

Feb 28th | [IoTShow.in](https://www.iotshow.in) and India Electronics Week 2019

# Looking Inside the Black-Box of an AI/ML Based System

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Founder, [SunvAI](https://www.sunv.ai)

- AI Powered Platform that Enables People with Complaints to Those who could Resolve Them.



BEFORE I BEGIN

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**JOURNEY SO FAR**

# [ Evolution of information sharing ]



Image Source - internet



# 2017 *This Is What Happens In An Internet Minute*

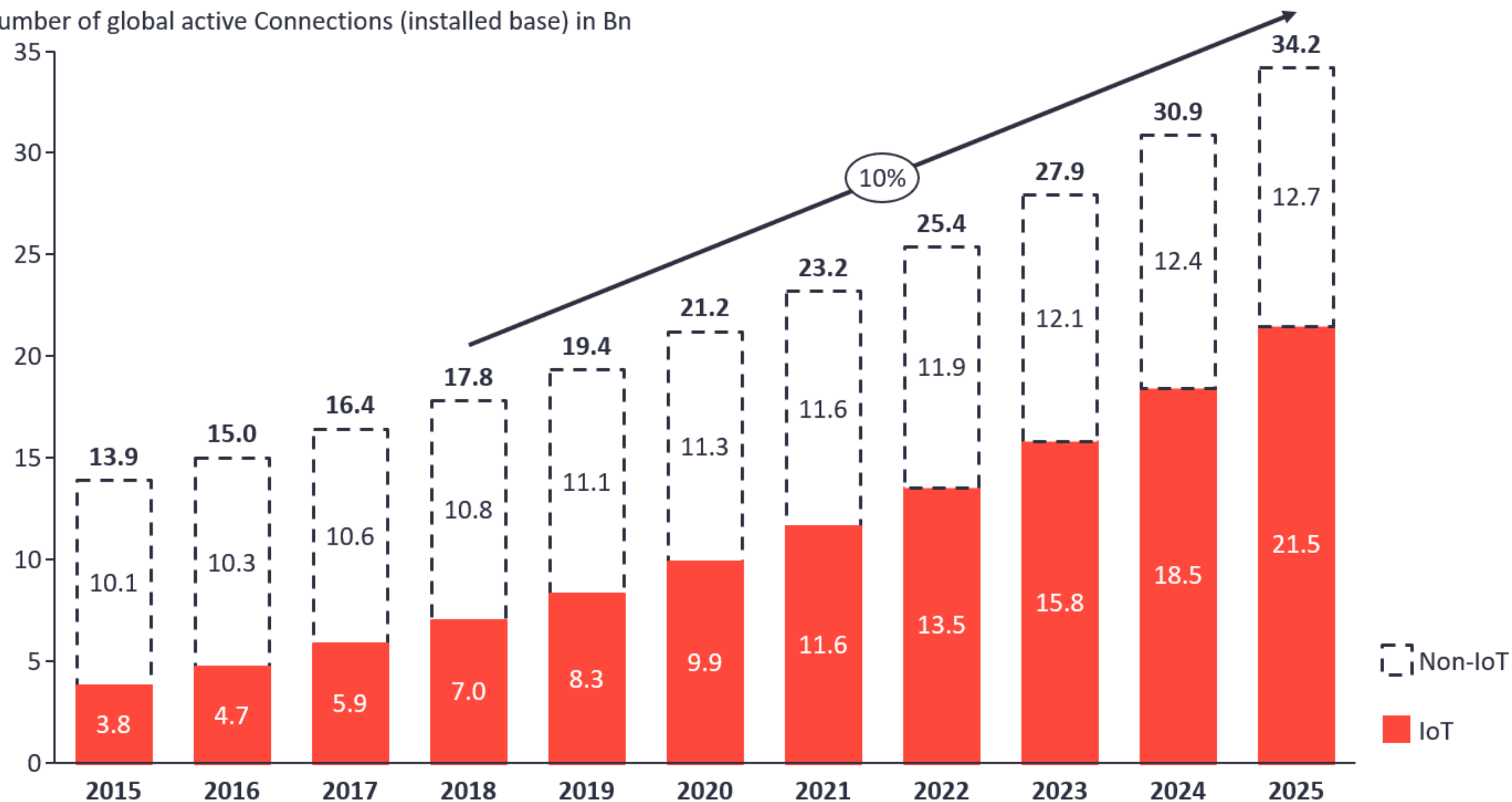


# 2018 *This Is What Happens In An Internet Minute*



# Total number of active device connections worldwide

Number of global active Connections (installed base) in Bn

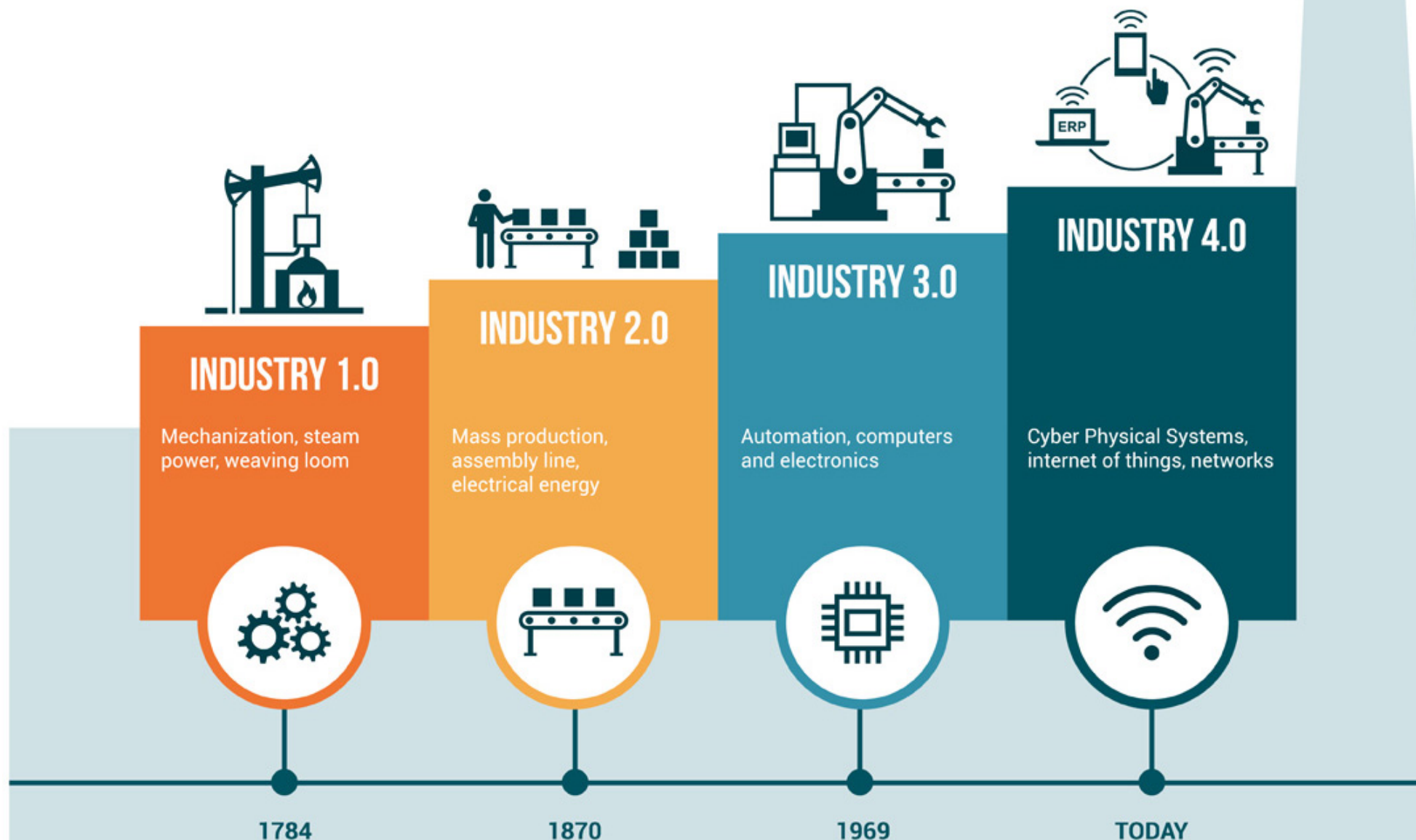


Note: Non-IoT includes all mobile phones, tablets, PCs, laptops, and fixed line phones. IoT includes all consumer and B2B devices connected – see IoT break-down for further details  
 Source: IoT Analytics Research 2018



# INDUSTRIAL REVOLUTION

TRANSFORMING INDUSTRIES AND INNOVATION



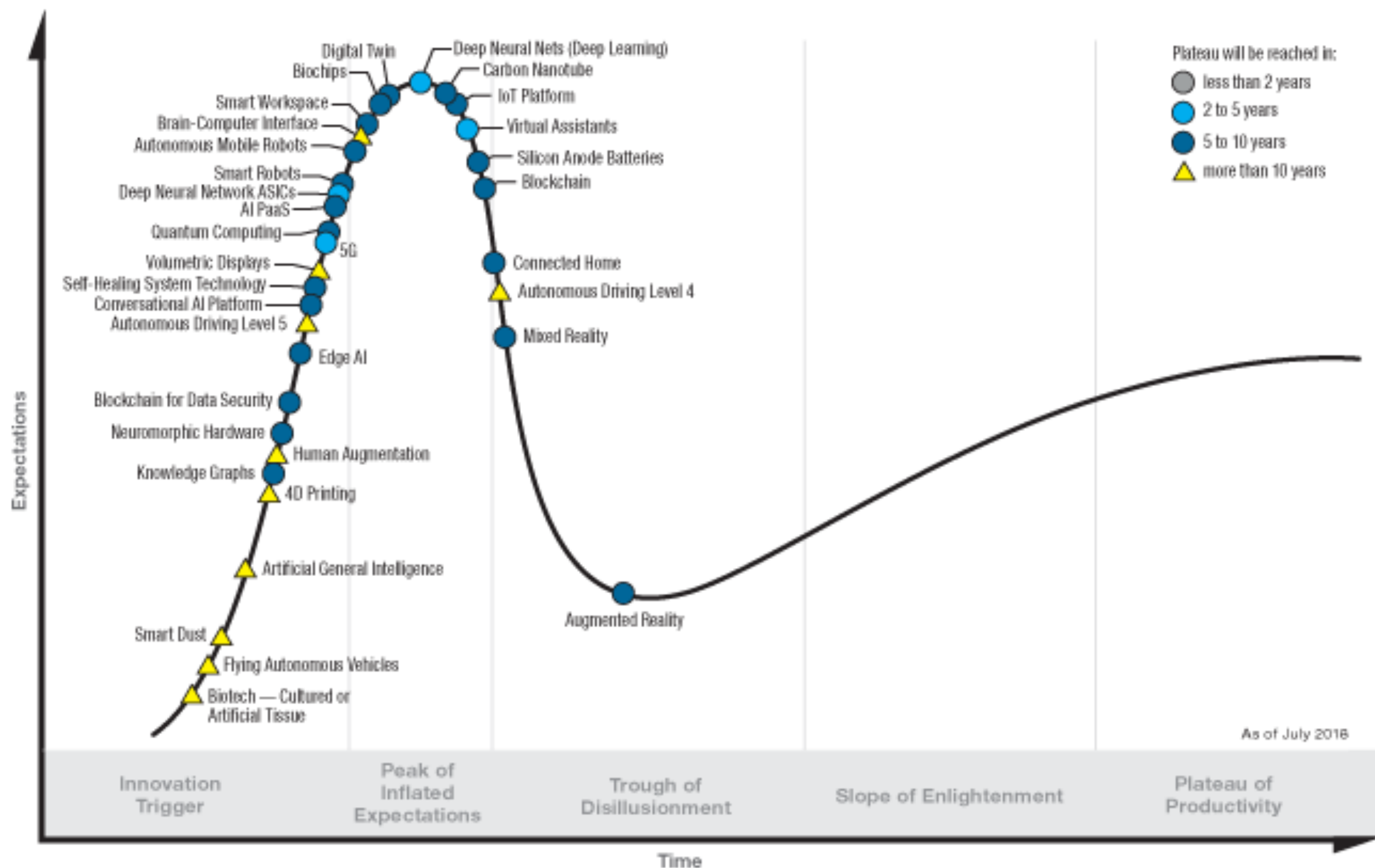


**A SMART WORLD**

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**WAY FORWARD**

# Hype Cycle for Emerging Technologies, 2018



[gartner.com/SmarterWithGartner](https://gartner.com/SmarterWithGartner)

Source: Gartner (August 2018)  
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**Gartner.**





WHERE ARE WE  
TODAY?

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**PRESENT SCENARIO**

USAGE OF AI & IOT IN —

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## A FEW INDUSTRY SPECIFIC EXAMPLES



## A FEW INDUSTRY SPECIFIC EXAMPLES

### ► Retail





## A FEW INDUSTRY SPECIFIC EXAMPLES

- ▶ Retail
- ▶ Healthcare



## A FEW INDUSTRY SPECIFIC EXAMPLES

- ▶ Retail
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- ▶ Transportation



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## A FEW INDUSTRY SPECIFIC EXAMPLES

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- ▶ Healthcare
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- ▶ etc.



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IS IT PERFECT?

*“Architecting Happiness ~ Effectively Untangle, Link Rightly”*



Image Source - internet



IS IT PERFECT?

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## MARKETS / BUSINESSES



IS IT PERFECT?

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## MARKETS / BUSINESSES

- ▶ High Technology
  - ▶ Perfection



IS IT PERFECT?

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## MARKETS / BUSINESSES

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- ▶ Traditional Businesses
  - ▶ Change





## MARKETS / BUSINESSES

- ▶ High Technology
  - ▶ Perfection
- ▶ Traditional Businesses
  - ▶ Change
- ▶ Emerging Markets
  - ▶ Reach | Device | Compute





WHAT CAN YOU EXPECT?

# Looking Inside the Black-Box of an AI/ML Based System

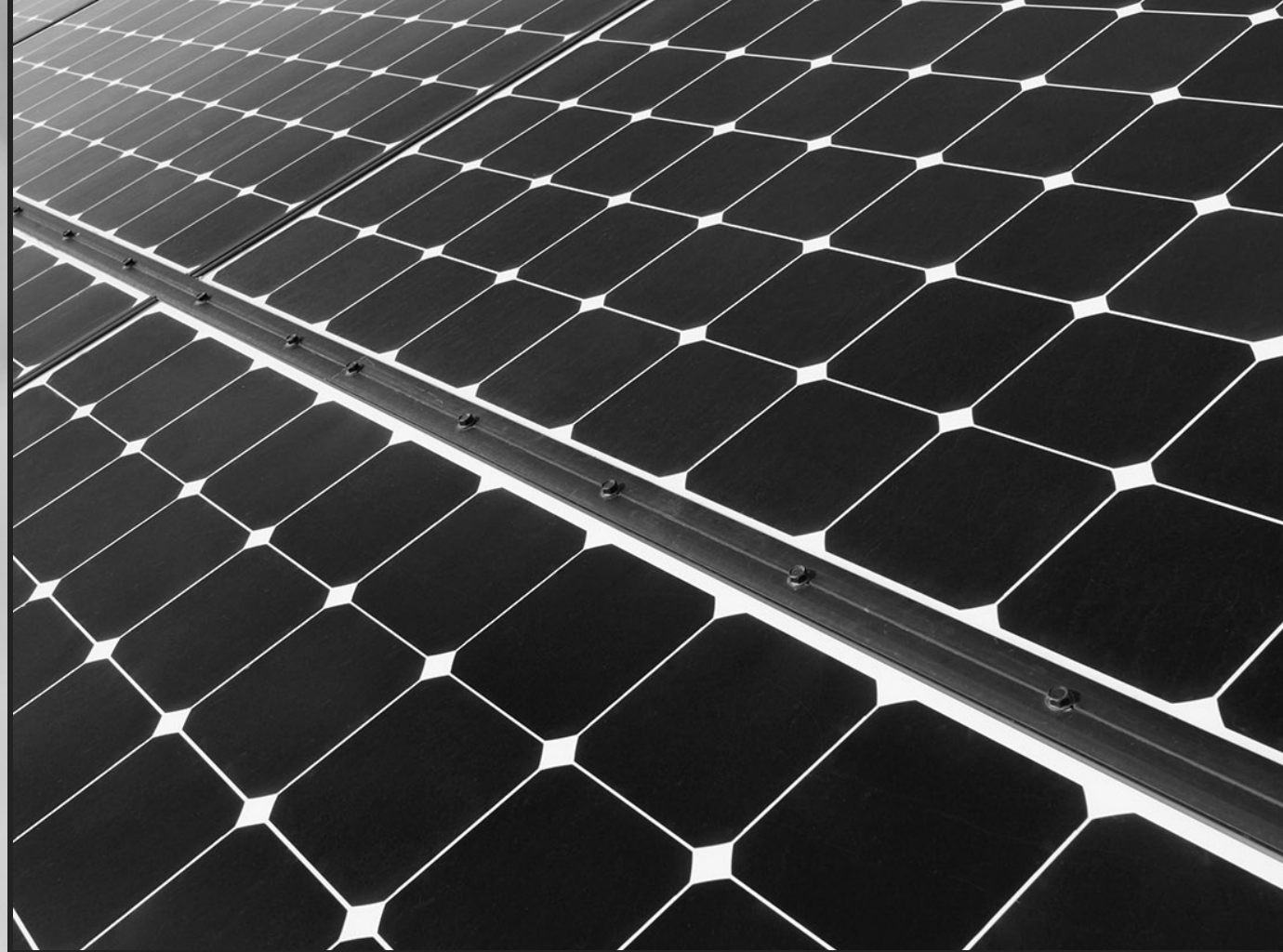
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## **BUILDING A LEARNING SYSTEMS**





**RULES?**





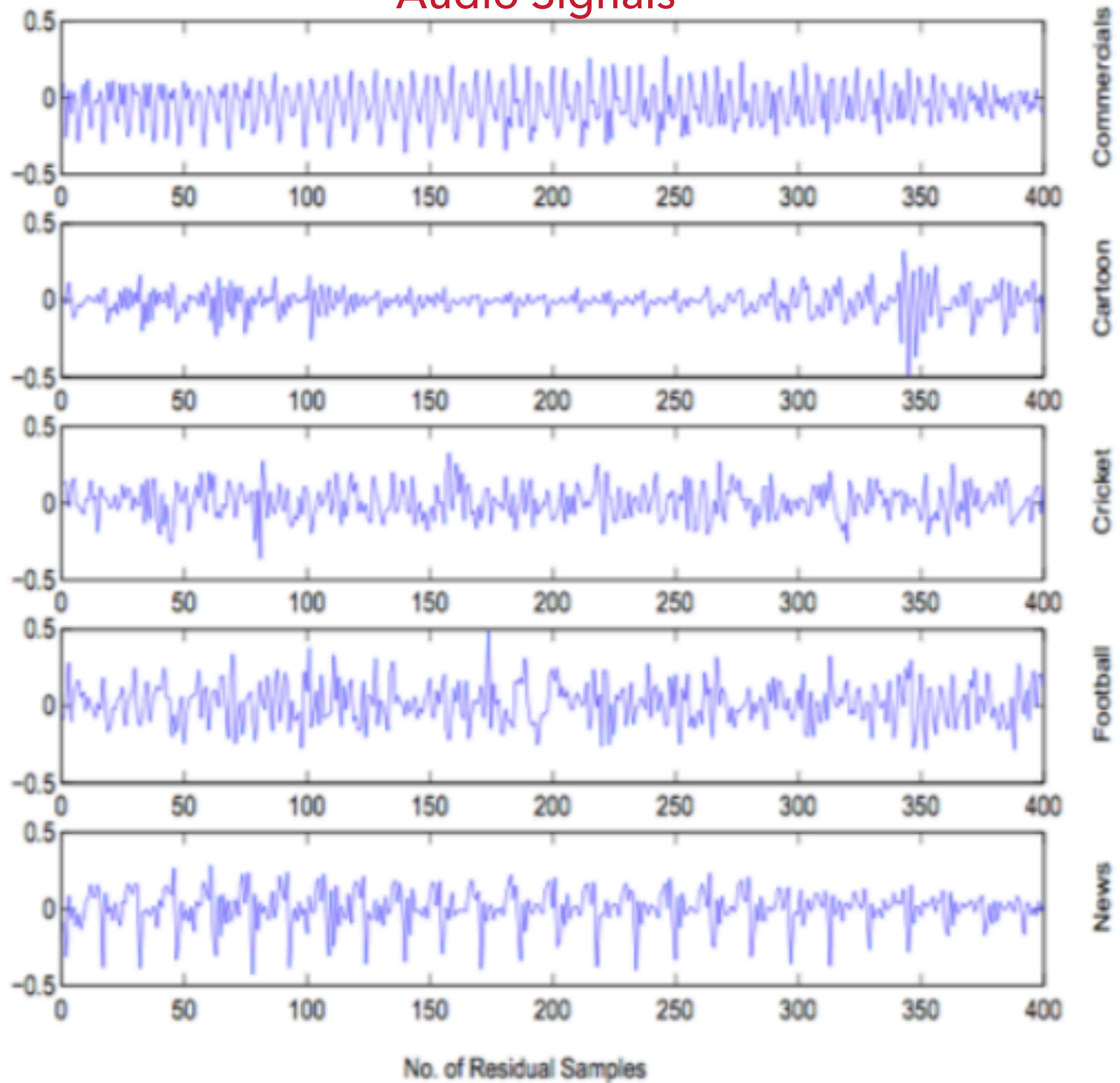
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# UNDERSTANDING “DATA AND DISTRIBUTION” FOR A LEARNING SYSTEM

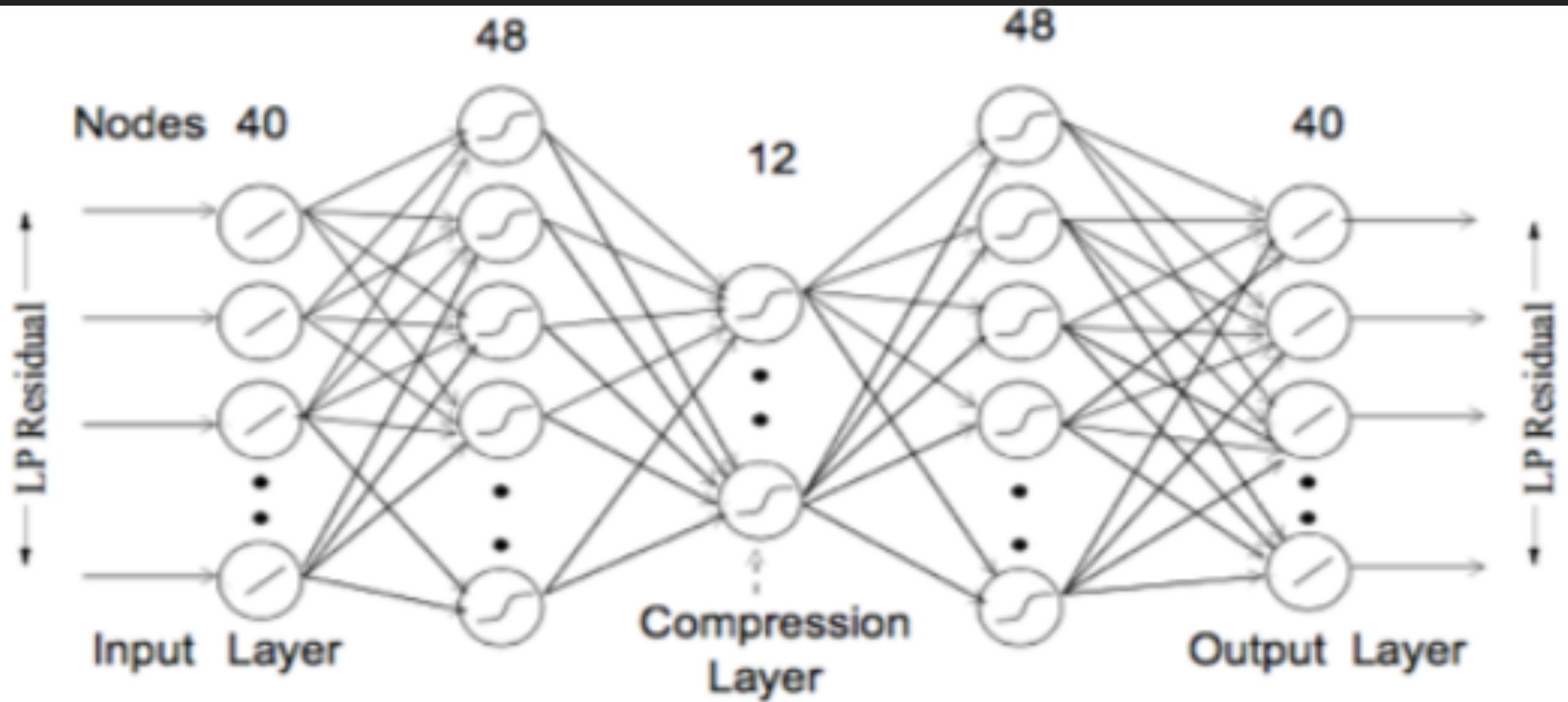
- ▶ An example – Audio Clip Classification
  - ▶ A paper @ <http://www.eurasip.org/Proceedings/Eusipco/Eusipco2004/defevent/papers/cr1580.pdf>

# Audio Signals

Residual Amplitude for Audio Clips

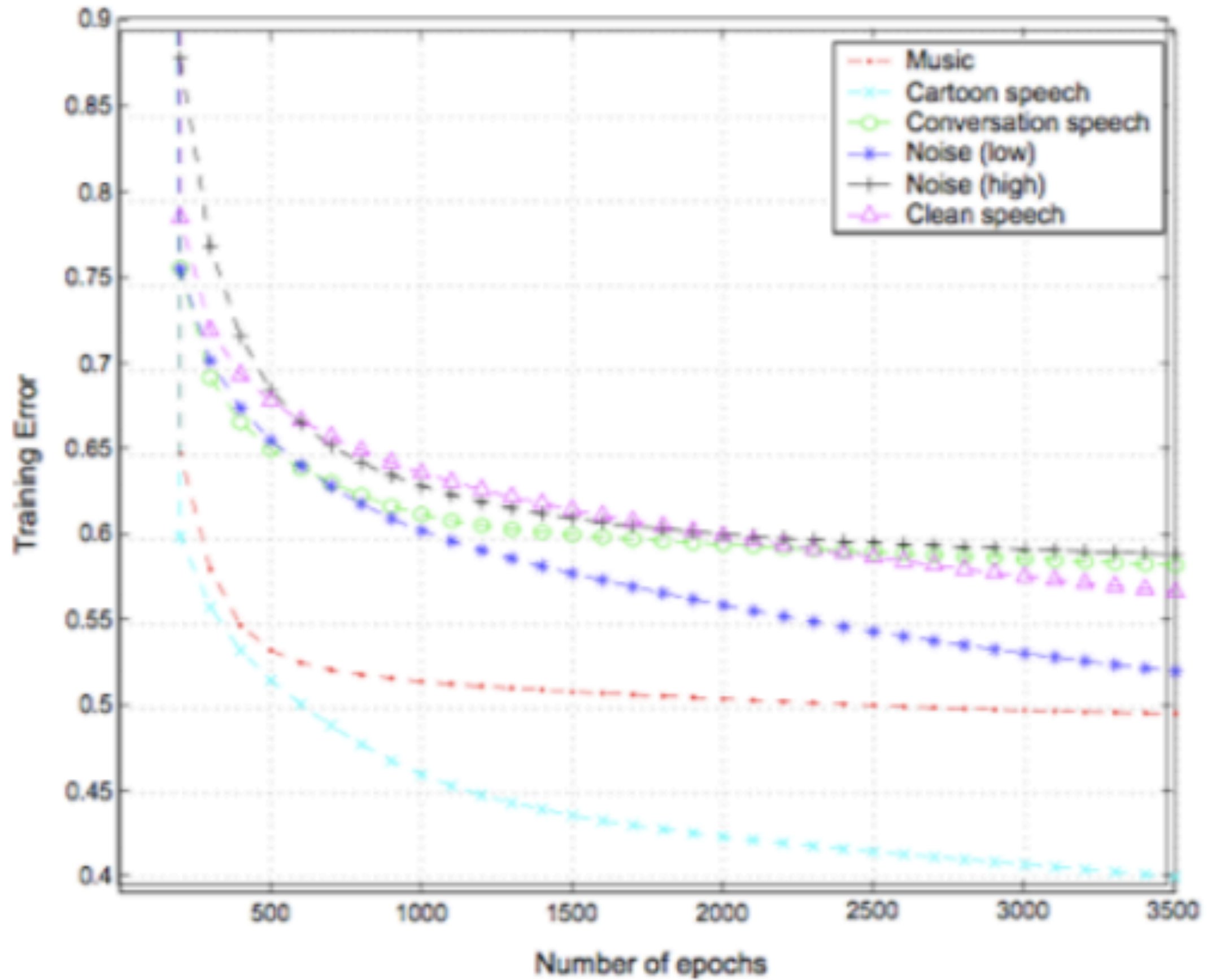


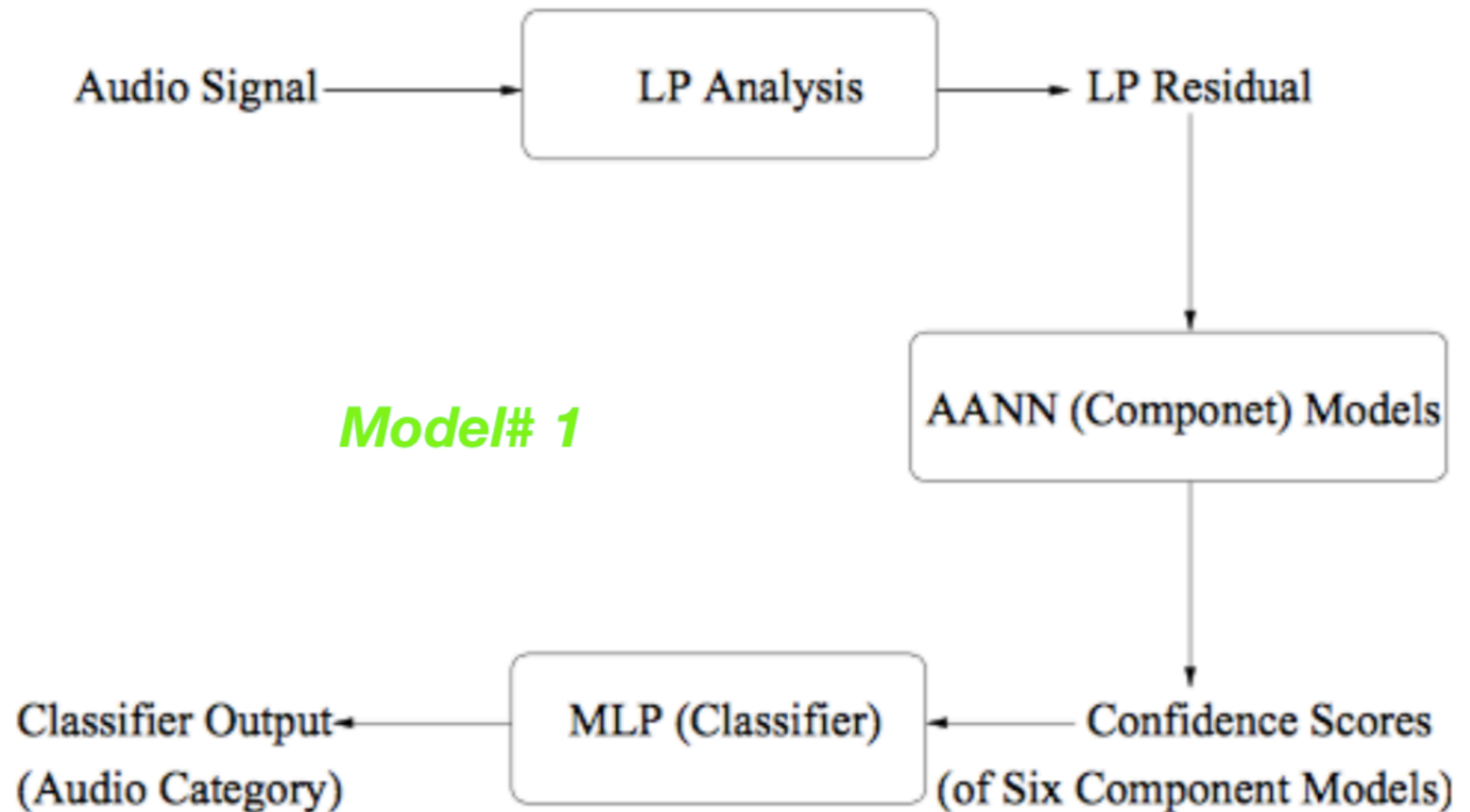
# Neural Networks Models





## Error Curves





# Audio Clip Classification (contd..)

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- This was the modelling for capturing sub-segmental information in audio signal

***Model# 1***

- Similarly, modelling is done for capturing

- Segmental, and

***Model# 2***

- Supra-segmental

***Model# 3***

information in the audio signal

***Model# 4***

- Last modelling was for combining the above three systems





# DATA & DISTRIBUTION

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## AI/ML SYSTEMS

### BLACK-BOX?

WHAT CAN YOU EXPECT?

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## SOLUTION BUILDING USING AI — AN EXAMPLE

WHAT CAN YOU EXPECT?

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## SOLUTION BUILDING USING AI — AN EXAMPLE

PROJECT — VOICE-BASED REMOTE-AUTHENTICATION AND  
RECORDING OF HEALTH DATA IN RURAL SCENARIO



## SOLUTION BUILDING USING AI — AN EXAMPLE

### PROJECT — VOICE-BASED REMOTE-AUTHENTICATION AND RECORDING OF HEALTH DATA IN RURAL SCENARIO

- ▶ Choosing Right AI Technique(s)
  - ▶ Why Voice is NOT the Right Choice Here?
  - ▶ Options
    - ▶ Fingerprint for Authentication

WHAT CAN YOU EXPECT? (CONTINUED...)

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(CONTINUED...)

## (CONTINUED...)

- ▶ System Building –
  - ▶ Considering if Selected 'AI' Technique Fails?

### (CONTINUED...)

- ▶ System Building –
  - ▶ Considering if Selected 'AI' Technique Fails?
- ▶ Other Concerns –
  - ▶ Data Privacy and Protection
    - ▶ Misuse and/or Manipulation
      - ▶ Adding Layers of Security – Abiding Laws



## (CONTINUED...)

- ▶ System Building –
  - ▶ Considering if Selected 'AI' Technique Fails?
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WHAT CAN WE DO  
TODAY?

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**TAKEAWAY FOR YOU**

YOUR ACTION ITEMS — TO IDENTIFY —

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**WHERE IS YOUR BUSINESS?**

## WHERE IS YOUR BUSINESS?

- ▶ Fully Physical | Partially Digital | Fully Digital



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— ON RIGHT TRACK? —

YOUR ACTION ITEMS — TO IDENTIFY —

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**WHAT SHOULD BE YOUR NEXT STEP?**



YOUR ACTION ITEMS — TO IDENTIFY —

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## WHAT SHOULD BE YOUR NEXT STEP?

- ▶ Basic Automation

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— START AND CONTINUE —

**THANK YOU...**

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