



Deep Learning 101: A Primer on How Advanced Algorithms are Developed

September 19th, 2017

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What is Deep Learning?

The Deep Learning Boom

Deep Learning Algorithm Development

Deep Learning Applications



What is Deep Learning?

Deep Learning is a subfield of machine learning concerned with algorithms inspired by the structure and function of the brain called artificial neural networks

**Image
Processing**



**Language
Processing**

**Speech
Recognition**

**Drug
Discovery**

IoT

Genomics

What is Deep Learning?



Rules-based
Algorithm Pipeline

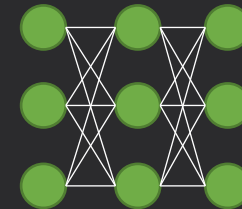


Car
Not Car

Feature Engineering

Rule Engineering

Machine Learning
Algorithm Pipeline

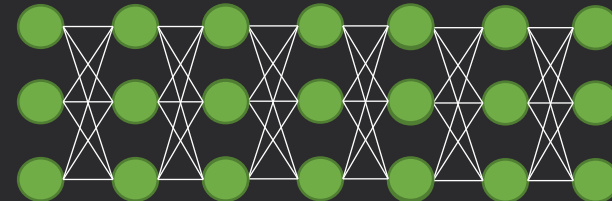


Car
Not Car

Feature Engineering

ML Model

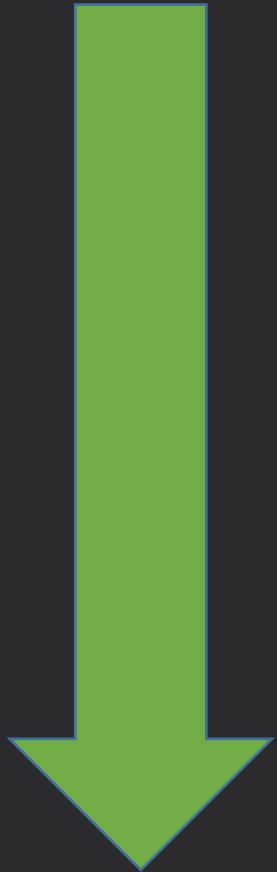
Deep Learning
Algorithm Pipeline



Car
Not Car

Deep Learning Model

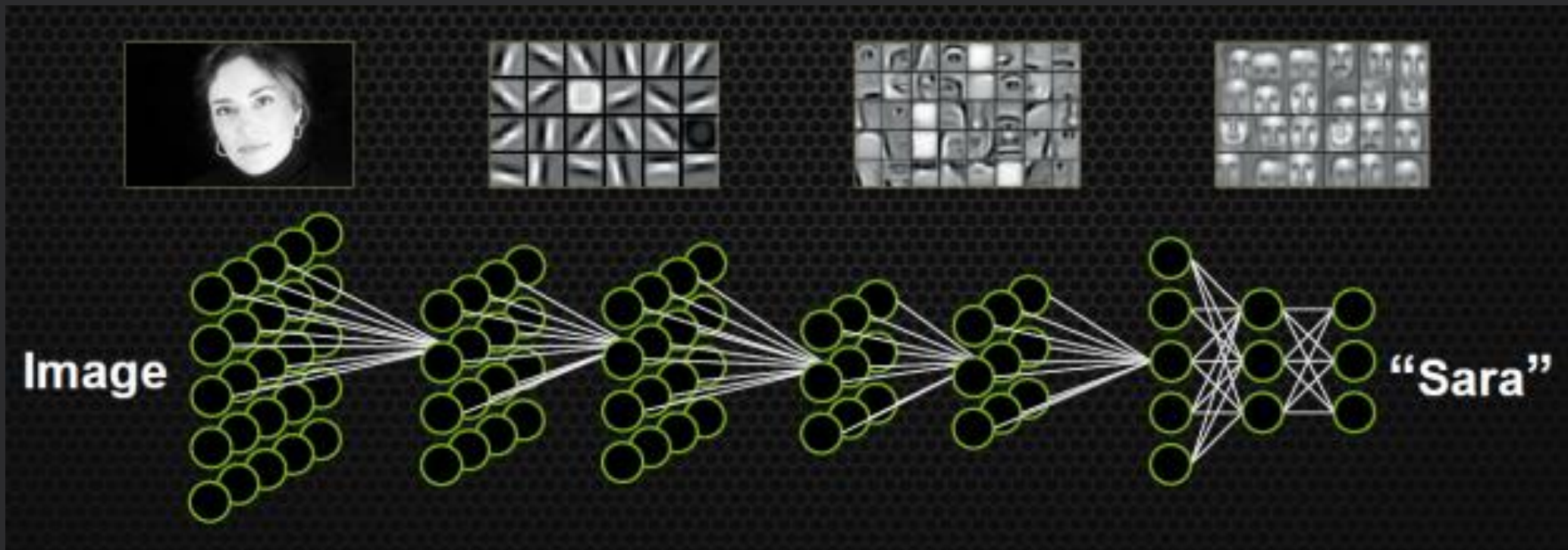
Increased
Sophistication &
Capabilities





What is Deep Learning?

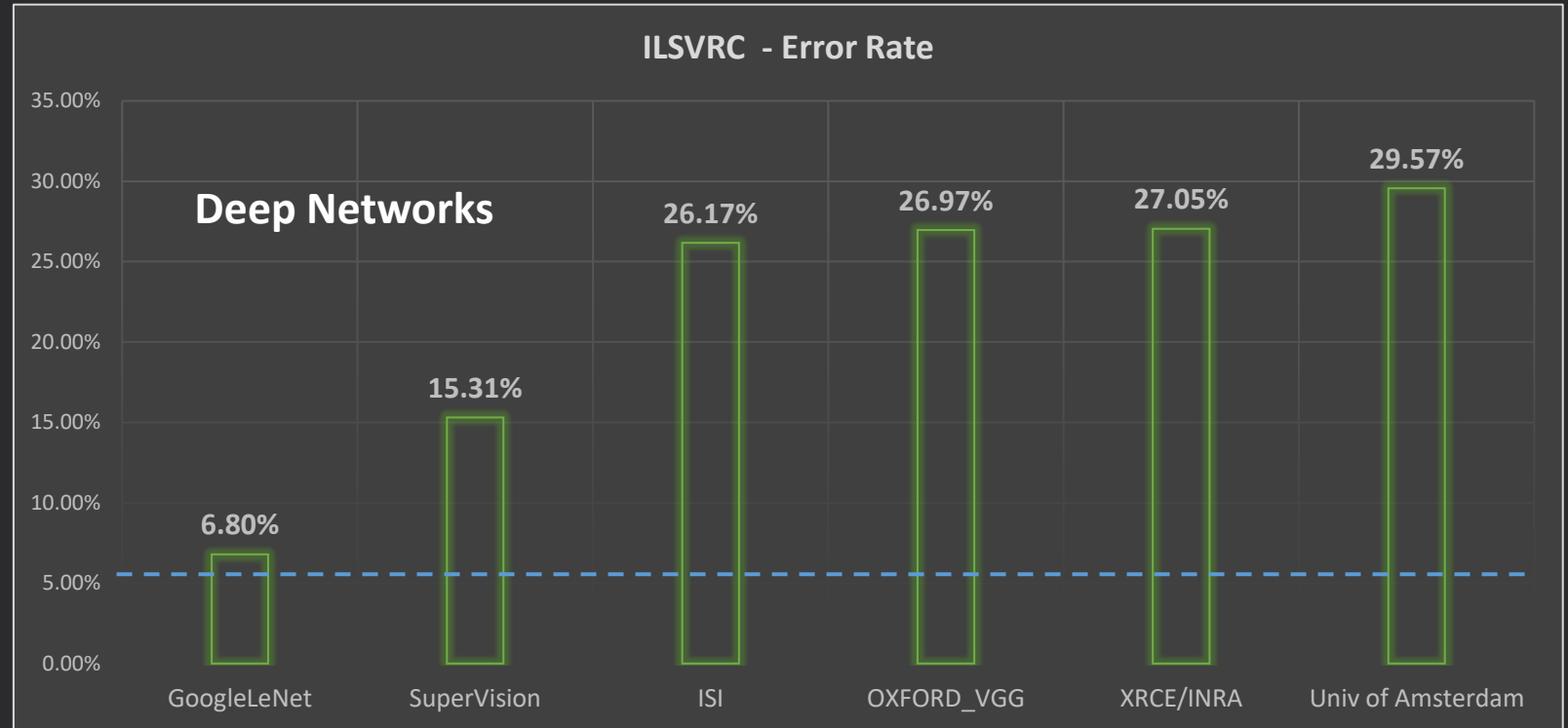
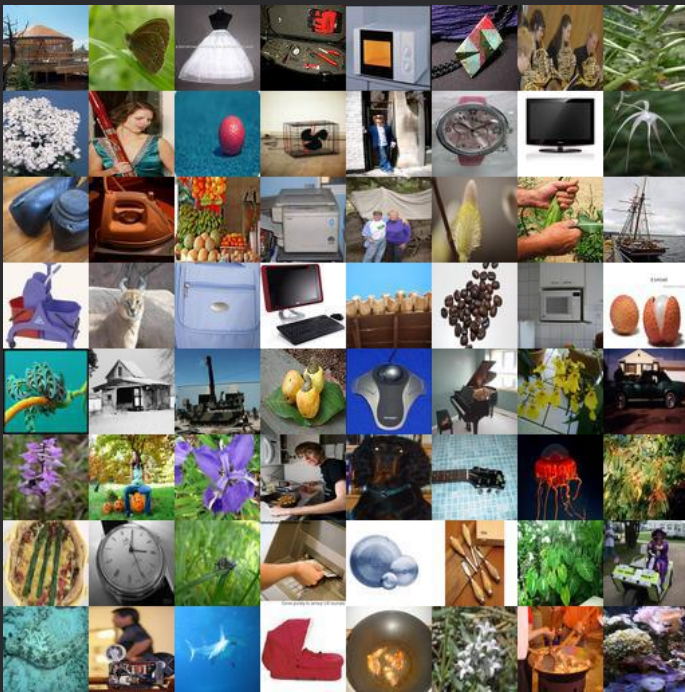
'Deep' refers to the model learning a hierarchy of features that logically build upon each other in increasing levels of abstraction.





The Deep Learning Boom

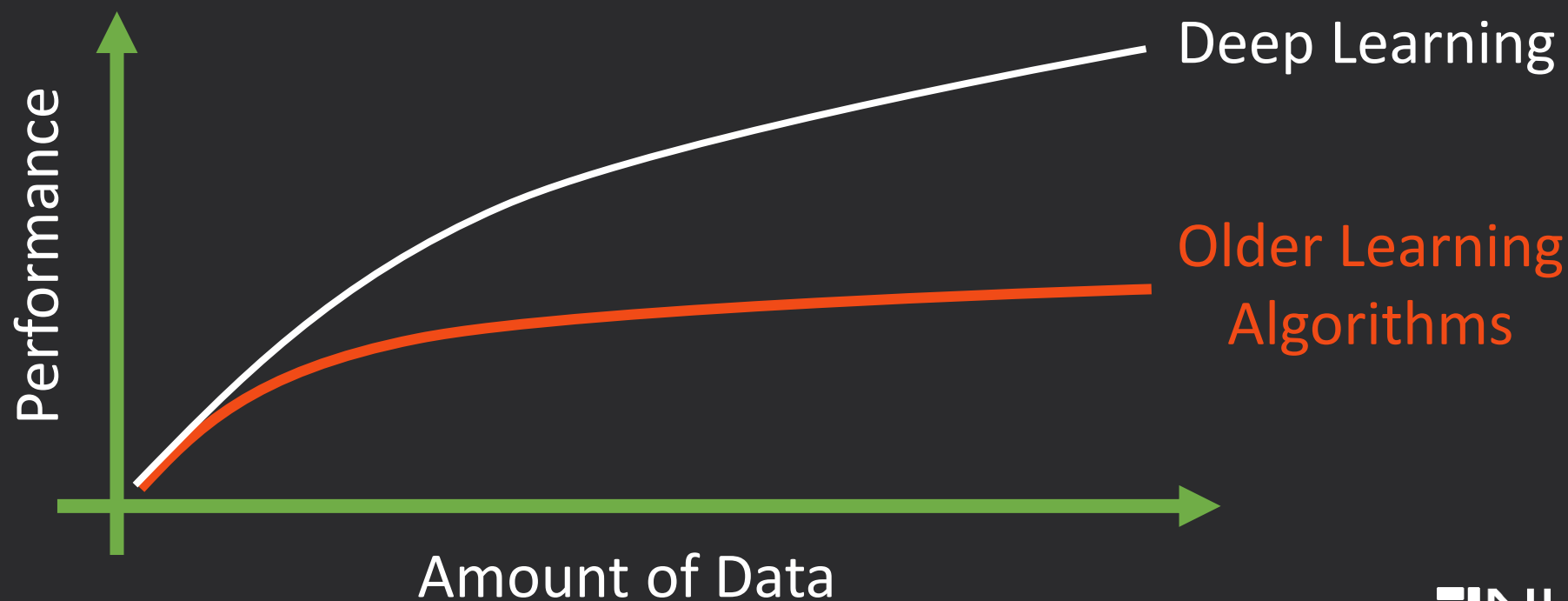
ILSVRC – ImageNet Large Scale Visual Recognition





The Deep Learning Boom

How do modeling techniques scale with the amount of data?





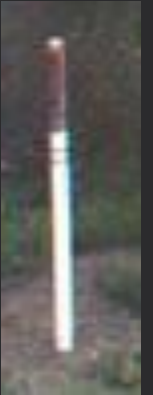
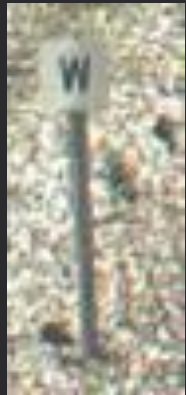
Algorithm Development

Data
Collection

Annotation
& Analysis

Algorithm
Training

```
Division BALTIMORE
Line BA
Track 2
Location 108MI 3528FT
Date 08/12/2014
File 952
Time Division JACKSONVILLE
Speed Line A
DataBreak 1Track 2
Location 615MI 1325FT
Date 07/02/2015
File 2166
Time Division JACKSONVILLE
Speed Line ANA
DataBreak 1Track 1
Location 620MI 844FT
Date Division JACKSONVILLE
File Line A
Time Track 1
Speed Location 621MI 4562FT
DataBreak Date 07/02/2015
File 2166
Time 10:12:49
Speed 30.1 mph
DataBreak 181286
```



Algorithm Application



**Raw
Imagery**



**What the
Algorithm `Sees`**

The logo for NLP LOGIX features a stylized icon on the left composed of several white and green squares. To the right of the icon, the text "NLP LOGIX" is displayed in a white, sans-serif font. The letter "X" at the end of "LOGIX" is highlighted in a vibrant green color.

Questions?