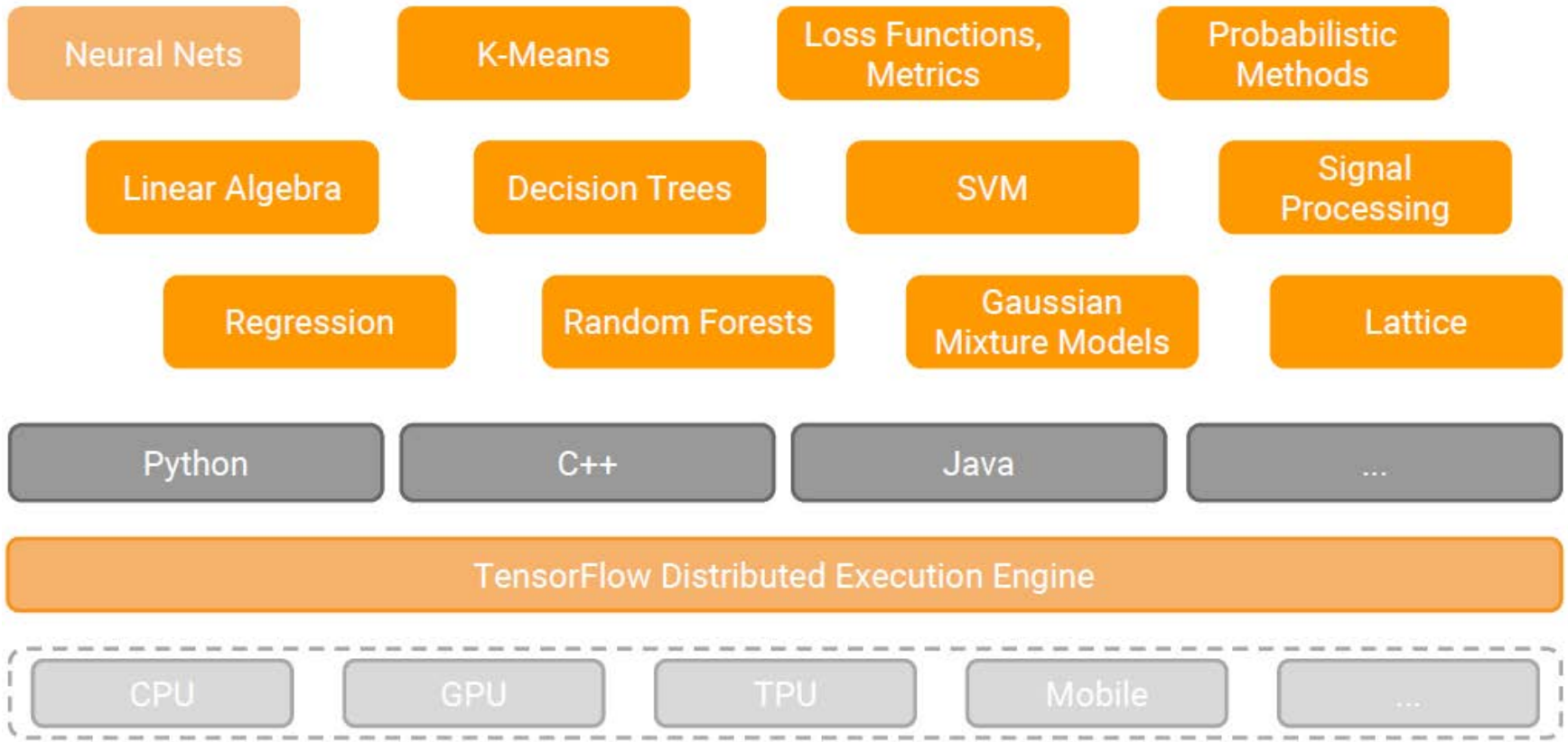
What makes a Google Developers Expert?

Google Developers Experts (GDEs) are a global network of experienced product strategists, designers, developers and marketing professionals actively supporting developers, startups and companies changing the world through web and mobile applications.

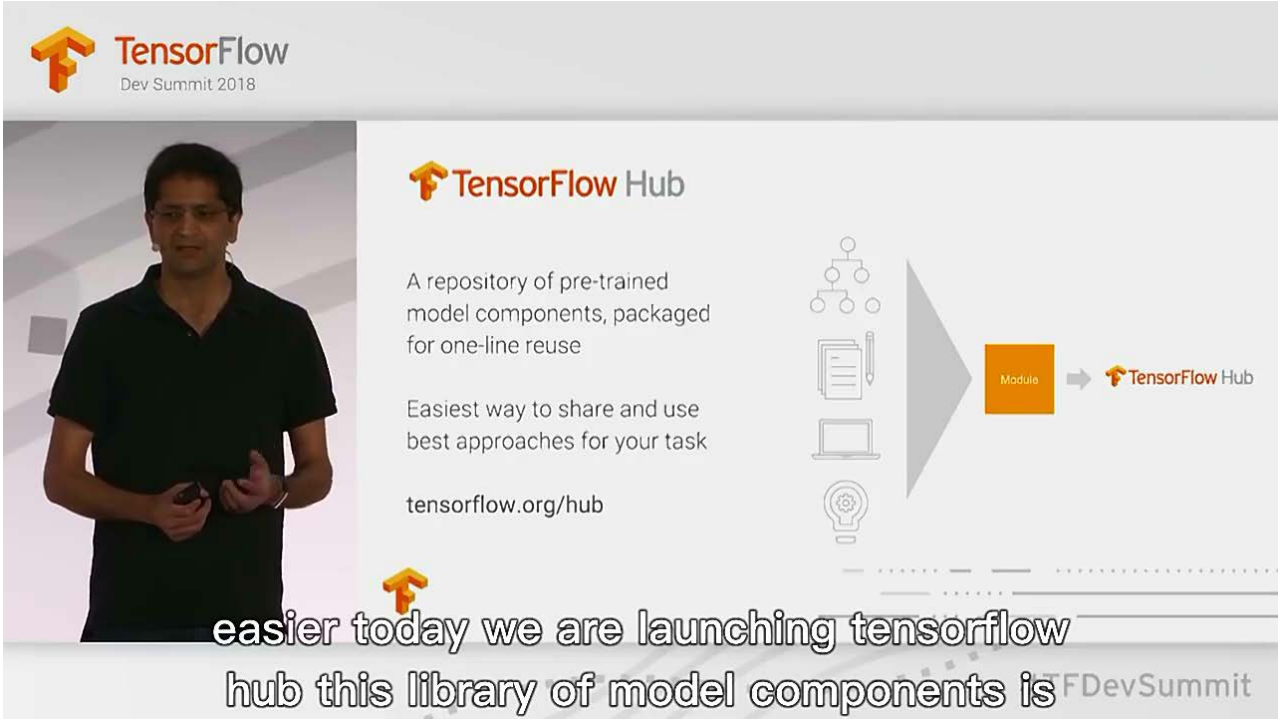
GDEs are experienced, recognized developers of Google technologies as well as outstanding professionals in product strategy, UX/UI, marketing, growth hacking and monetization. They distinguish themselves through frequently speaking at conferences, share their passion and experience by publishing videos and tutorials, writing code samples, mentoring developers and startups and much more. Thanks to their support, developers, high-potential startups and technical communities around the world build and launch highly innovative apps.


Google Developers Experts
搜索
所有产品
首页
ABOUT
BECOME AN EXPERT
TECHNOLOGY
MARKETING
PRODUCT DESIGN
LOCATION
All
Android
IoT
Wearables
Web Technologies
Dart
Identity
Flutter
Google Maps APIs
Google Cloud Platform
Angular
Firebase
G Suite
Machine Learning
Google Analytics
Assistant
Google APIs for iOS
TECHNOLOGY
MARKETING
PRODUCT DESIGN
LOCATION
All
Distribution
Monetization
Data Analysis
Branding
TECHNOLOGY
MARKETING
PRODUCT DESIGN
LOCATION
All
User Research
Interaction Design
Visual Design
Sprint Master
Product Strategy
Assistant

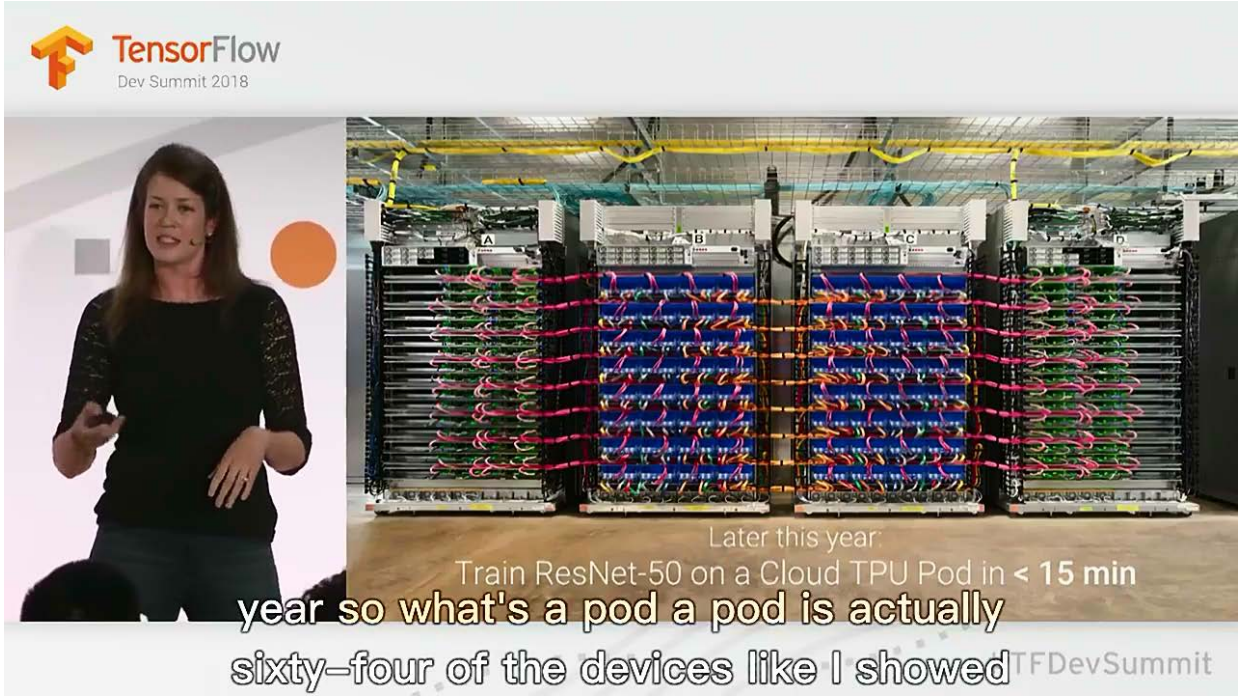
A comprehensive ML toolkit



媒体关注的


TensorFlow
Dev Summit 2018
TensorFlow Hub
A repository of pre-trained model components, packaged for one-line reuse
Easiest way to share and use best approaches for your task
tensorflow.org/hub
Module
TensorFlow Hub
easier today we are launching tensorflow hub this library of model components is
#TFDevSummit


TensorFlow
Dev Summit 2018
TensorFlow runs in many languages...
python
C++
Java
Go
julia
C#
Haskell
R
JS
community I'm excited to announce tensor flora Jas it's a it's bringing machine
#TFDevSummit


TensorFlow
Dev Summit 2018
Later this year:
Train ResNet-50 on a Cloud TPU Pod in < 15 min
year so what's a pod a pod is actually sixty-four of the devices like I showed
#TFDevSummit

我们今天关注的

Machine Learning Related:

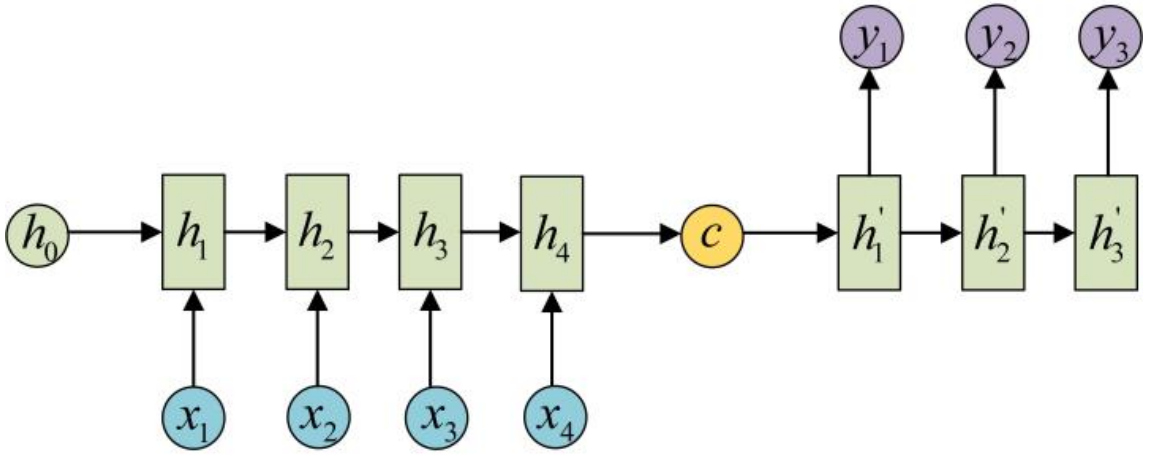
- **9.Reconstructing Fusion Plasmas**
- **10 Real-World Robot Learning**
- **11.Project Magenta**
- **13.Nucleus TensorFlow toolkit for Genomi**
- **19 Applied AI at The Coca-Cola Company**
- **Cassava Disease**
- **AstroNet: Identify Exoplanets in Light Curves**

提纲性的介绍，详细程度不一☺

11. Project Magenta

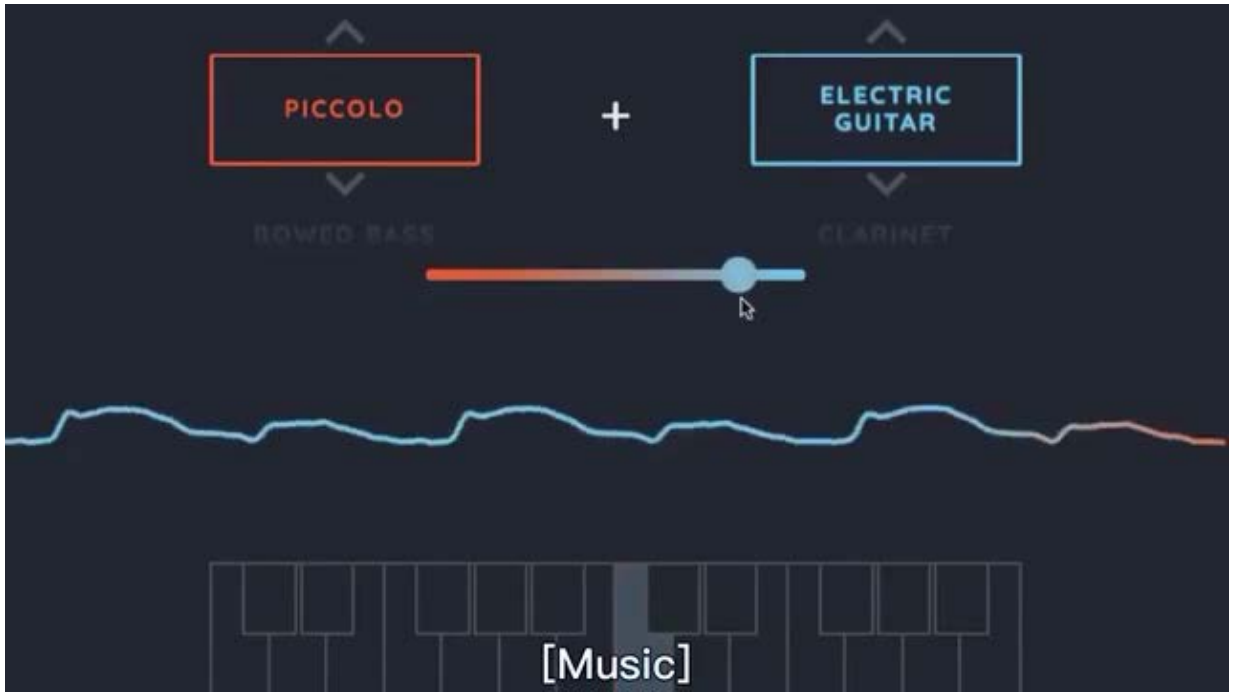
1 根据输入自行输出

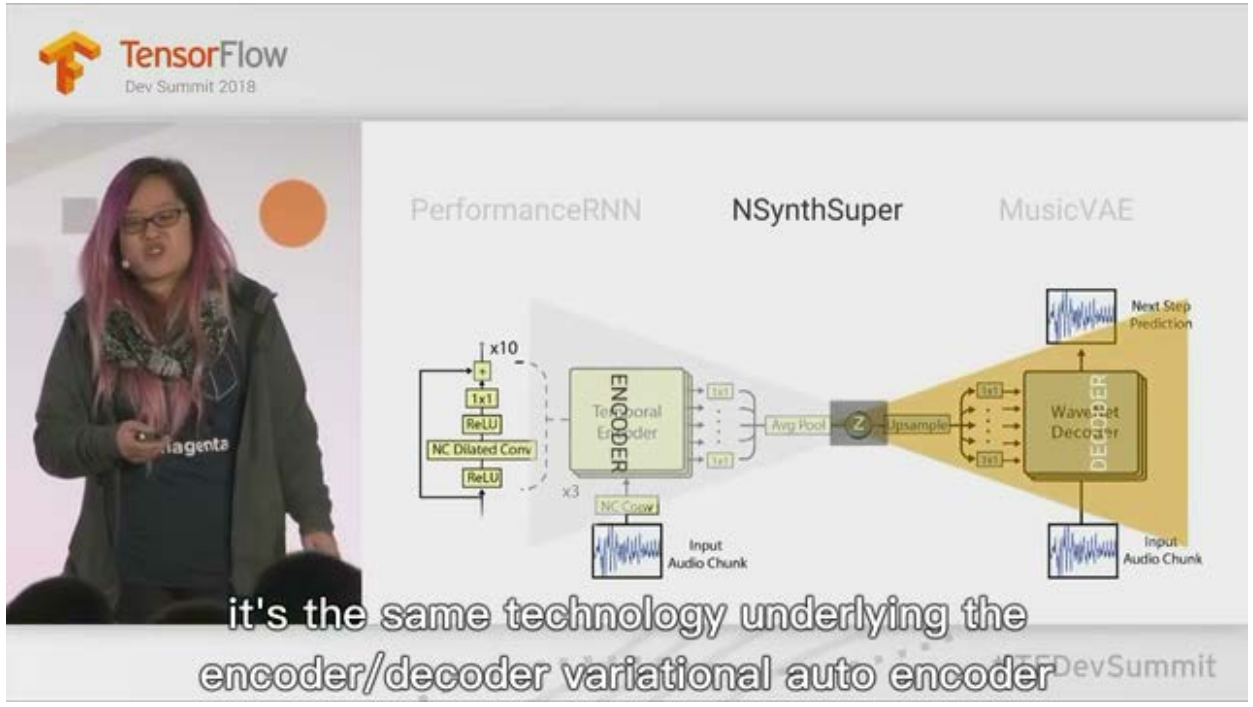
RNN

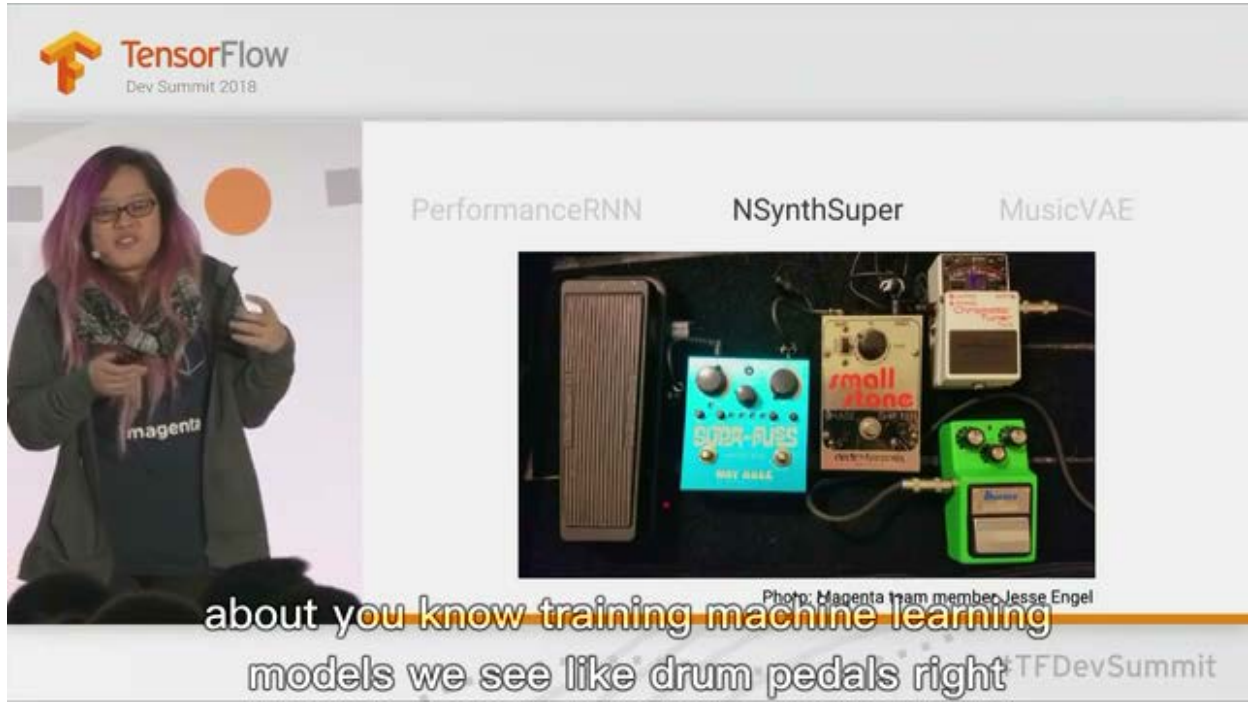


2 更换乐器

Encoder-Decoder







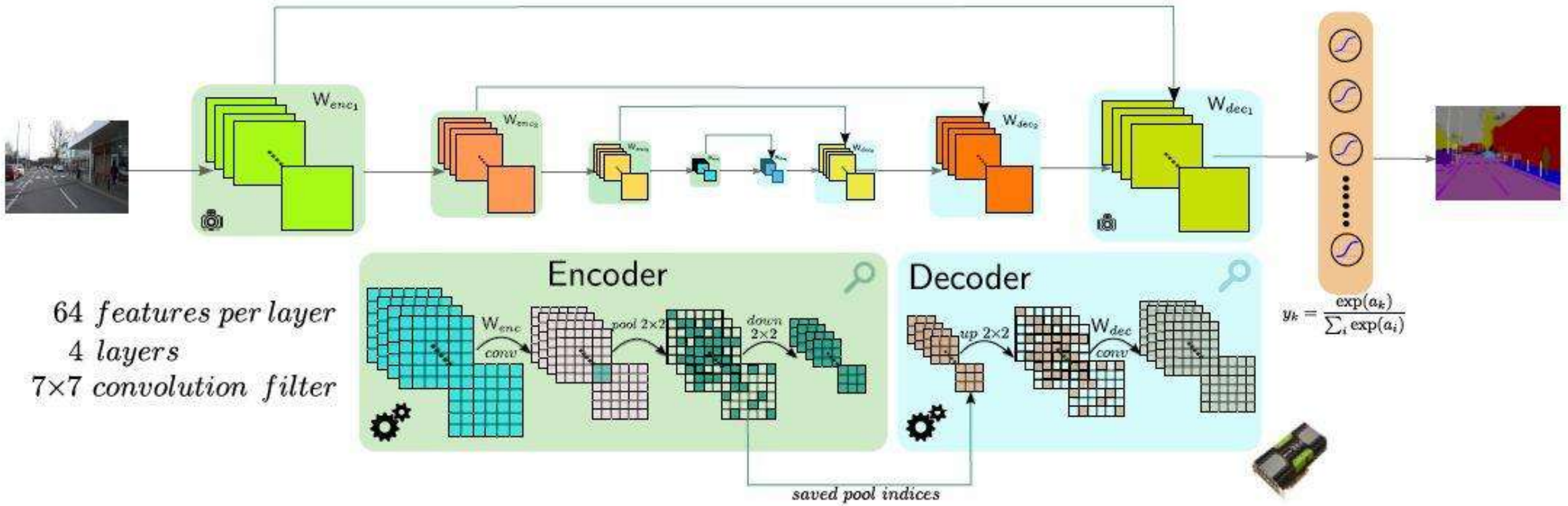
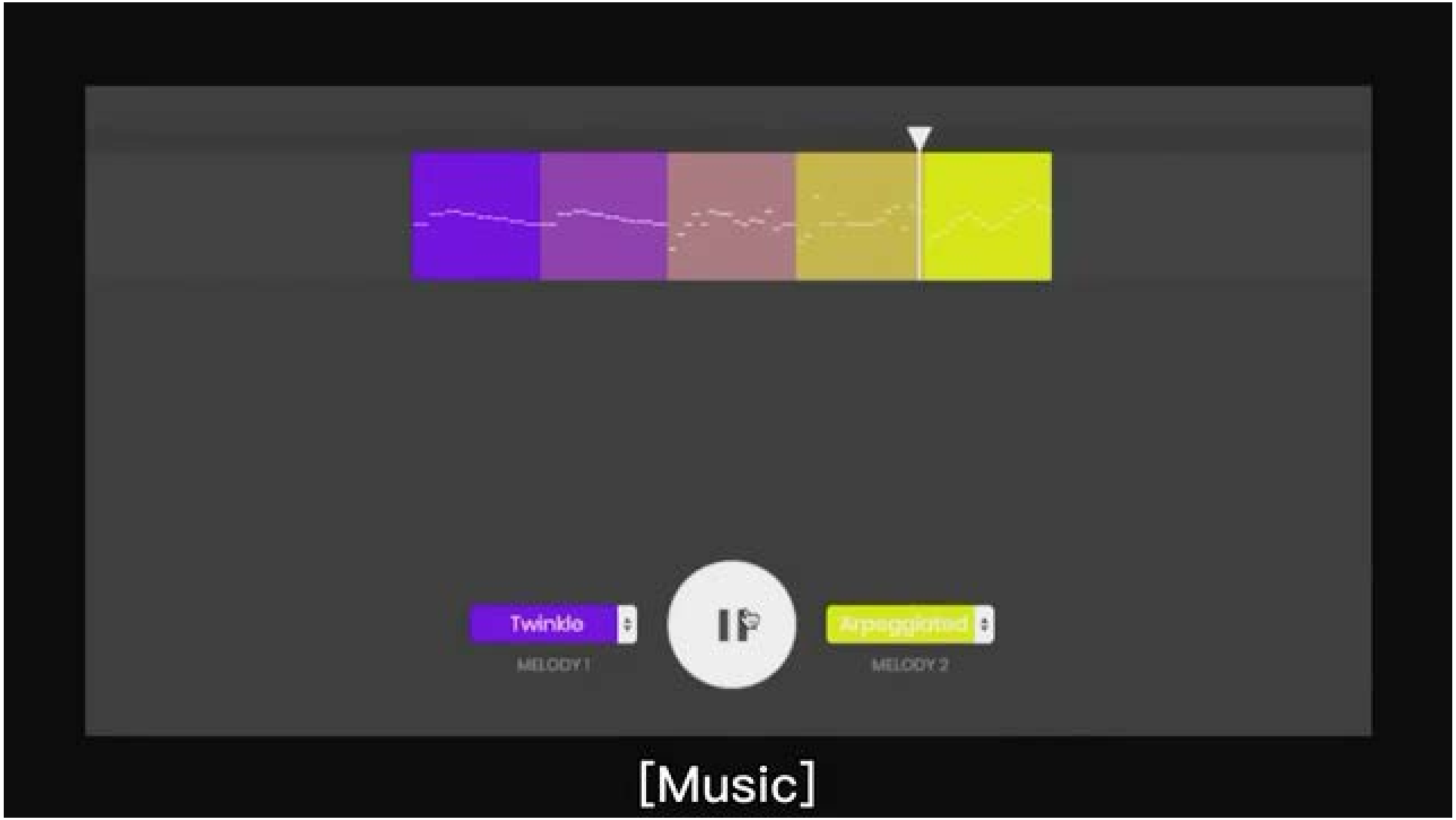


Figure 1. A 4 layer SegNet which takes in an RGB input image and performs *feed-forward* computation to obtain pixel-wise labelling. A stack of feature encoders is followed by a corresponding decoders. The soft-max layer classifies each pixel independently using the features input by the last decoder. An encoder uses the convolution-ReLU-max pooling-subsampling pipeline. A decoder upsamples its input using the transferred pool indices from its encoder. It then performs convolution with a trainable filter bank.


里故門津
惠明画框厂销售

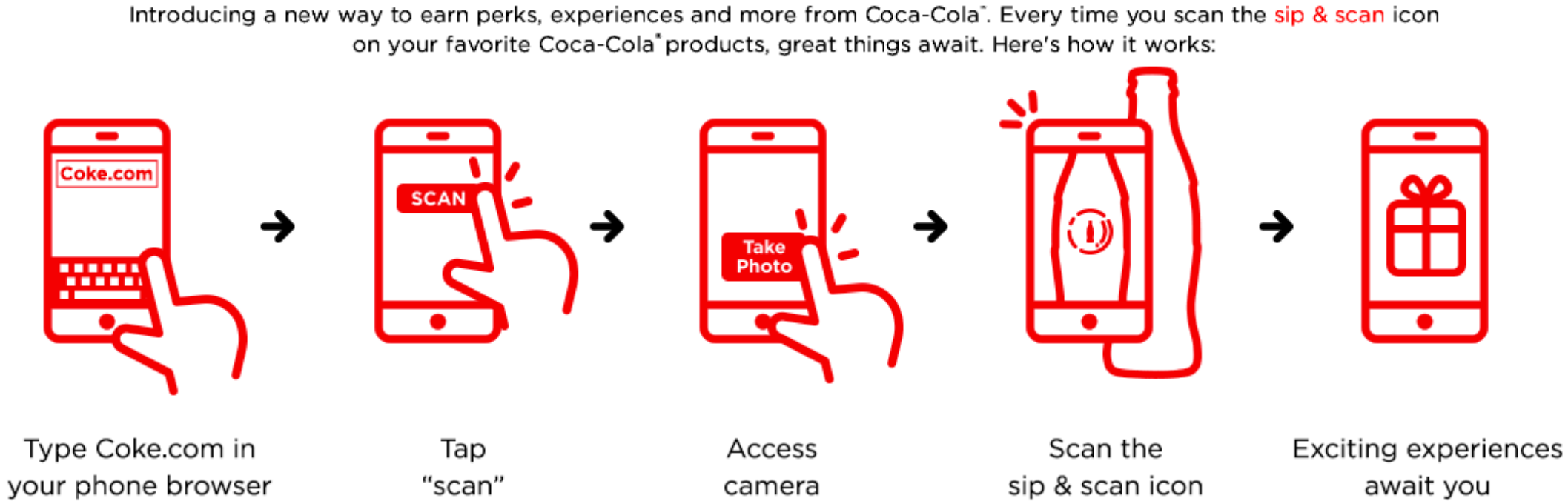
3 更换风格



19. Coca-Cola AI Application

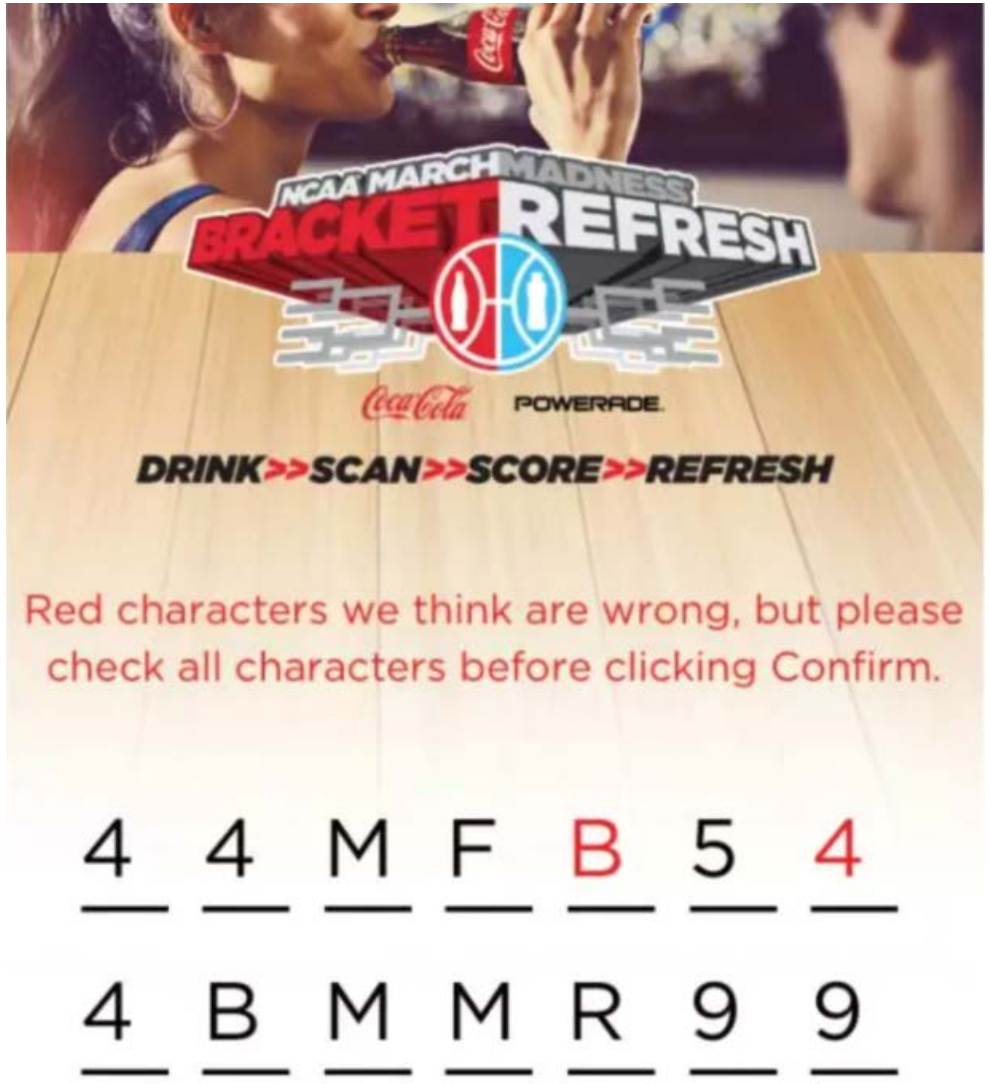
用户体验改进

- 输入产品编码来参加推广活动
- 14 位字符肉眼识别手动输入麻烦



需求

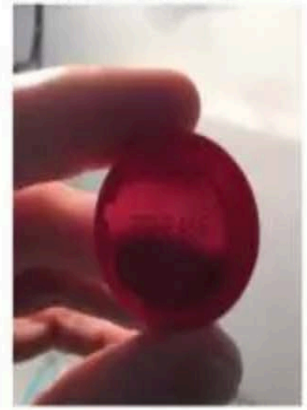
- 快速：产品编码图像发送到 OCR 管道后处理时间平均一秒
- 准确： 95% 的字符串识别准确率，且模型通过主动学习随时间不断改进
- 小型：直接分发到移动应用上，并在模型随时间改进时适应无线更新
- 不同的产品编码介质：数十种不同的字体类型、瓶盖与纸箱包装介质组合



Valid code found: 44MFB544BMMR99

Valid code found: 67R0MJBWHRFKHV

Valid code found: P5HR466W7TT7KL



Valid code found: P5HR466W7TT7KL

Valid code found: H96L5HR6BR5JHL

Valid code found: P5HR466W7TT7KL

Improving the model in 3 phases

Improving image normalization...

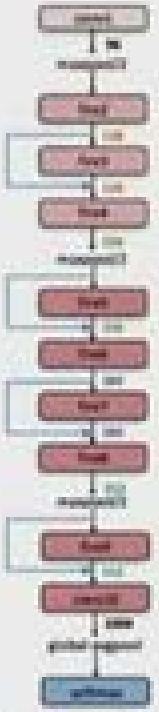
Started with Binarization

Now using Best Channel Conversion

made the model too large.

Reduce model size

Implementing SqueezeNet...



*Iandola et al, 2016

prevented the model from converging.

Improve training efficiency

Using Batch Normalization...

$$\mu_B \leftarrow \frac{1}{m}\sum_{i=1}^{m} x_i$$

$$\sigma_B^2 \leftarrow \frac{1}{m}\sum_{i=1}^{m}(x_i - \mu_B)^2$$

$$\widehat{x}_i \leftarrow \frac{x_i - \mu_B}{\sqrt{\sigma_B^2 + \epsilon}}$$

$$y_i \leftarrow \gamma \widehat{x}_i + \beta \equiv \mathrm{BN}_{\gamma,\beta}(x_i)$$

*Ioffe & Szegedy, 2015

gets the model to converge!

model (25-fold decrease)
with accuracy >95%

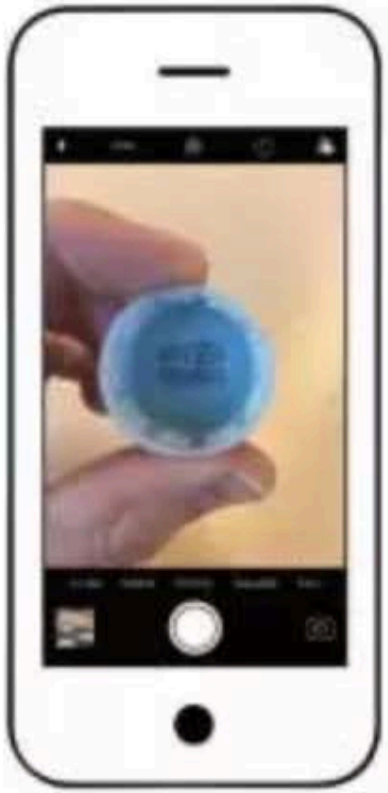
so our model development effort went through three big iterations initially

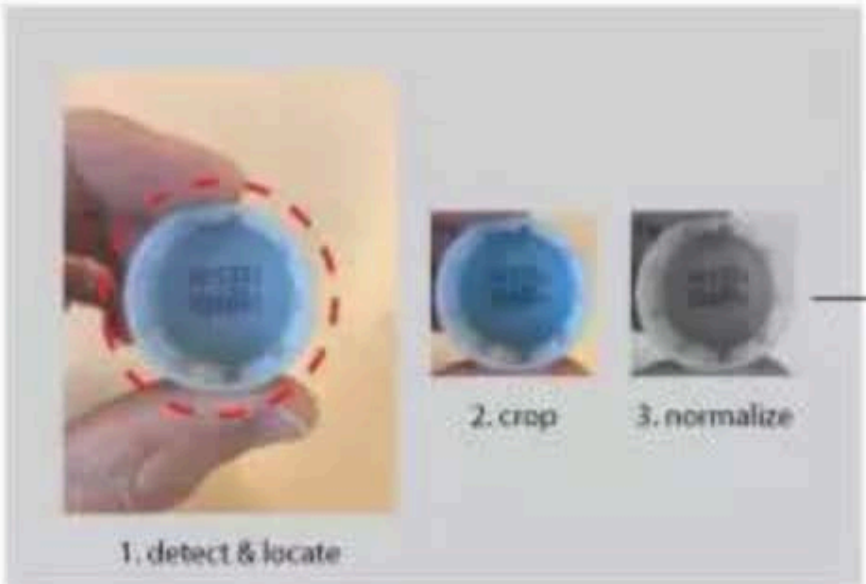
1 Take a picture

2 Process the image

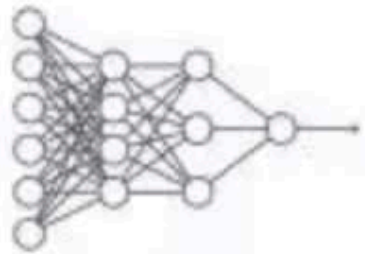
3 Extract the text

4 Display the results





TensorFlow



A trained Neural Network
predicts the 14 pincode values

Bingo!
A valid pincode was predicted

Close!
We're off by a few characters,
ask the user to correct them

send corrected code
and image back to training

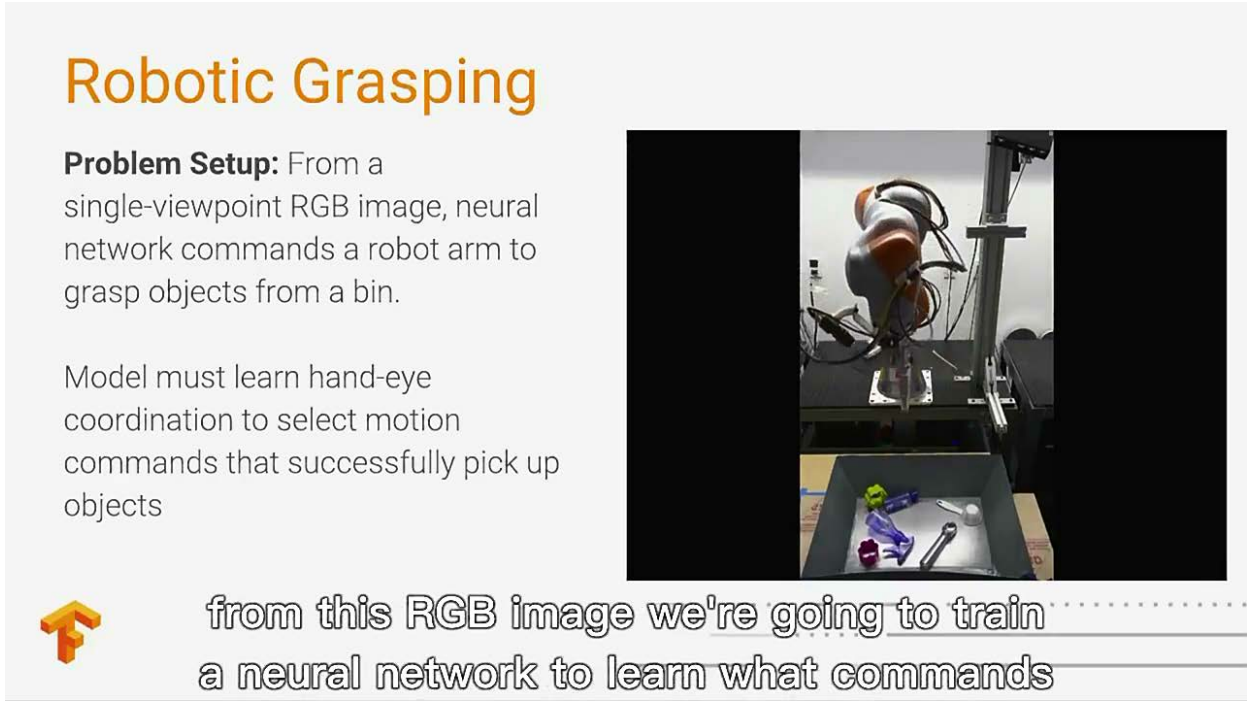
10. Real-World Robot

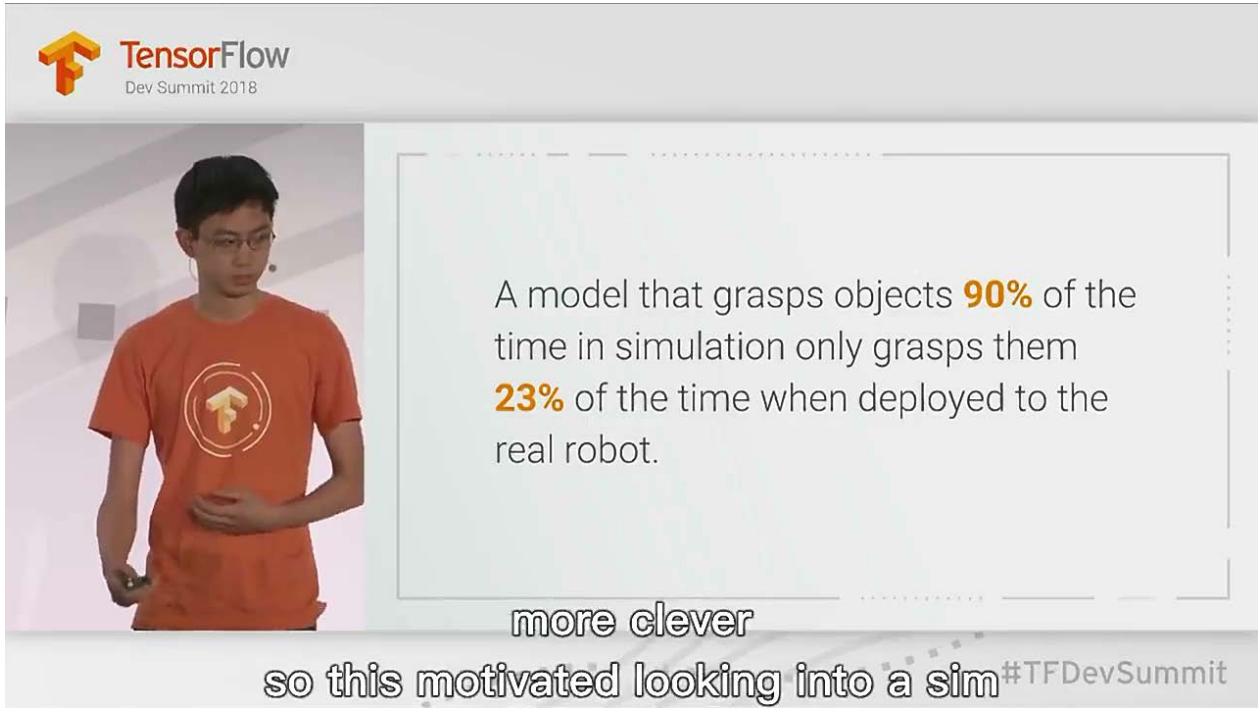
方案

- 单眼视觉采集RGB图
- 神经网络控制机械臂

问题

- 90%--23%





解决方案

- **Sim-Real Transfer**

Sim-to-Real Techniques

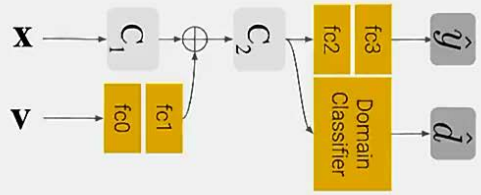
Randomized Simulations

Texture, Colors, Lighting

Object Models

Domain Adaptation

Feature-level

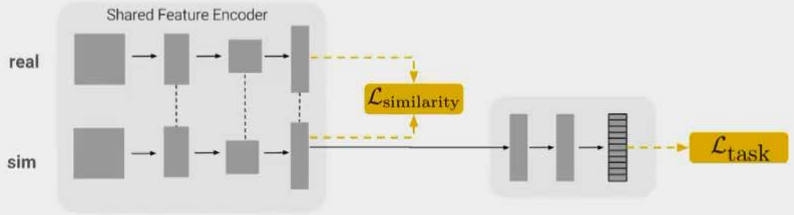


Pixel-level

changing and how lighting is interacting with your scene and you can also play

TensorFlow
Dev Summit 2018

Feature-Level Domain Adaptation



Domain-Adversarial Neural Networks (DANNs)*

End-to-end learning of **domain-invariant features**, by training a model with an **adversarial domain classifier**

*(Ganin et al, JMLR 2016)

on both data sets but then at an intermediate feature layer of the

#TFDevSummit

TensorFlow
Dev Summit 2018

Pixel-Level Domain Adaptation

Image generator, conditioned on simulated image, generating a more realistic one

Generated images must be useful for training a downstream task model

(Bousmalis et al, CVPR 2017)

the task model at the same time we found that in practice this was useful because

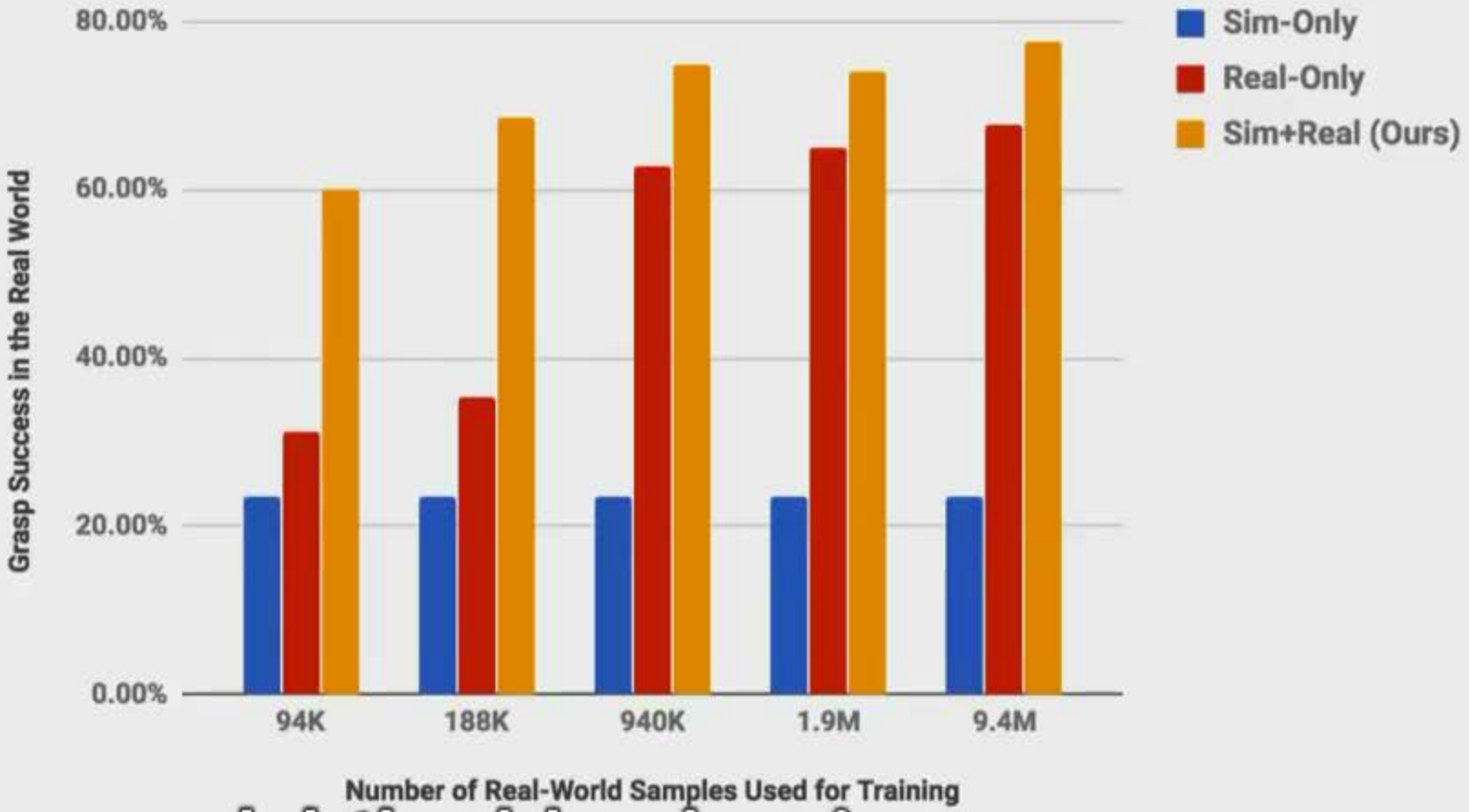
#TFDevSummit

Results

Match real-only performance with 50x fewer real samples

Can improve on real-only models even with full real dataset

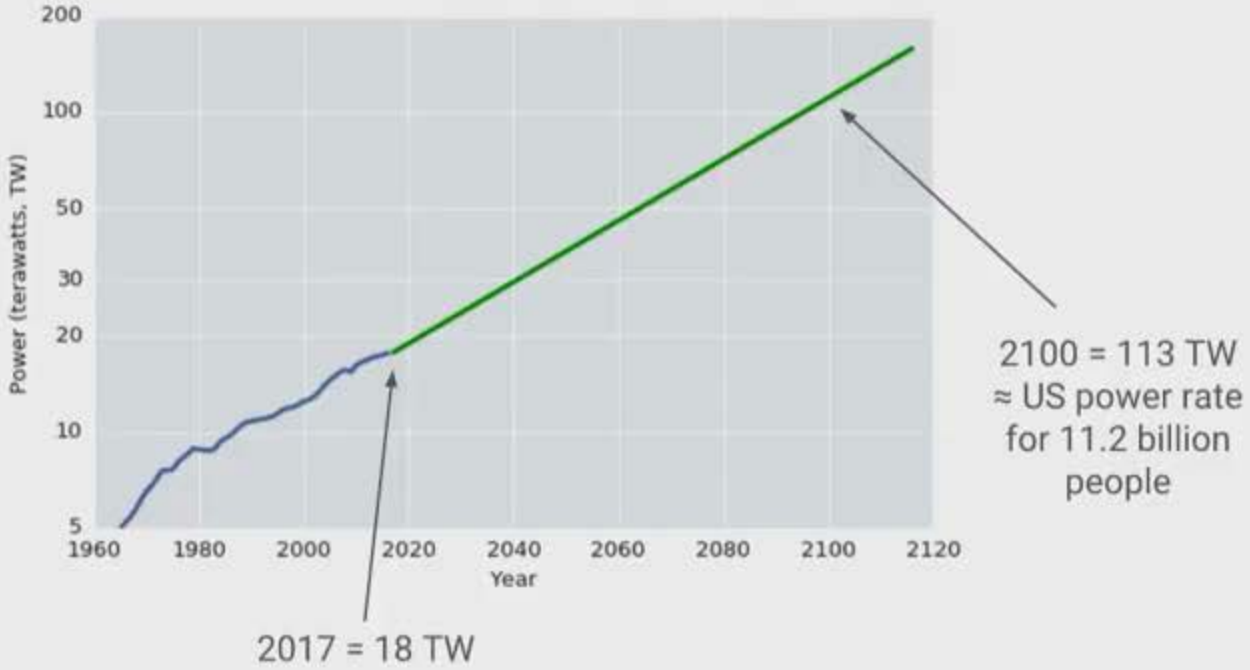
Can perform well even without real labels

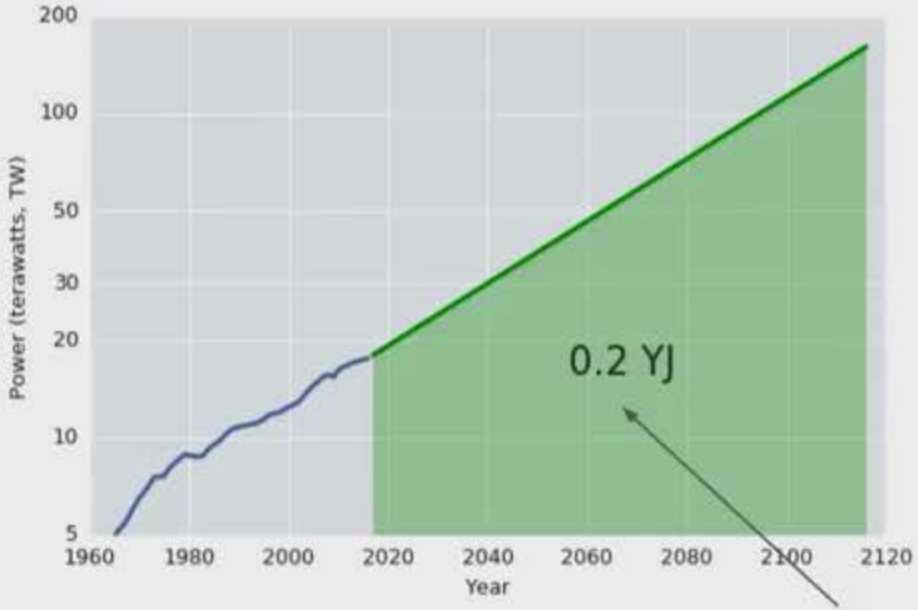


given to the model the blue bar is our performance when we use only simulated

9.Reconstructing Fusion Plasmas

Why this matters: Civilization needs ~ O(Yottajoule)





Data: BP Statistical Review of World Energy
Figures: Pl

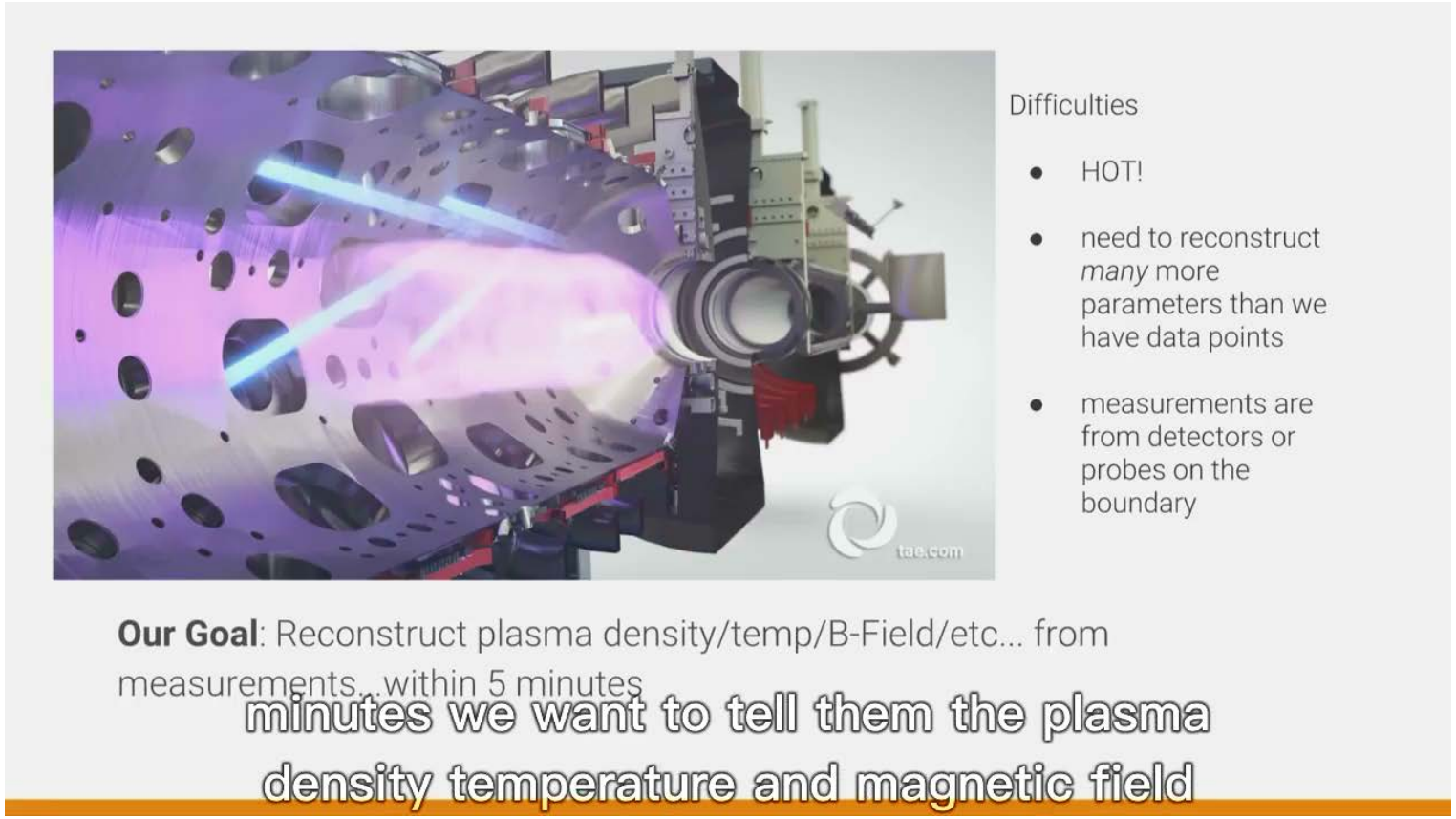
want to enjoy the same power usage that we do now in the United States that's

难点

- 高温环境
- 已有数据点不足以重构
- 只有边缘位置的测量

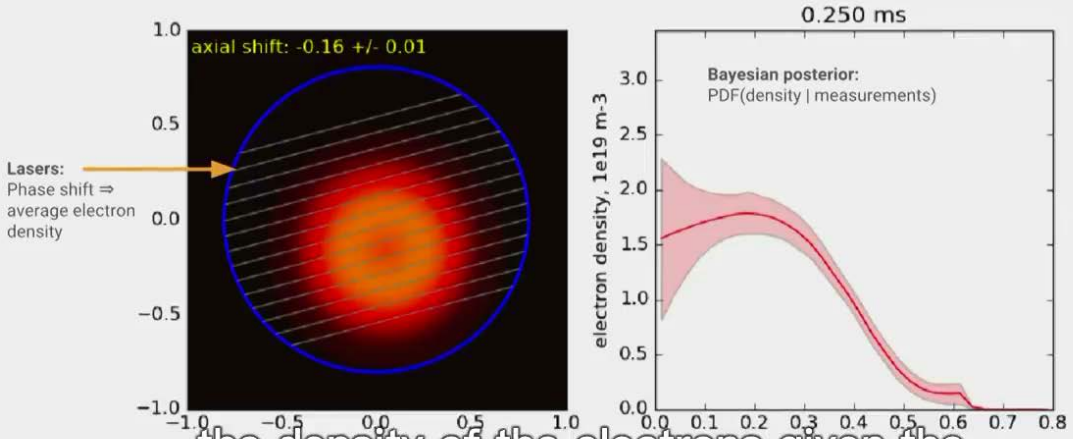
需求

- 五分钟迅速建立各种场



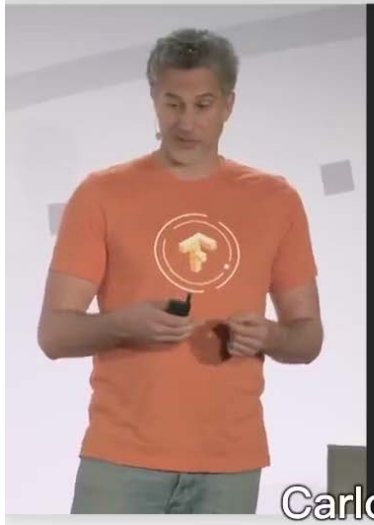
Example reconstruction:

Electron density -- with error bars



the density of the electrons given the measurements and we can visualize that

TensorFlow
Dev Summit 2018



Bayesian Inference

```
import tensorflow_probability as tfp

# Variational Inference
z = approximate_posterior.sample()
ELBO_loss = -(prior.log_prob(z)
              + likelihood(z).log_prob(measurement)
              - approximate_posterior.log_prob(z))

# Hamiltonian Monte Carlo
states, _ = tfp.mcmc.sample_chain(
    num_results=1000,
    current_state=tf.ones([N]),  # Initial state
    kernel=tfp.mcmc.HamiltonianMonteCarlo(
        target_log_prob_fn=lambda z: prior.log_prob(z) + likelihood(z).log_prob(measurement),
        step_size=0.01,
        num_leapfrog_steps=10))
```

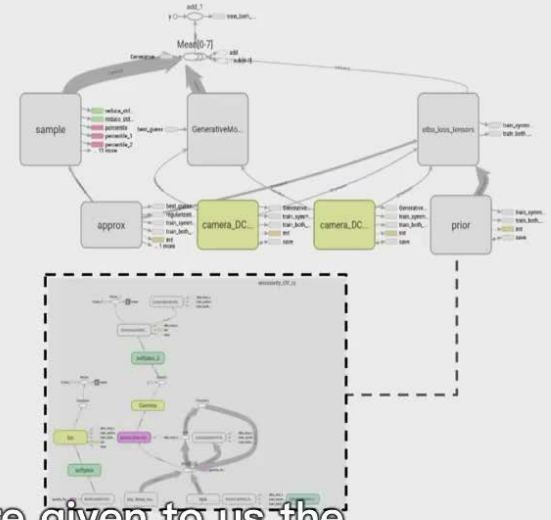
#TFDevSummit

Carlo is one that uses gradients in order to help you take samples faster so

~~Deep Learning~~

Inverse Problem

- No labels
- There is a “right” answer
- Graph models physics, rather than generic functions

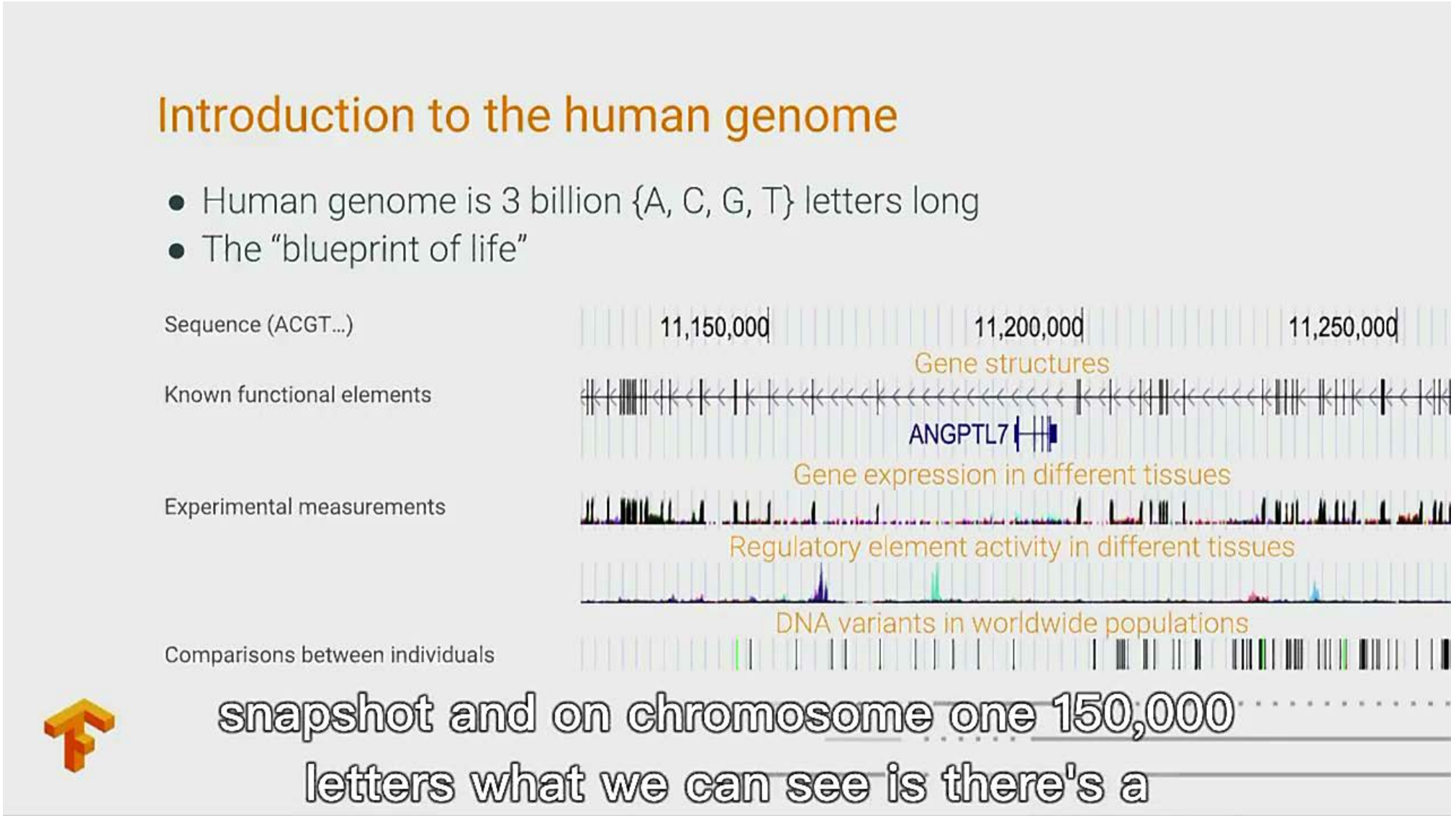


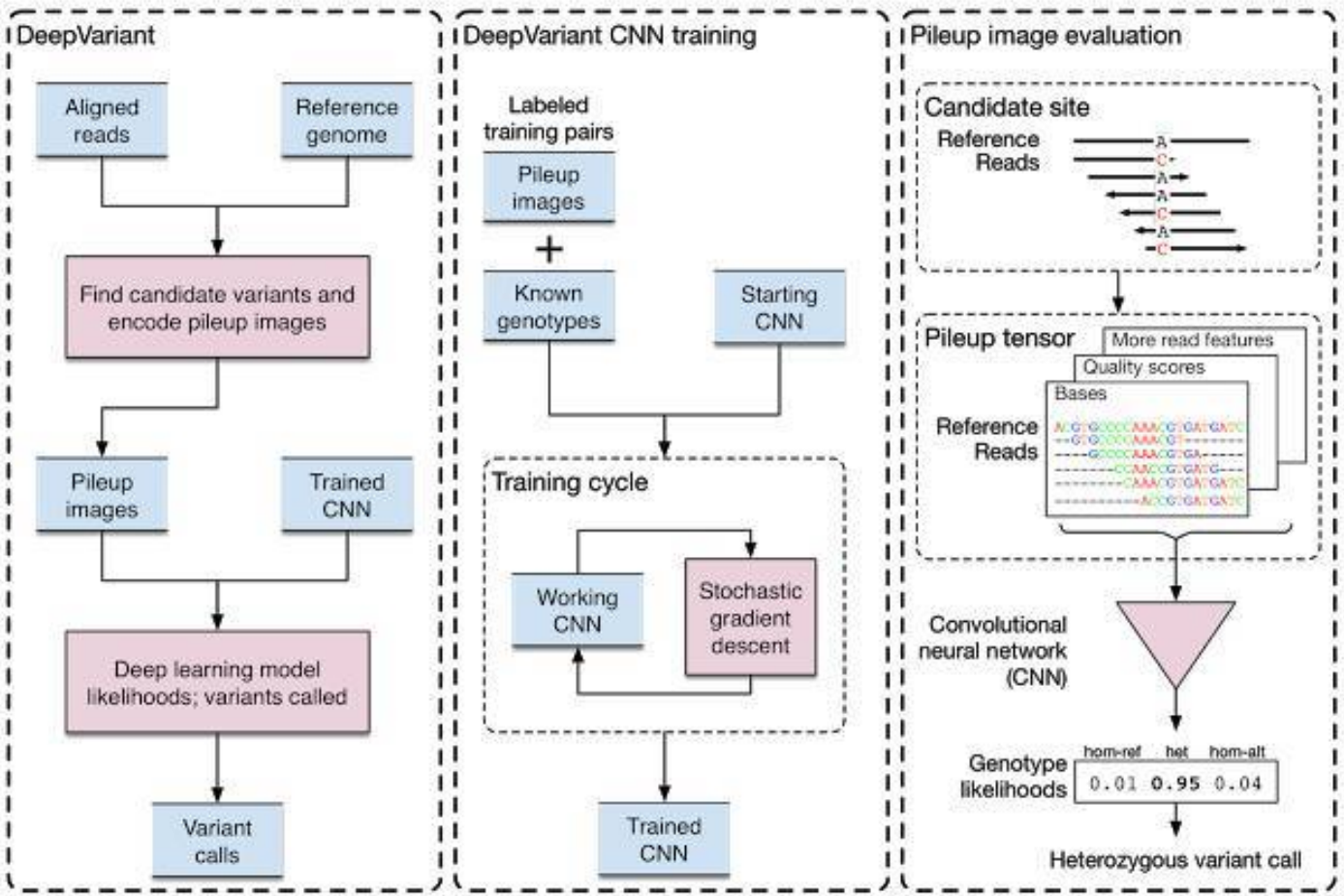
TensorFlow’s Value

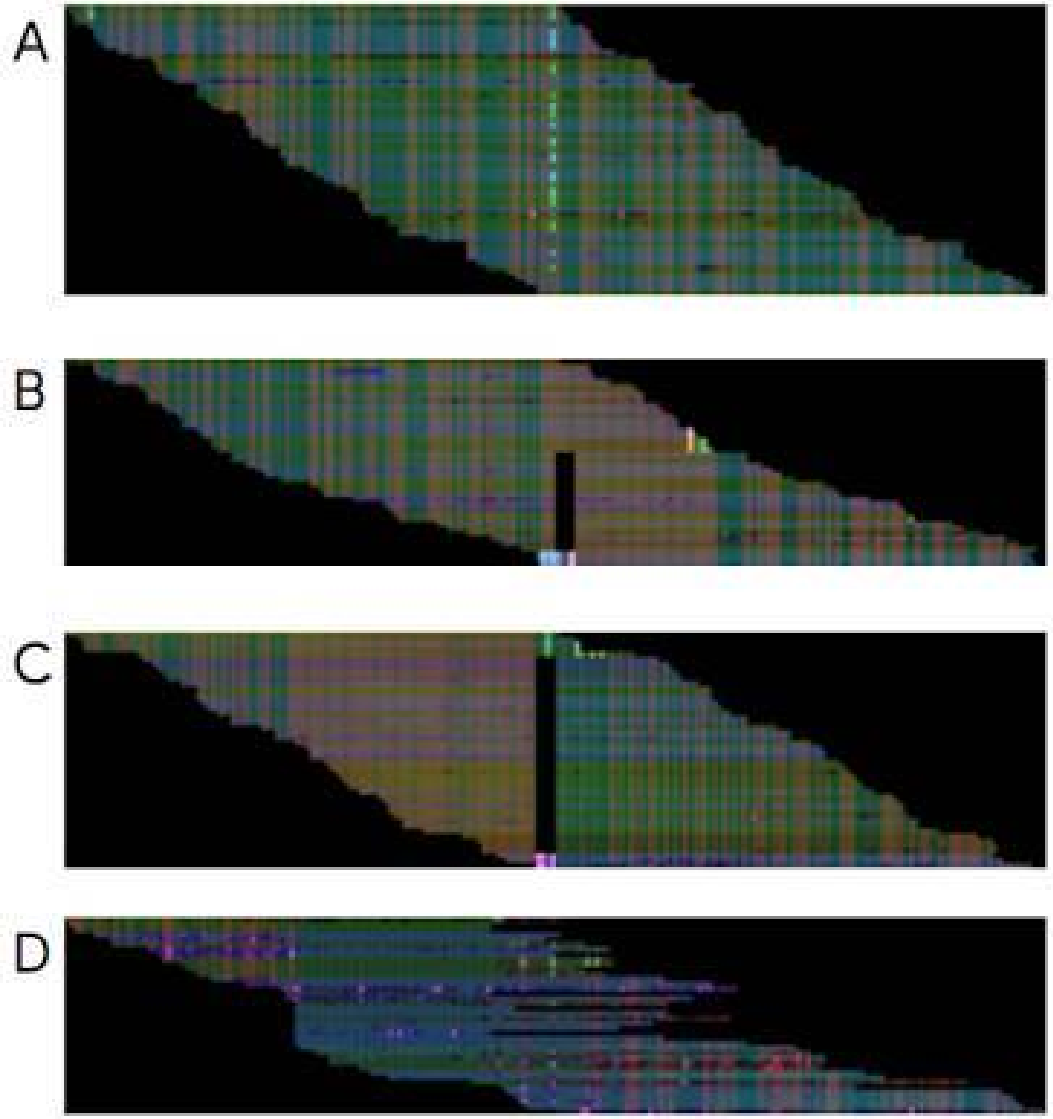
- `distributions/tensorflow_probability` libraries
- Auto-diff
- GPUs
- Distributed

are no labels that are given to us the natural label here would be a would be a

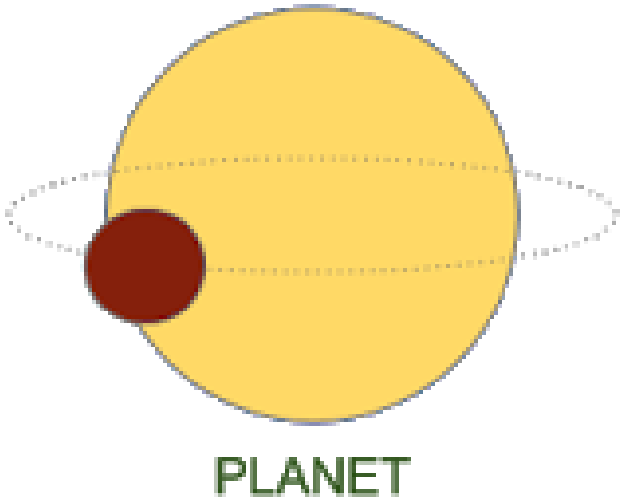
13.Nucleus TensorFlow toolkit for Genomi

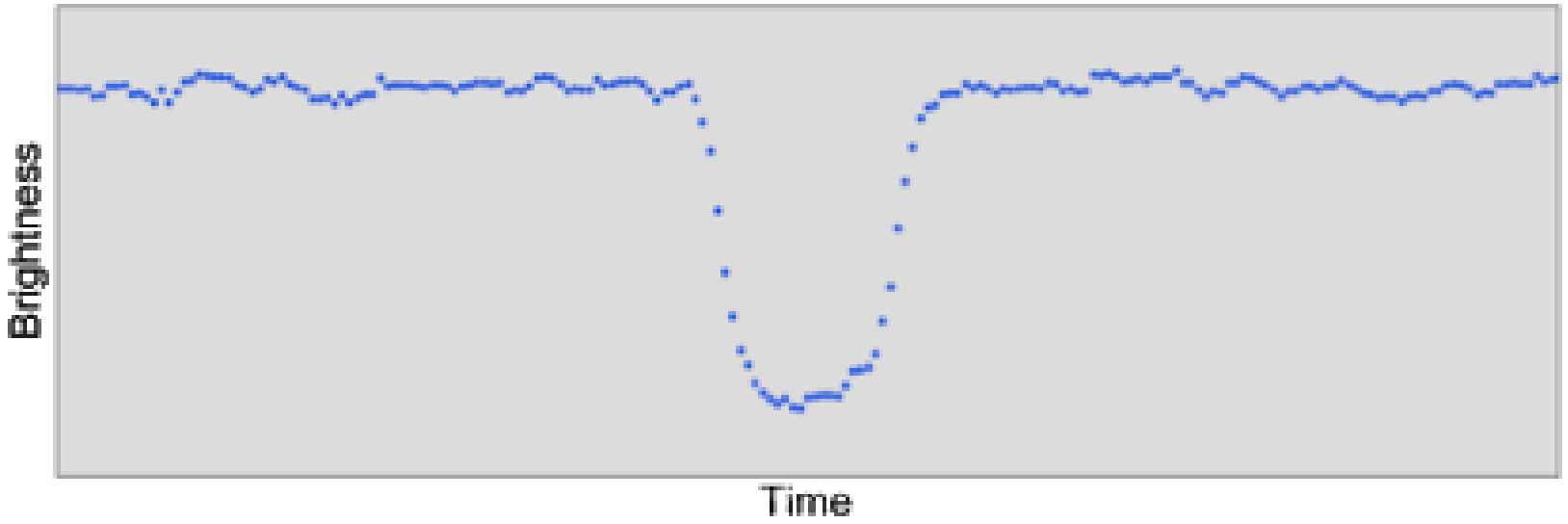


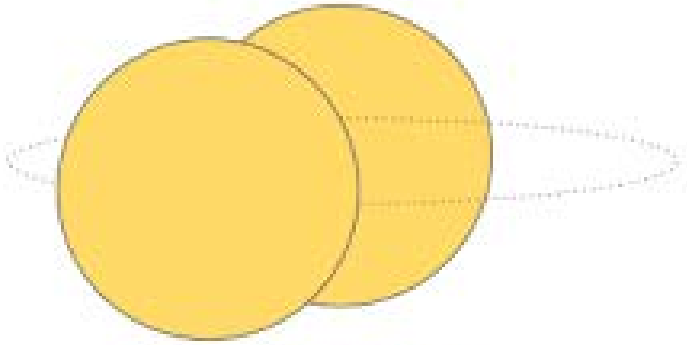

DeepVariant
Aligned reads
Reference genome
Find candidate variants and encode pileup images
Pileup images
Trained CNN
Deep learning model likelihoods; variants called
Variant calls
DeepVariant CNN training
Labeled training pairs
Pileup images
+
Known genotypes
Starting CNN
Training cycle
Working CNN
Stochastic gradient descent
Trained CNN
Pileup image evaluation
Candidate site
Reference Reads
Pileup tensor
More read features
Quality scores
Bases
Reference Reads
Convolutional neural network (CNN)
hom-ref het hom-alt
Genotype likelihoods
0.01 0.95 0.04
Heterozygous variant call


A
B
C
D

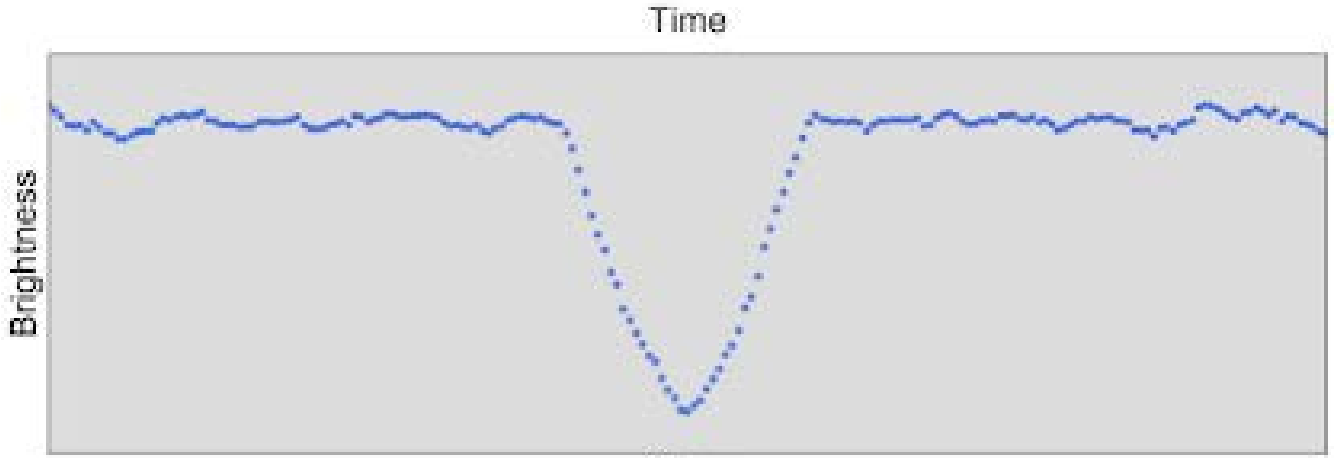
13. AstroNet

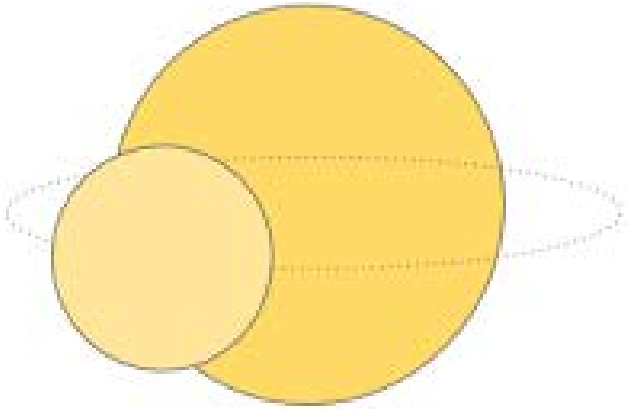




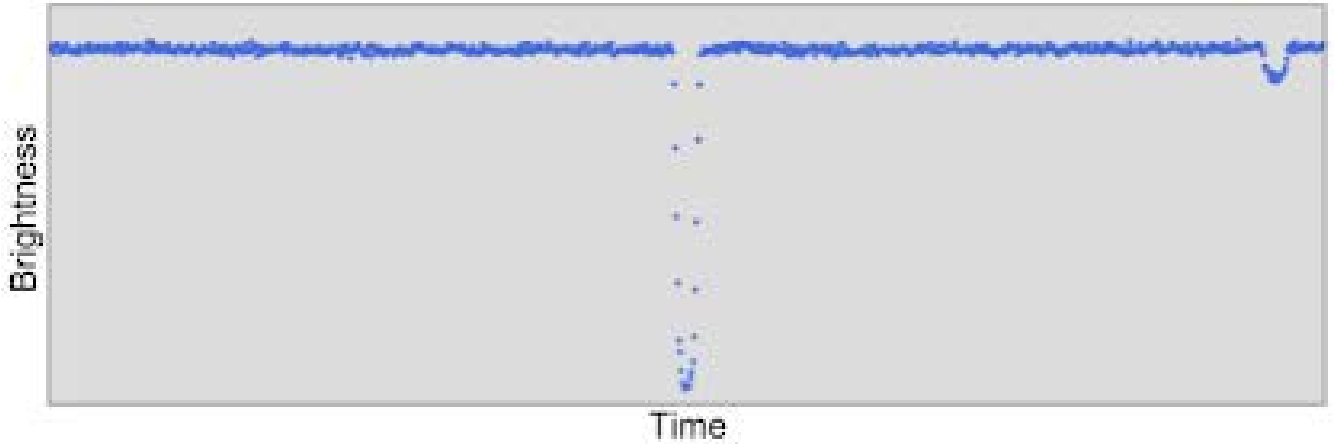


BINARY STAR

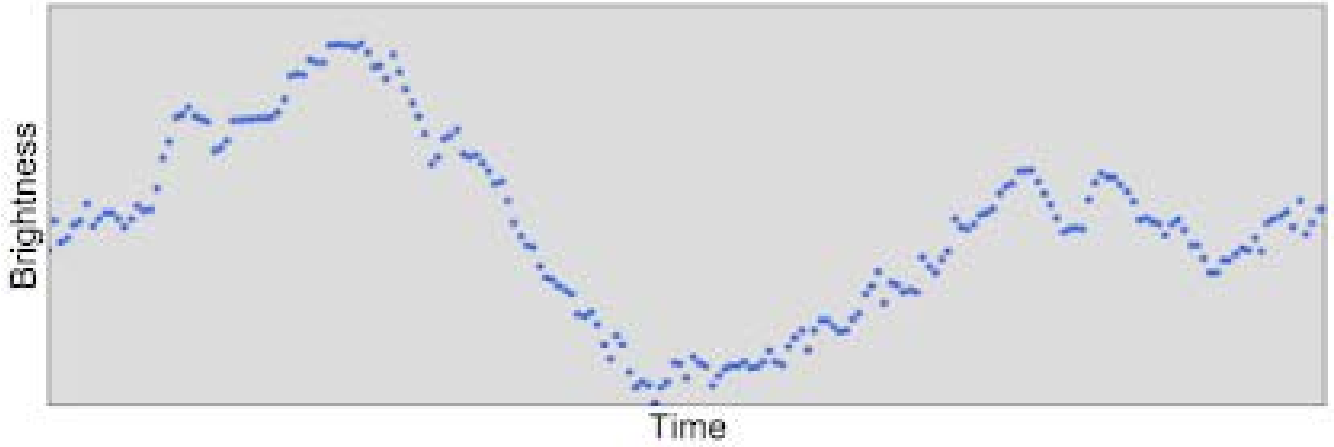


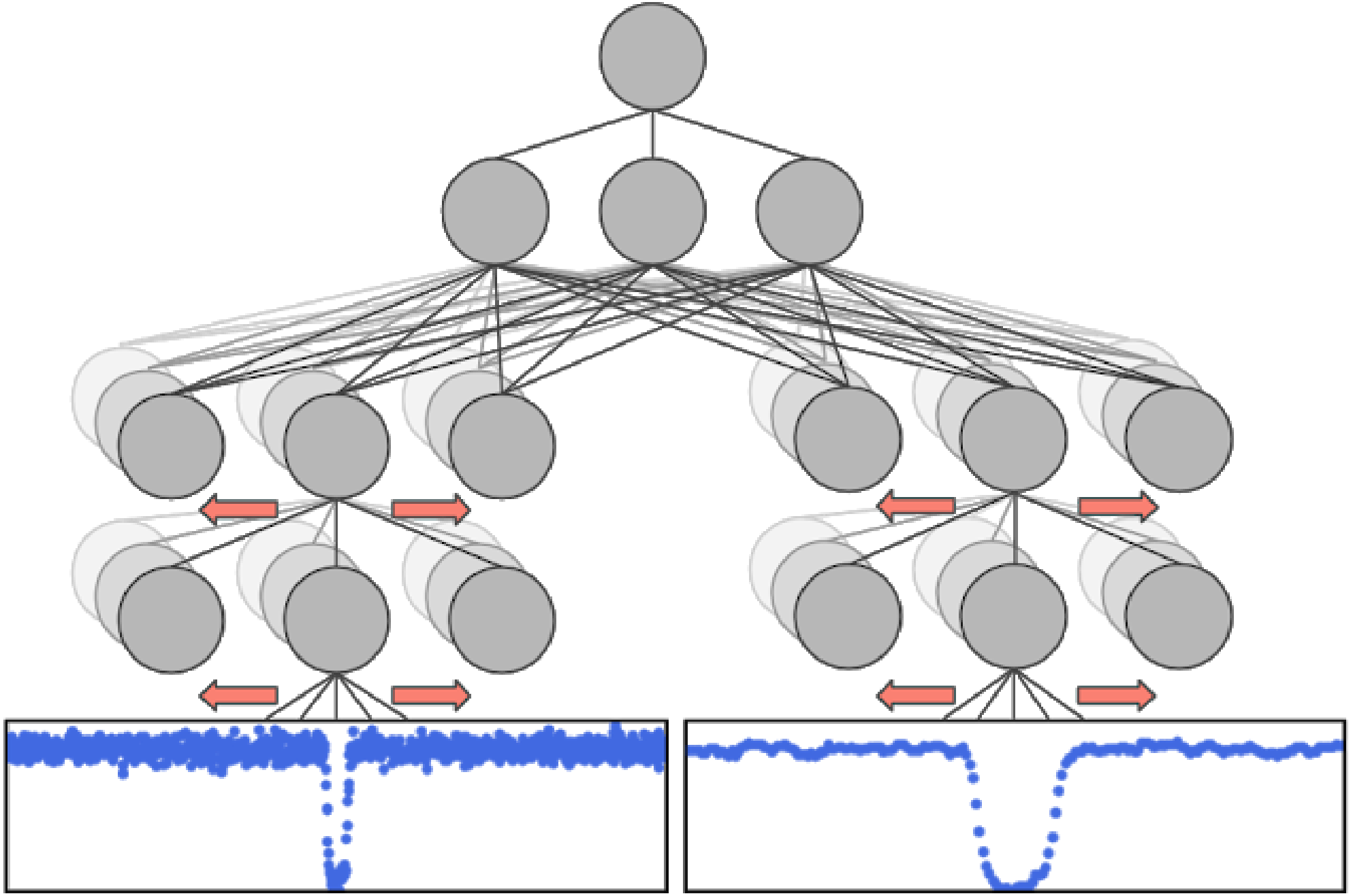


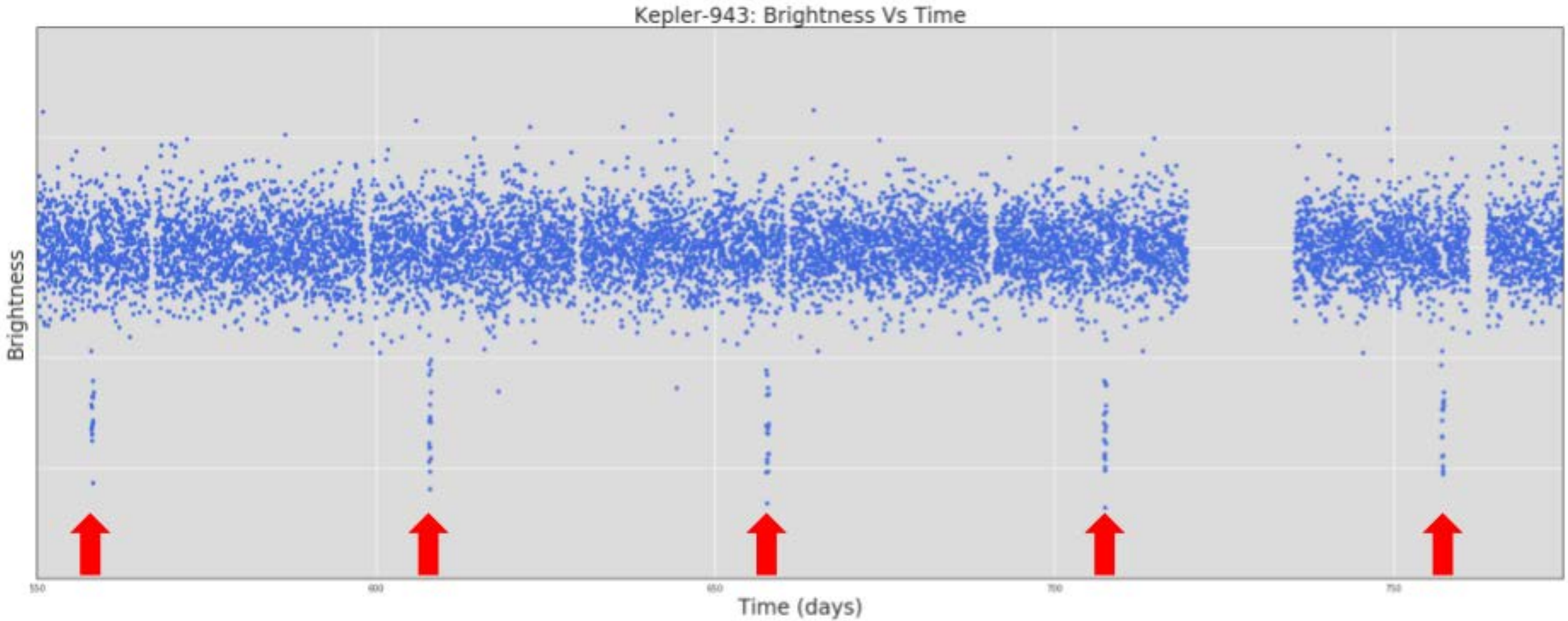
BINARY STAR



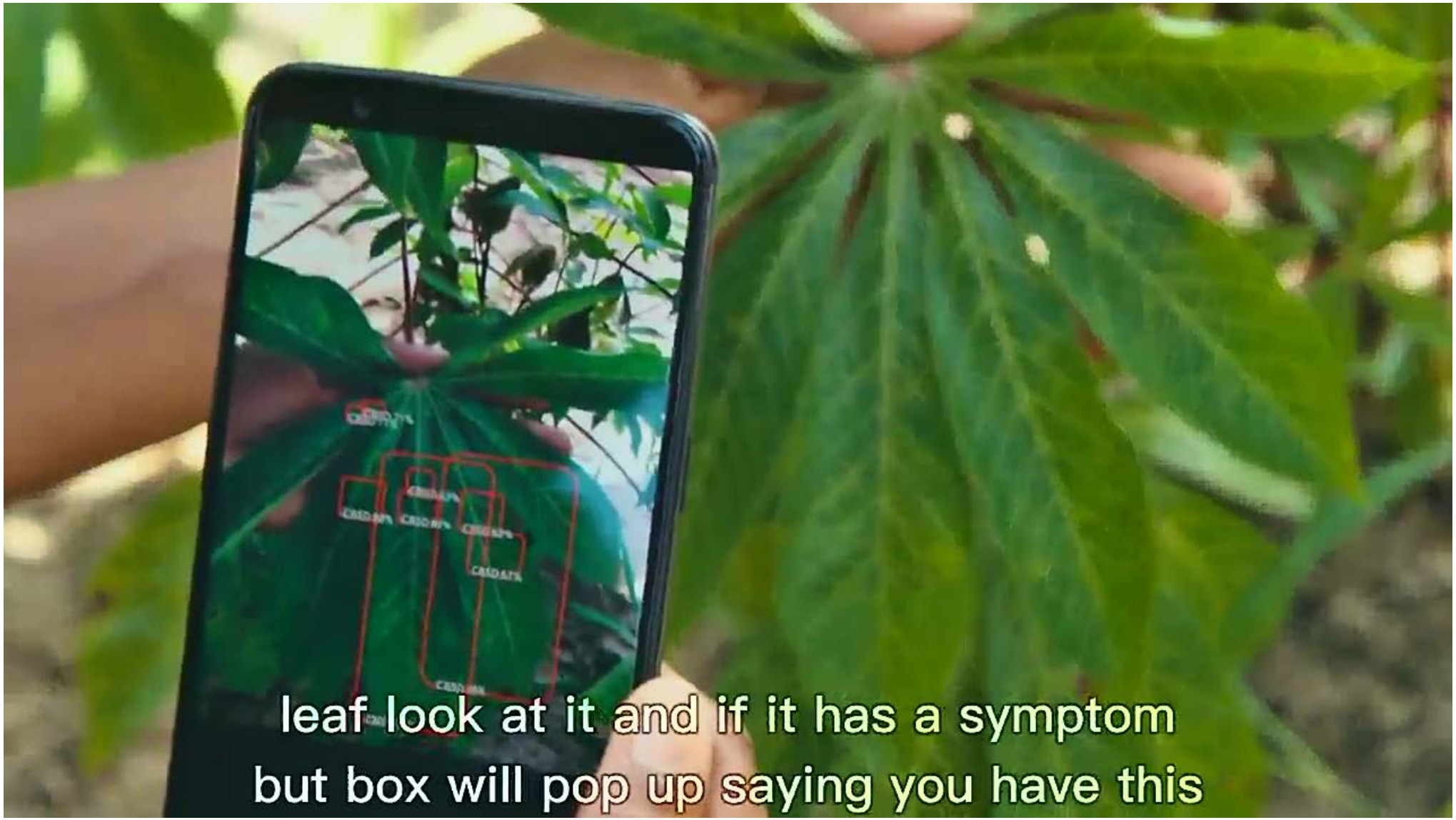
OTHER PHENOMENA






Kepler-943: Brightness Vs Time
Brightness
550
600
650
700
750
Time (days)

Cassava Disease




Penn State,
United States
CIP, India
Bioversity,
Ethiopia
CIAT, Vietnam
IITA, Nigeria
IITA, Kenya
CIAT, Colombia
CIP, Peru
CIP, Ecuador
IITA, Zambia
IITA, Mozambique
IITA, Tanzania

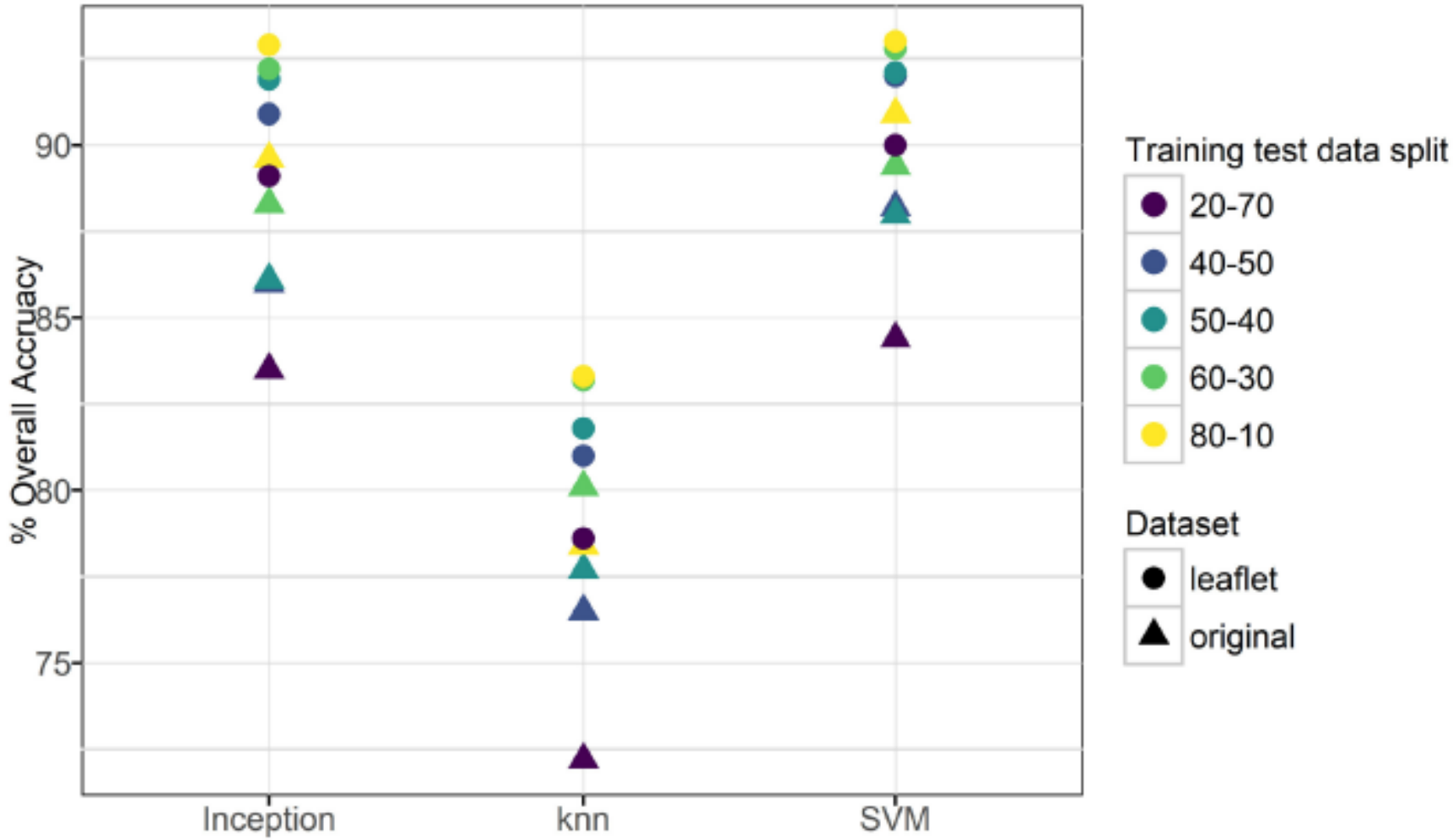


FIGURE 3 | Overall accuracy for transfer learning using three machine learning methods.

总结

Machine Learning Related :

• 9.Reconstructing Fusion Plasmas	能源
• 10 Real-World Robot Learning	机械
• 11.Project Magenta	娱乐
• 13.Nucleus TensorFlow toolkit for Genomi	基因
• 19 Applied AI at The Coca-Cola Company	消费
• Cassava Disease	农业
• AstroNet: Identify Exoplanets in Light Curves	天文

有价值的应用才是王道！


RIDE FOR FREE

谢谢