

01 | Introduction



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Why Deep Learning Is Exciting?

- Deep learning models have revolutionized many areas of machine intelligence
 - Speech recognition
 - Natural language processing
 - Image recognition
 - Handwriting recognition
 - etc., etc., ...
- Deep learning models particularly effective for **unstructured data**

Why Deep Learning Is Exciting?

- Previously, models for unstructured data were highly specialized
 - Used complex **hand-engineered** features
 - Feature sets were very problem specific
 - Error rates stuck in the double digit precents
 - Feature sets could require a lifetime of work!
- Deep learning models provide a generalized approach to complex models for unstructured data
 - Deep learning models **learn features**
 - Error rates now routinely around 1% or less!

Why Deep Learning Now?

- Neural network models have been around for a long time
 - Deep learning models are based on neural networks
 - Early neural network models developed from the 1940s to 1960s
 - Early neural network models not that effective (Minsky and Papert, 1969)
- Very little research in 1970s
- Training deep NNs with backpropagation algorithm (Rummelhart et. al., 1986) sparked new interest
 - Early deep NNs proved hard to train
 - Limited computing capacity

Why Deep Learning Now?

- Continuing work on algorithms to overcome training problems in 1990s into 2000s
- Rania et. al. (2009), demonstrated that **Graphics Processing Units (GPUs)** could be effectively applied to training deep NNs
 - Removed a significant computational bottleneck
 - Combined with low cost cluster computing and large memory
 - Can train very large, or deep, models

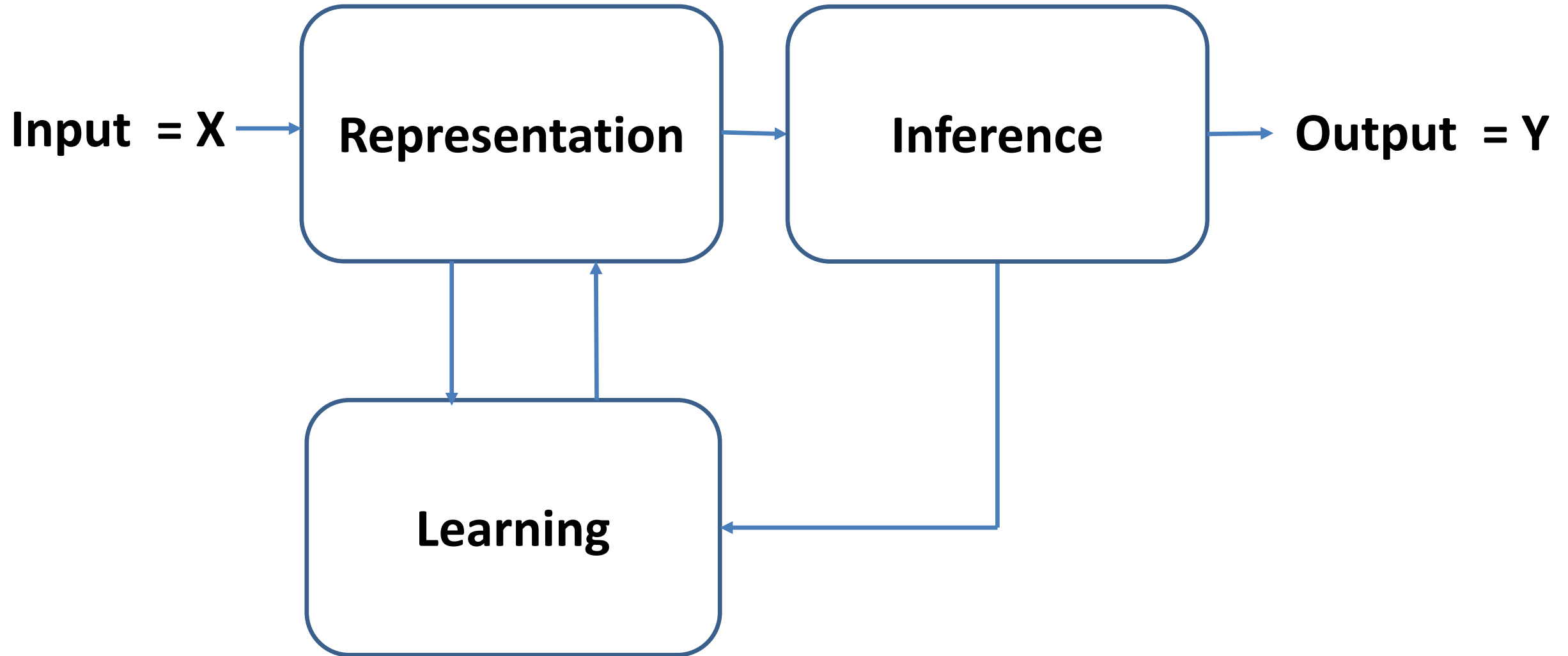
Why Deep Learning Now?

- The current decade has seen an explosion in deep learning research
 - Deep learning approaches to many problems continue to appear
- Deep learning solutions are now routinely deployed on a large scale
 - Many powerful APIs in platforms like Azure
 - Open source pre-trained models
 - New solutions continue to appear

Why This Course?

- This course will give you the background to understand deep learning principles
 - Understand the theory behind common deep learning models
 - Know the pitfalls in training deep learning models
- You will gain hands-on experience with a variety of deep learning models

Why This Course?



Why This Course?

Topics for this course

- Background review for deep learning and introduction to Keras
- Basic building blocks for deep NNs
- Regularization for training deep NNs
- Optimization for training deep NNs
- Convolutional NNs
- Recurrent NNs

About Your Instructor

- Principle Consultant at Quantia Analytics
- Instructor, Harvard Extension School, University of Washington
- MS and PhD in Geophysics from Princeton University
- Developed interest in NNs starting in 1980s
- Co-founded analytics businesses
- Worked in a number of areas:
 - Capital markets risk
 - Image analysis
 - Fraud detection
 - Forecasting
 - Failure prediction



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