



Hewlett Packard
Enterprise

Predicting Service Outage Using Machine Learning Techniques

HPE Innovation Center

HPE Innovation Center - Our AI Expertise

Sense

Learn

Comprehend

Act

Computer Vision

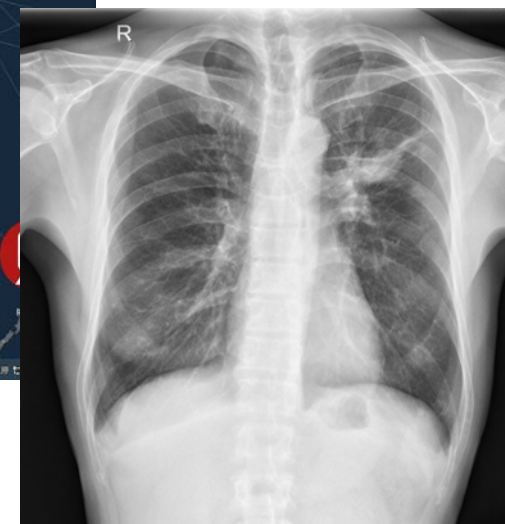
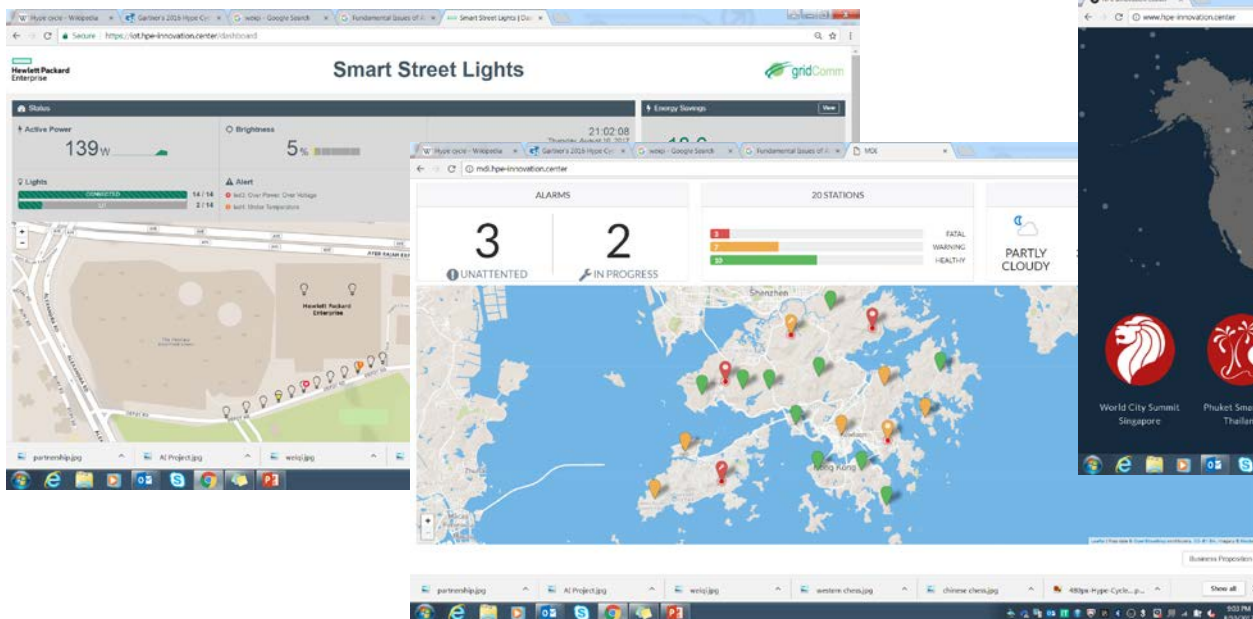
Machine Learning

Natural Language
Processing

Expert System

Audio/ Speech
Processing

Knowledge
Representation





IT Operations Analytics (ITOA)

IT operations analytics (ITOA)

Optimize IT operational service in near real time for production application and infrastructure computing environments.



IT operations analytics (ITOA)

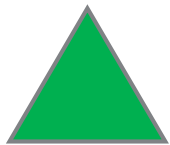
Analyze
high volume structured, unstructured log data and
business data



Proactively **avoid** service interruptions, slowdowns and outages
Have **faster** root-cause analysis and problem recovery times
Enhance system and application performance
Improve end-user experience
Increase operational efficiency
Improve computing resource utilization

Worldwide IT Operations Analytics Market, 2016

\$1.9 Billion



32.9%



Hewlett Packard Enterprise

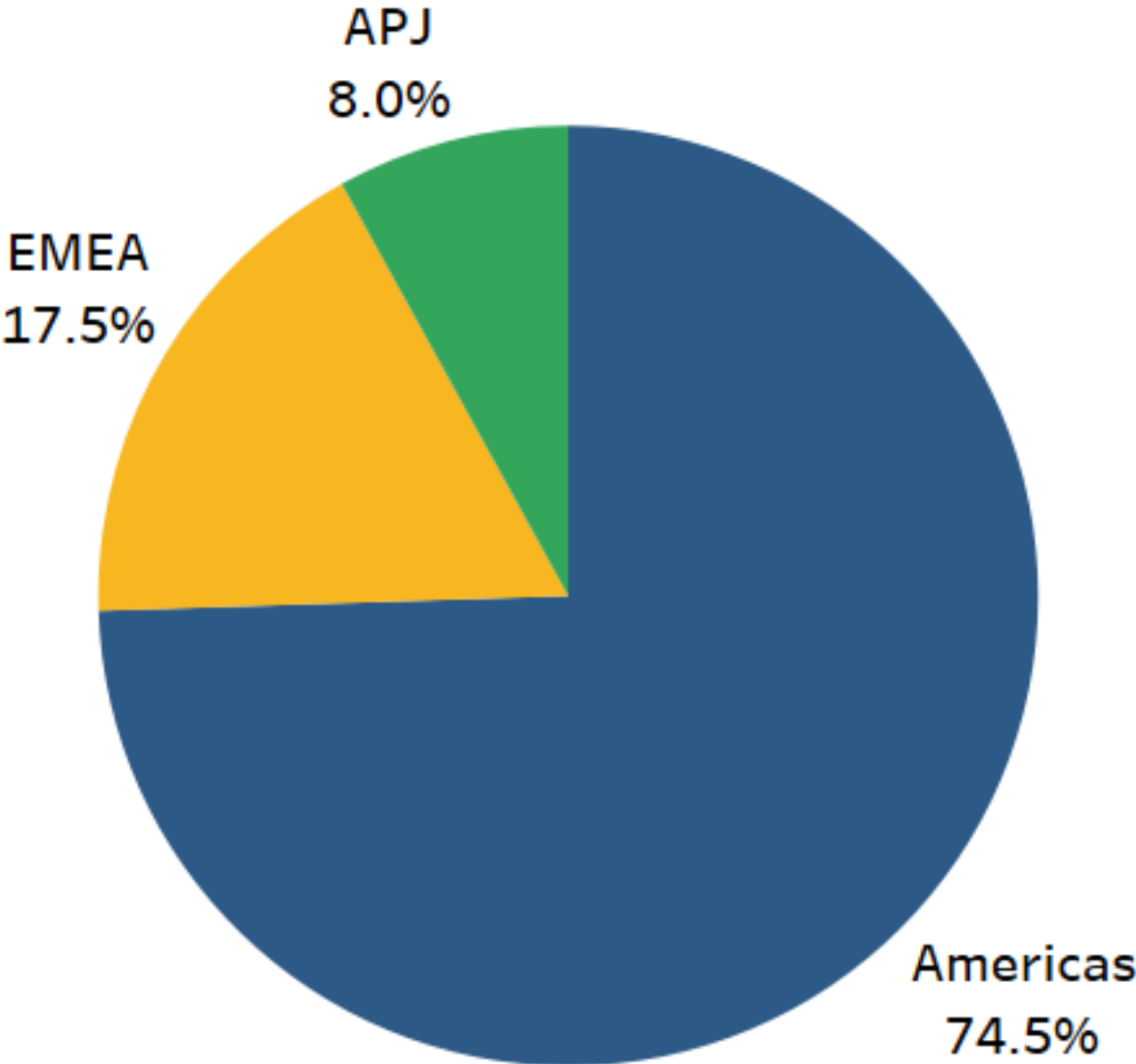
+17.0% y/y

\$97.8M

Worldwide IT Operations Analytics Business Revenue Share

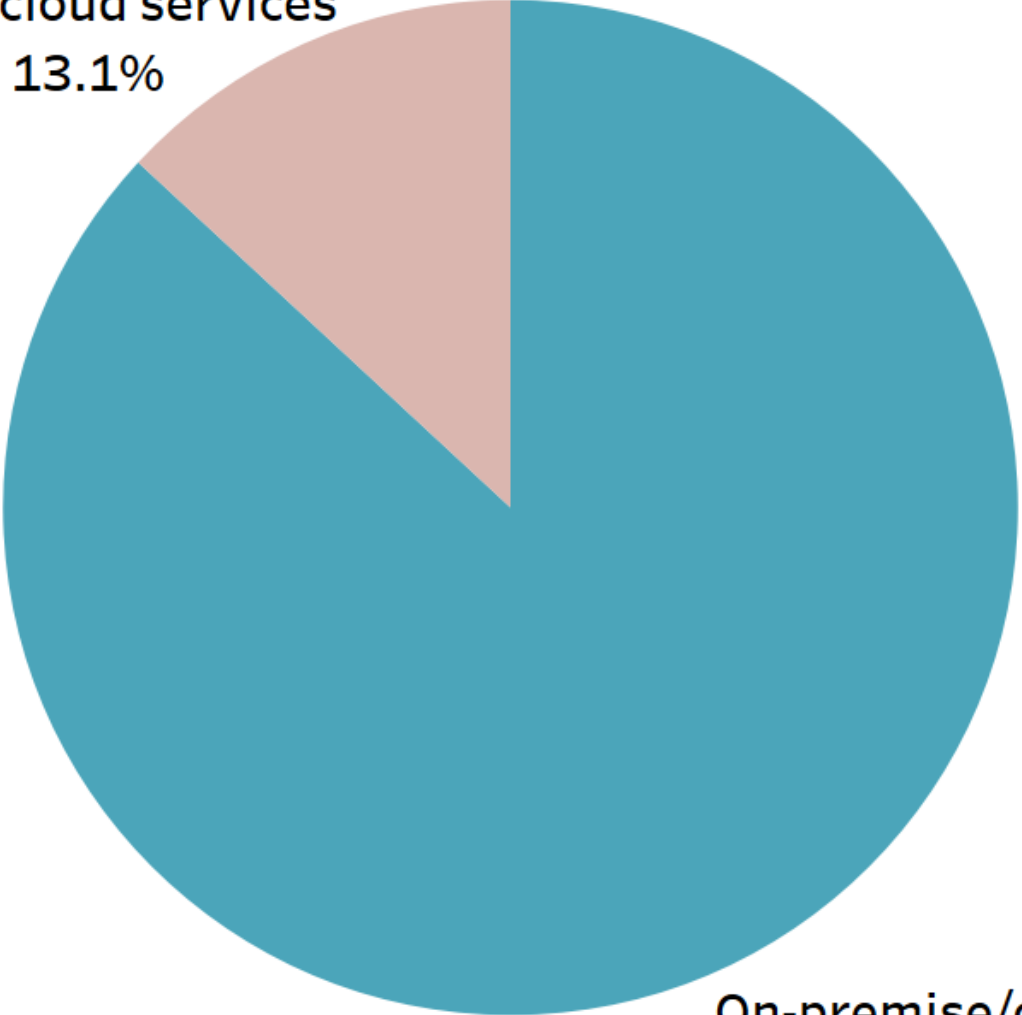
by
region

2016



Worldwide IT Operations Analytics Business Revenue Share

Public cloud services
13.1%



On-premise/others
86.9%

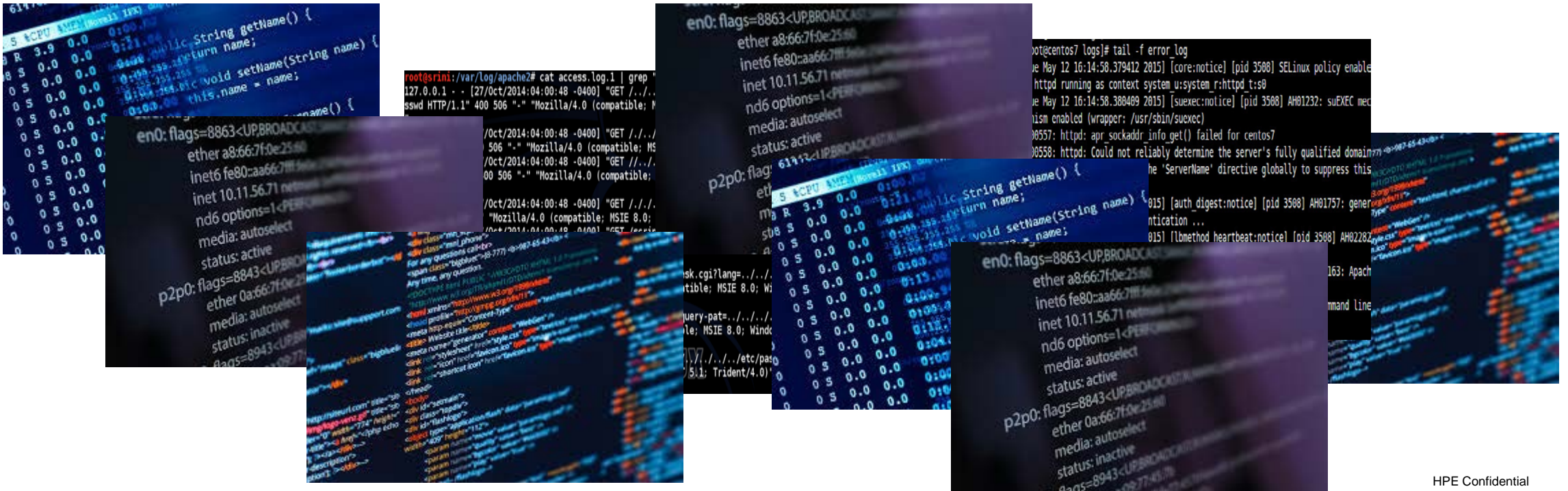
2016

by
deployment
type



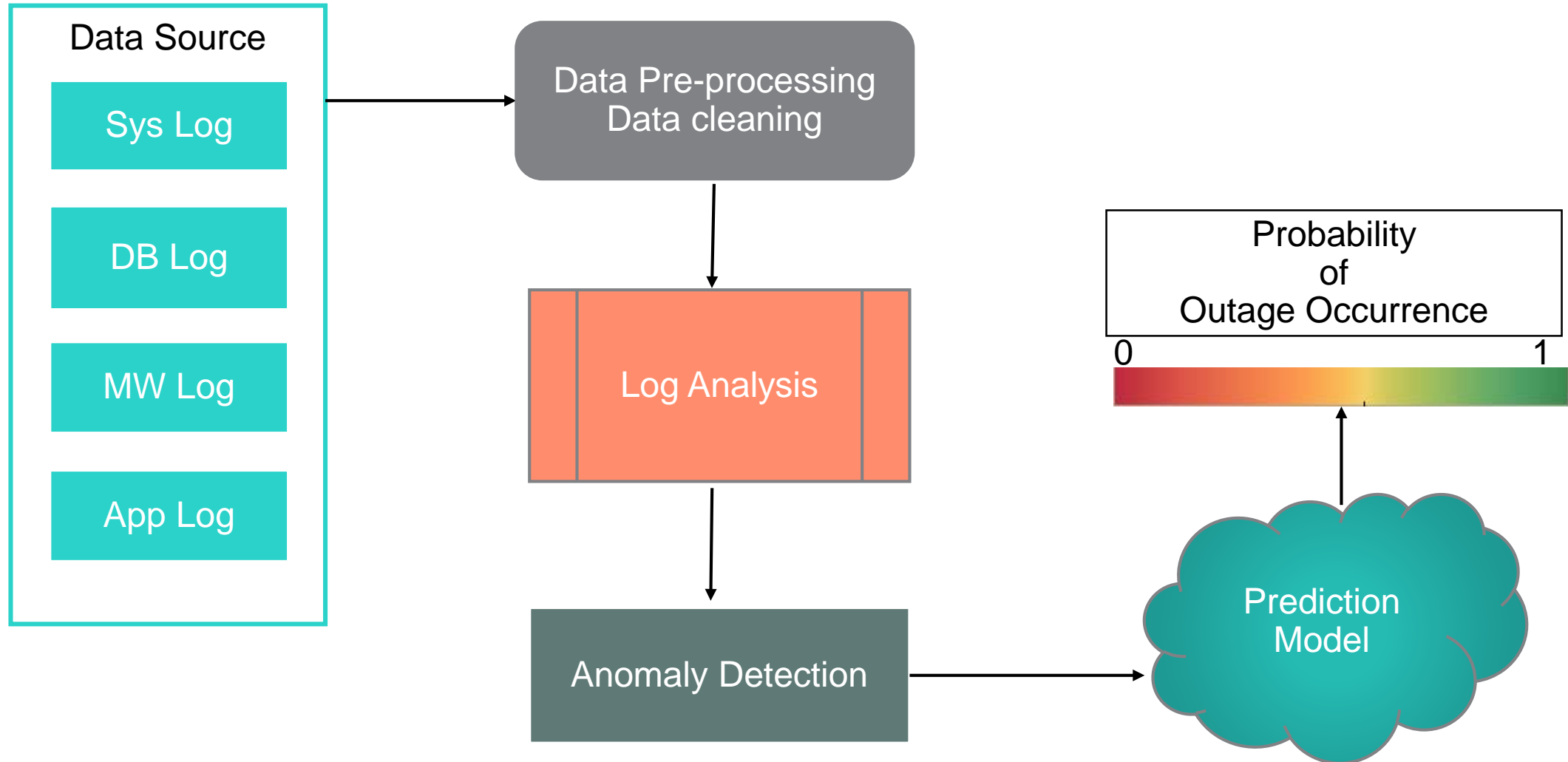
Service Outage Prediction: a case study

25 TB log data

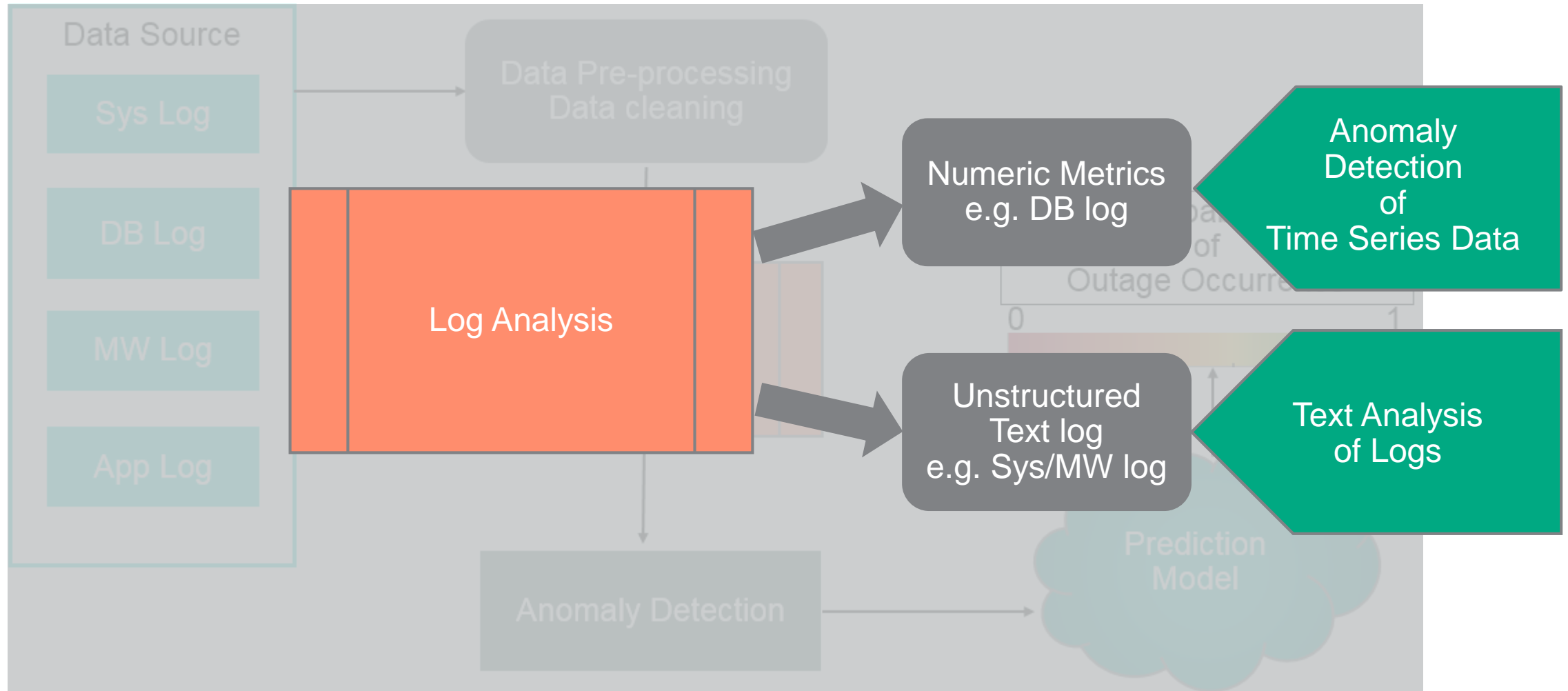


Probability of occurrence of service outage

Service Outage Prediction



Service Outage Prediction



Service Outage Prediction - Three Models



Naïve Bayes

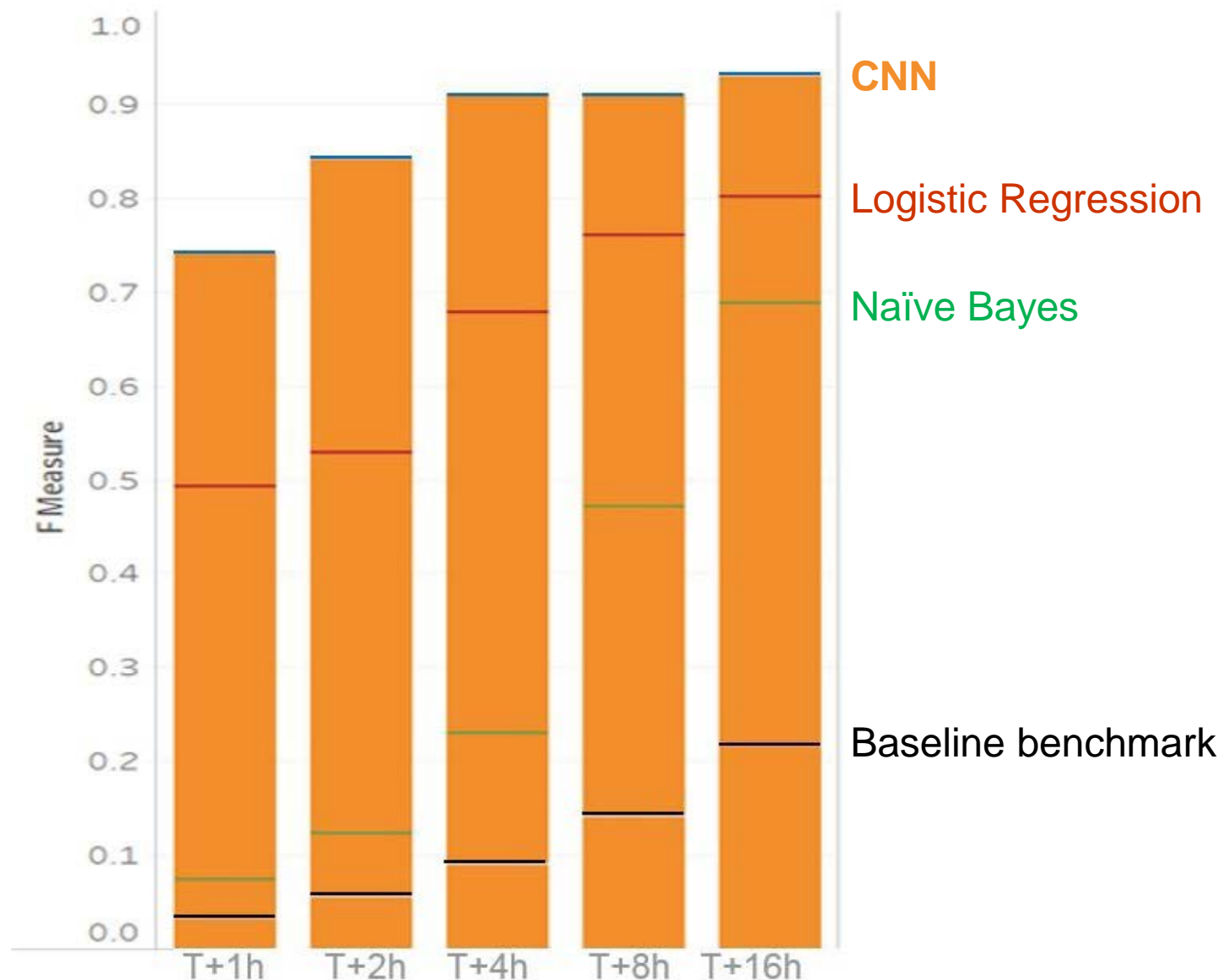


Logistic Regression

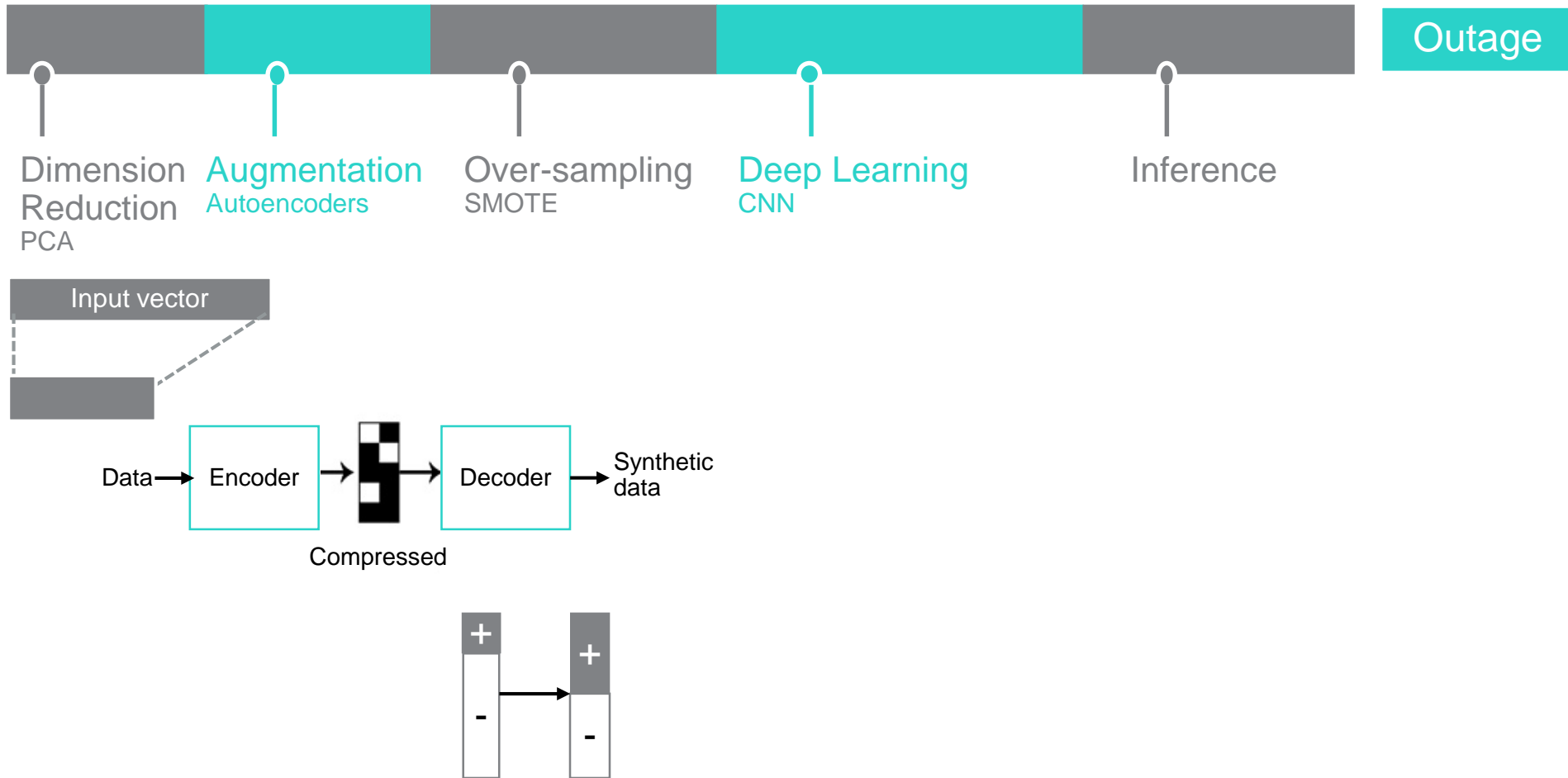


Deep Learning

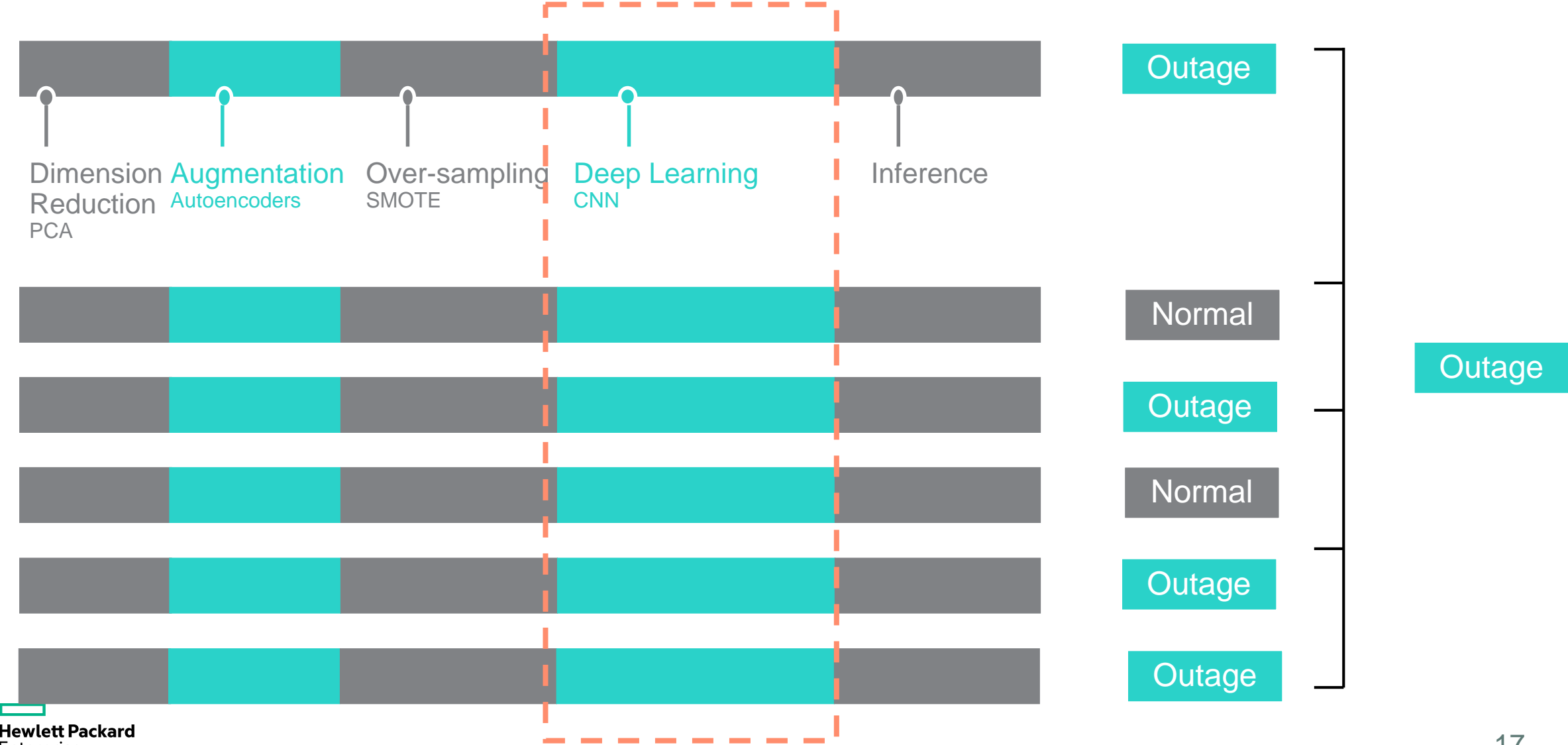
Performance Comparison of Different Models

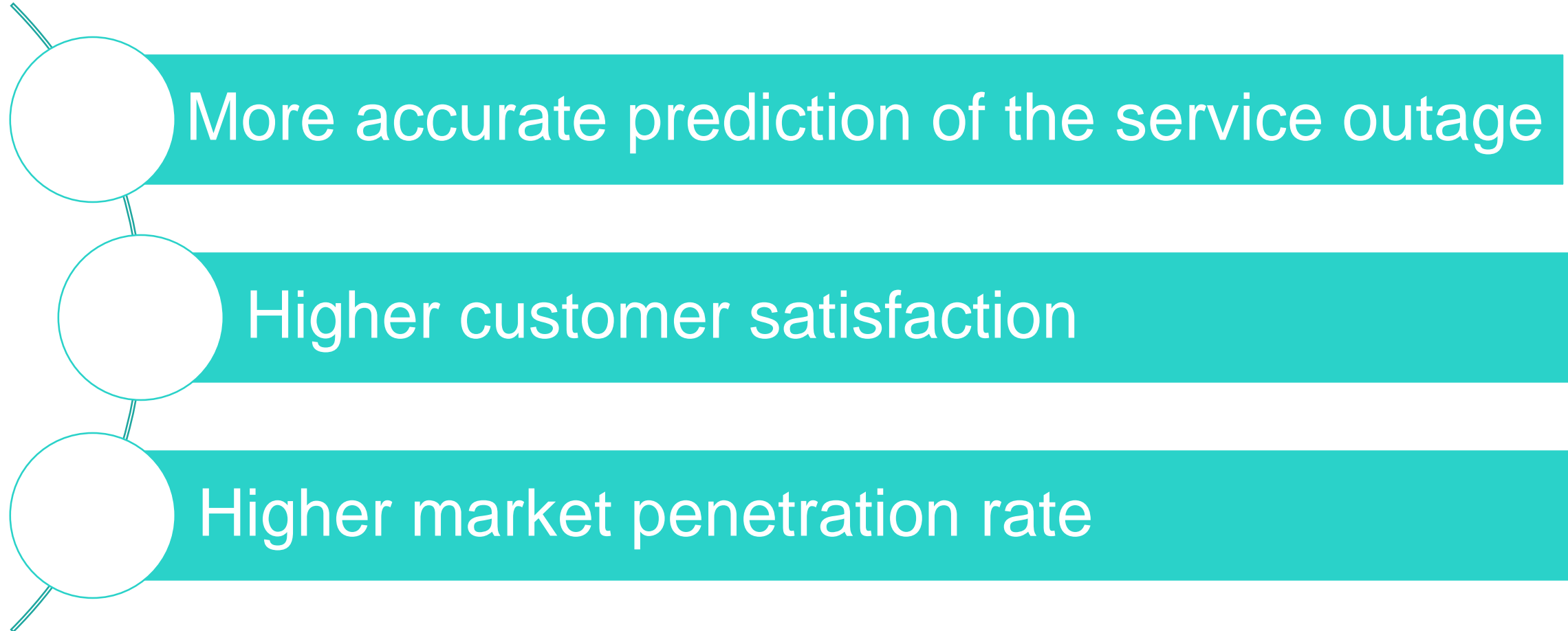


Building Deep Learning Model with Imbalanced Data



Ensembles of CNN







HPE Portfolio for Deep Learning

HPE has a comprehensive, purpose-built portfolio for Deep Learning

Government,
academia and
industries



Financial
services



Government
and academia



Life Sciences,
Health



Autonomous
vehicles / Mfg.

HPE
POINTNEXT

Advisory, professional and operational services, HPE Flexible Capacity, HPE Datacenter Care for Hyperscale

Compute ideal for training models in data center

HPE SGI 8600

Petaflop scale for deep learning and HPC



HPE Apollo 6500

The enterprise bridge to accelerated computing



HPE Apollo sx40

Maximize GPU capacity and performance with lower TCO



Compute for both training models and inference at edge

HPE Apollo 2000

The bridge to enterprise scale-out architecture



Edge analytics and inference engine

HPE Edgeline EL4000

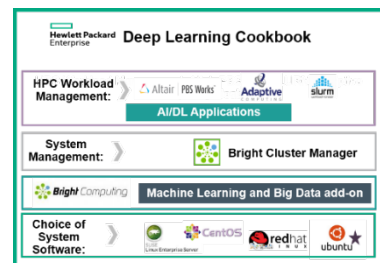
Unprecedented deep edge compute and high capacity storage; open standards



AI Software Framework

Easy Setup and Flexible OS

Using Bright Computing's distribution of deep learning software development components and workload management tool integration



HPC Storage

HPE Apollo 4520



HPC Data Management Framework Software

Large-scale, storage virtualization & tiered data management platform

Choice of Fabrics



Arista Networking

- Intel® Omni-Path Architecture
- Mellanox InfiniBand
- HPE FlexFabric Network

HPE AI customers gaining competitive advantage

Solving complex AI challenges with hybrid cluster



東京工業大学
Tokyo Institute of Technology



“Through our partnership with SGI, and now HPE, the Tokyo Institute of Technology has worked successfully to deliver a **converged world-leading HPC and Deep Learning platform....**”

Satoshi Matsuoka
Professor and TSUBAME Leader
Tokyo Institute of Technology..



Hewlett Packard
Enterprise

Upping the ante on Artificial Intelligence



“The discoveries and insights our researchers are now uncovering will have direct effects on human lives by way of **advancing precision medicine, increasing energy efficiency, and improving policymaking for the economy.**”

Dr. Nick Nystrom
Senior Director of Research
Pittsburgh Supercomputing Center

Libratus AI program defeats world's best poker players



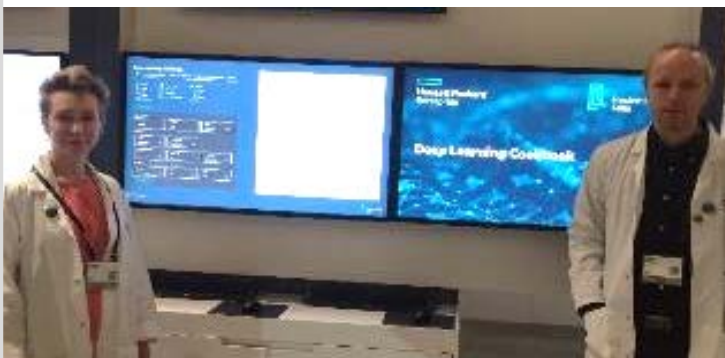
“The best AI’s ability to do **strategic reasoning with imperfect information** has now surpassed that of the best humans.”

Dr. Tuomas Sandholm
Professor of Computer Science Department
Carnegie Mellon University

HPE demystifies deep learning for faster intelligence



Get started rapidly: Develop deep learning models



AI expertise and solutions
to “get started” with deep learning models

Expertise

- Rapid technology selection guides
- State of the art training

Solutions

- Integrated purpose-built solutions
- Out of the box solutions



Scale and Integrate: Deliver attractive returns



Proven blueprints and services
for “scalable” production deployments

Proven Blueprints

- Reference Architectures
- Innovation labs for best practices

Services

- Deploy, integrate and support
- Flexible, on-demand capacity



Optimize Environment: Enhance competitive advantage



Technology integration
capabilities to maximize performance

Integration capabilities

- Enhanced global Centers of Excellence
- Next gen technology integration

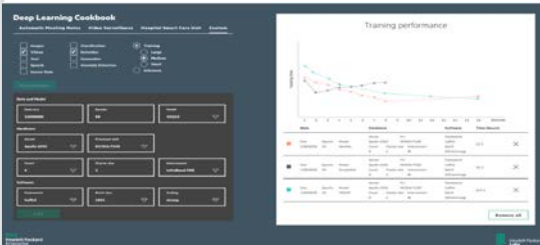
New AI expertise, blueprints and technologies to get started, scale, integrate and optimize

AI expertise and solutions to “get started” with deep learning models

Select

ideal technologies & systems

Make Informed technology decisions with **New HPE Deep Learning Cookbook**



Comprehensive technology selection tool

- Estimates & refines performance
- Characterizes frameworks
- Recommends ideal hardware and software stacks

Train

your teams

Gain organizational competencies with **Enhanced Deep Learning Institute**



State of the art deep learning training

- Latest techniques
- Software frameworks
- Infrastructure requirements
- Hands on, instructor led

Enhance

employee productivity

Accelerate app development with **New deep learning integrated solution**



Pre-configured, proven hardware & software solution

- Purpose-build platform
- Easy to use and install
- Simple management
- Automated framework updates

Leverage

“out of the box” solutions

Increase security of e-commerce with **Enhanced HPE Fraud Detection solution**



HPE Fraud Detection Solution with Kinetica

- Uses deep learning techniques
- Qualified with Kinetica in-memory GPU database
- NVIDIA GPU accelerators

IT Expertise

Solutions

Implement and integrate your production environment

Powering artificial intelligence research

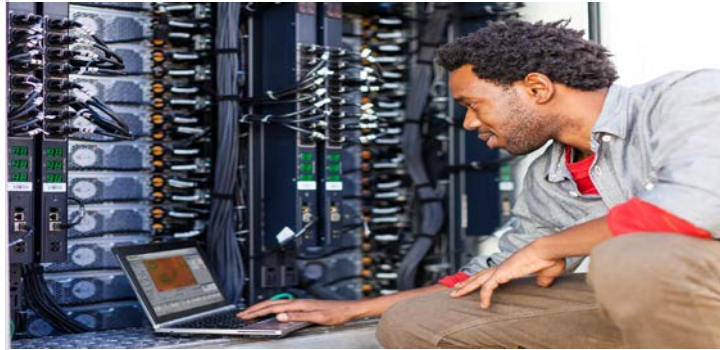


New AI Innovation Labs

Established AI testbed combining both HPE hardware and state of the art AI software to:

- **Collaborate** with leading academia on AI research projects
- **Support internal** HPE AI research
- **Support select customers and partners** in research and POC

Over 75 AI experts in global AI Innovation Labs



Key benefits

- **Stable AI environment** to accelerate time-to-value
- **Purpose-built platforms** to handle the most extreme performance needs
- **Early access** to latest technologies and new, cutting edge hardware and software, often pre-production
- **Faster provisioning and setup**

Advisory services for app and data integration



Expertise for quick deployments

- Implement and integrate with a trusted partner, HPE Pointnext services
- Leverage advisory, professional and operational services

HPE
POINTNEXT

HPE Early Access program for 8-way SXM2 GPU Volta!

Accelerating Deep Learning adoption



**Hewlett Packard
Enterprise**



Advice, planning, design, benchmarking

First Tier One OEM to provide early access to 8-way Volta SXM2 server

Timing is Q12018 for select customers

Configuration, benchmarking and technology selection guidance

Limited engagement for select customers through your Sales contacts



**Hewlett Packard
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Thank You