Deep Learning for Business

Business with
Deep Learning & Machine Learning

Why is Deep Learning Popular Now?

Why is Deep Learning popular now?

1. Declining Computational Costs

– Support of Cloud Computing

- Device connected to a cloud can receive data storing, data analysis, application functions, and control intelligence services
  - ✓SaaS (Software as a Service)
  - ✓PaaS (Platform as a Service)
  - ✓IaaS (Infrastructure as a Service)
- Support for mobile systems based on MEC (Mobile Edge Computing) and Fog computing

Why is Deep Learning popular now?

MEC (Mobile Edge Computing)

- Cloud computing implemented in/near mobile communication BSs (Base Stations) to speed up IT services and reduce network traffic and congestion

Fog Computing (Fogging)

- Multiple mobile devices (may include PCs or local clouds) collaborating to support cloud functions and services (e.g., storage, control, management, measurement, or networking)

Why is Deep Learning popular now?

2. Greater availability of data

- Higher quality of data collection through intelligent data filters and databases
- **Big Data** collection in real-time through Smartphones, SNS, and IoT sensors
  - Hadoop's MapReduce & HDFS (Hadoop Distributed File System) enables fast **<key, value>** feature extraction from structured data, semi-structured data, and unstructured data in real-time

Why is Deep Learning popular now?

3. Performance Scales with data

– Improved ML, DL, and Big Data technology makes better use of data

4. Faster feature engineering results

– Faster Servers & Networks

– Powerful Distributed Computing

- Cloud Computing, MEC, Fogging
- Big Data distributed computing
  - ✓Hadoop's MapReduce & HDFS

Why is Deep Learning popular now?

5. Hardware Innovation

– **Support of much more powerful CPUs and GPUs**

- Smartphone CPUs (multi-core, big.LITTLE)

– **Low energy consuming efficient processing on mobile devices**

- Smartphones, AR (Augmented Reality) devices, and IoT platforms that support powerful distributed computing

Why is Deep Learning popular now?

6. Integrated System HW/SW, Clouds, Servers, and Network Innovations

- Enhanced & improved reliability
- Understandable applications and practical examples exist that show how DL can be used
  - IBM's Watson
  - Google's Voice Search & DeepMind AlphaGo
  - Apple's Siri
  - Samsung's S Voice & Face Recognition

Why is Deep Learning popular now?

6. Integrated System HW/SW, Clouds, Servers, and Network Innovations

- Easy usable hardware, software, library models, and existence of pre-trained open models
  - **Google**'s Example
    - ✓Tensorflow 0.12, Tensorflow 1.0
    - ✓Inception-v3, Inception-v4

Pros & Cons of Machine Learning & Deep Learning

Pros

- State-of-art performance
- Architecture easily adaptable to multiple problem domains
- Reduces need for feature engineering

Pros & Cons of Machine Learning & Deep Learning

Cons

- Requires a lot of cleaned training data and computational power
- Long training time
- Cost
- Difficulty in Interpretation

Machine Learning Data Interpretation Methods

Universal Approximation Interpretation Method

- Continuous function approximation using a feedforward neural network used with a finite size single hidden layer

Probabilistic Interpretation Method

- Machine learning technique that conducts probability analysis and characterization of the activation nonlinearity using inference and optimization techniques (in training, analysis, and testing)

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References

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