

# Deep Learning - Theory and Practice

Sriram Ganapathy

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[sriramg@iisc.ac.in](mailto:sriramg@iisc.ac.in)

C 334, Electrical Engineering, IISc

+91 80 2293 2433



# What are signals

- ❖ Roland Priemer (1991). Introductory Signal Processing

Anything that conveys information about attributes or behavior of underlying phenomenon

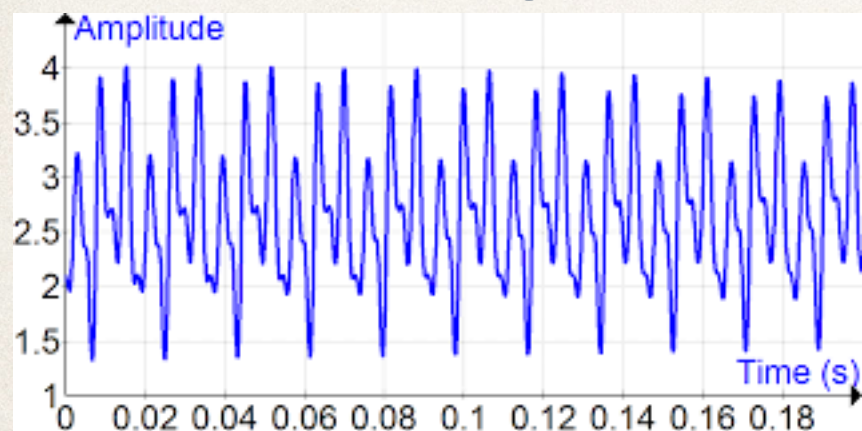
ECG Signal



Microsoft stock



Music Signal





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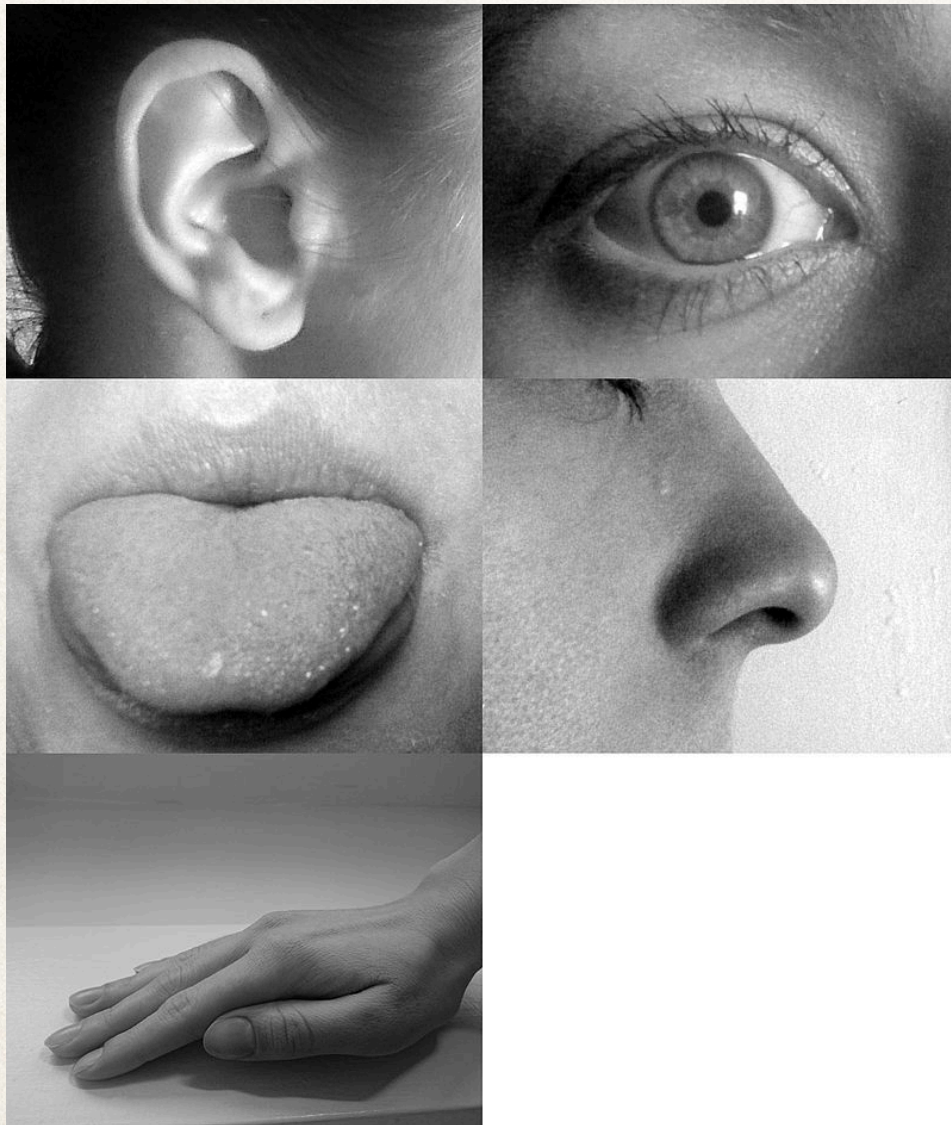
- ❖ Common signals - (mapping from one domain to another)
  - ❖ function of time (e.g. speech, music, ECG, financial data etc)
  - ❖ function of space (e.g. images)
  - ❖ joint function of time and space (eg. video signals)



# What are sensory signals

## ❖ Sensory signals

A sense is a physiological capacity of organisms that provides data for perception.



- ❖ Living organisms have multitude of sensations.
- ❖ Humans have the most complex perception system for these sensory signals.



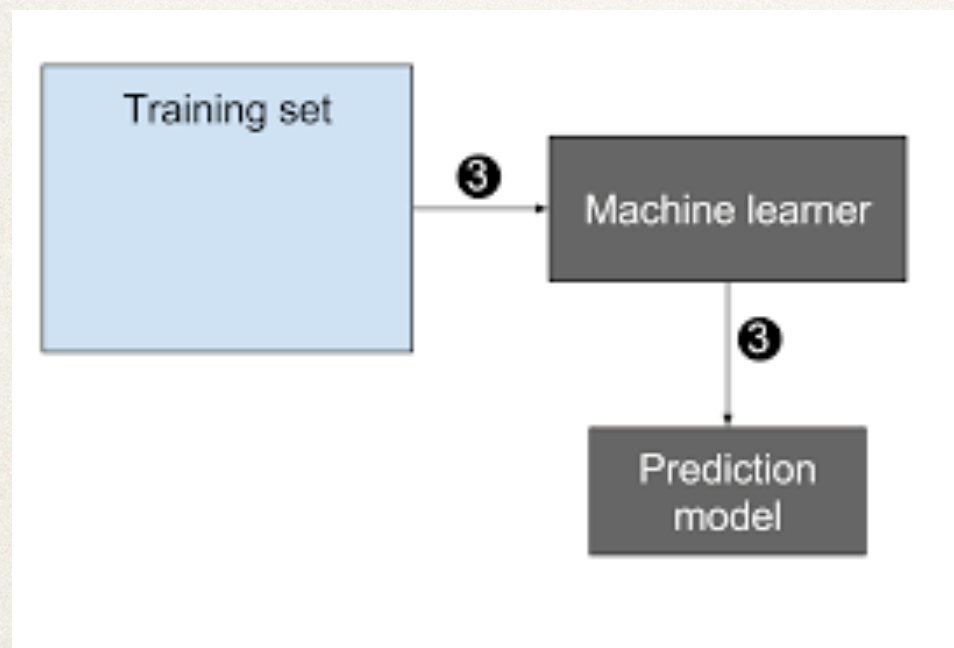
# What is learning

## ❖ Learning

Act of acquiring new / reinforcing existing knowledge, behavior, skills



- ❖ Human learning starts even before birth.
  - ❖ Fundamental to the existence and evolution.



- ❖ Machine learning
  - ❖ Branch of artificial intelligence
  - ❖ Attempts to use data to learn models that can predict / classify.



# Deep Learning Course

- ❖ Objectives
  - ❖ Automatic discovery of patterns.
  - ❖ Motivated by human capabilities to process real world signals.
  - ❖ Mimicking / Extending / Replacing human functions.
  - ❖ Branch of artificial intelligence.
  - ❖ Classification and Regression.



# MLSS - Examples

## ❖ Domain Identification - Blog v /s Chat ?

“I tried these Butterscotch Muffins today and they turned out so good. I had half the pack of butterscotch chips that I bought long back so wanted to use it up.”

"Hey, it's Geoff from yesterday. How's it going?  
Hi there. Don't wanna bother you long, but  
you saw this video?"



# MLSS - Examples

## ❖ Did a Human or Machine write this ?

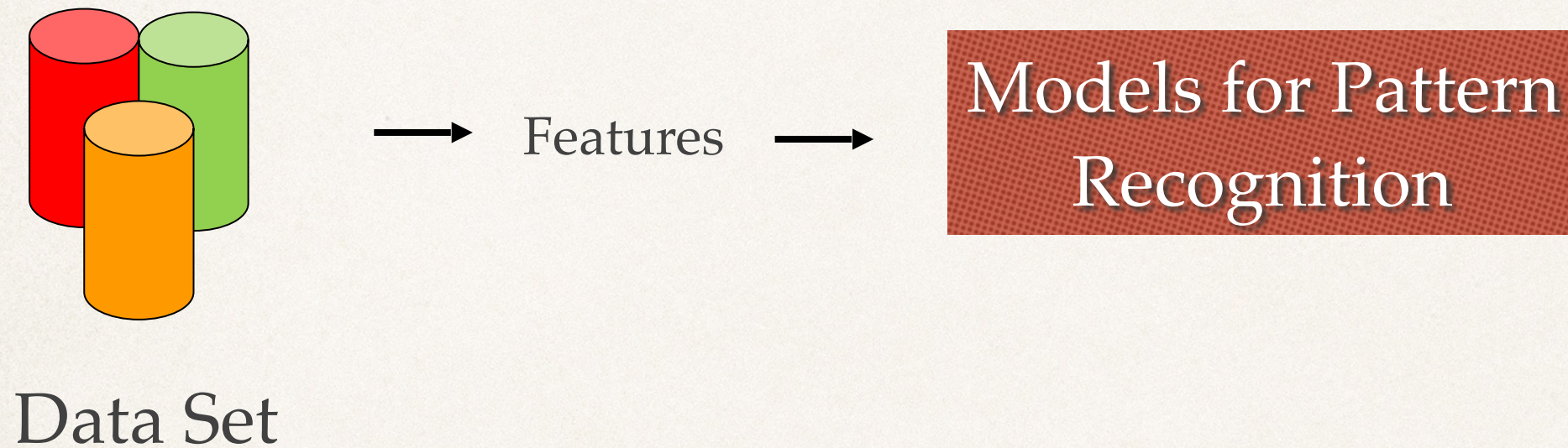
“A shallow magnitude 4.7 earthquake was reported Monday morning five miles from Westwood, California, according to the U.S. Geological Survey. The temblor occurred at 6:25 AM, Pacific time at a depth of 5.0 miles.”

“Kitty couldn’t fall asleep for a long time. Her nerves were strained as two tight strings, and even a glass of hot wine, that Vronsky made her drink, did not help her. Lying in bed she kept going over and over that monstrous scene at the meadow.”

<http://www.nytimes.com/interactive/2015/03/08/opinion/sunday/algorithm-human-quiz.html>



# What will be Covered



- ❖ Modeling the separation of data
- ❖ Deep Neural Networks.



# What we will do in DL course

- ❖ Basics of Machine Learning
- ❖ Neural networks
- ❖ Deep learning methodologies and Architectures
- ❖ Implementing Deep models