Introduction to Machine Learning

Yixin Lin, Serge Assaad, Rohith Kuditipudi

Duke University

yixin.lin@duke.edu, serge.assaad@duke.edu, rohith.kuditipudi@duke.edu

March 25, 2017

Outline

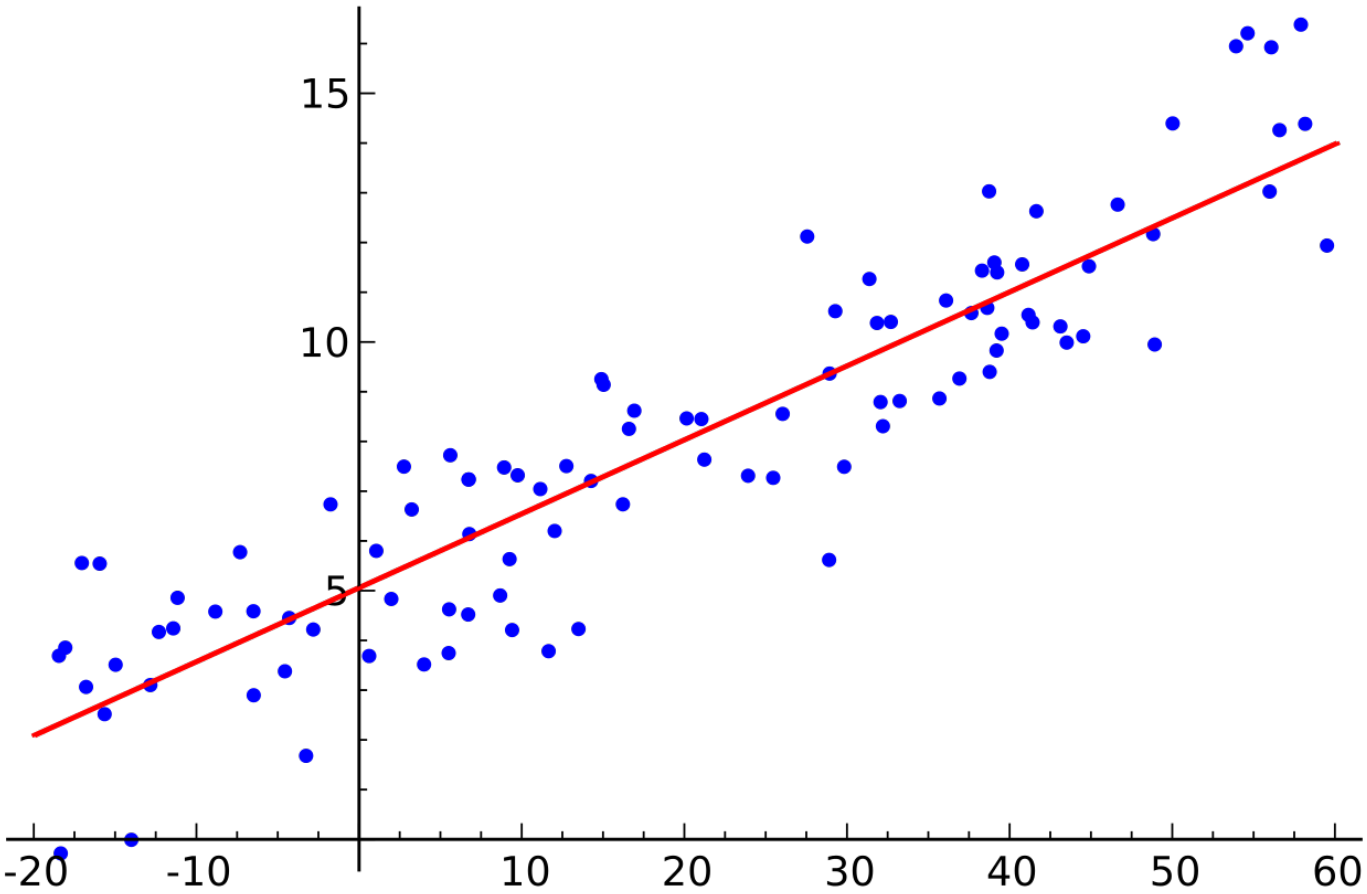
1. Overview of basic principles of machine learning
2. Introduction to neural networks
3. Tutorial on implementing deep learning algorithms

Overview of basic principles of machine learning

- Three components to any ML problem: the **task**, the **performance measure** and the **data**
- Essential definitions
  - **Features**
  - **Model**
  - **Parameters**
  - **Loss**
- Two (broad) kinds of tasks
  - **Supervised learning**: data is labeled/annotated
  - **Unsupervised learning**: data is unlabeled

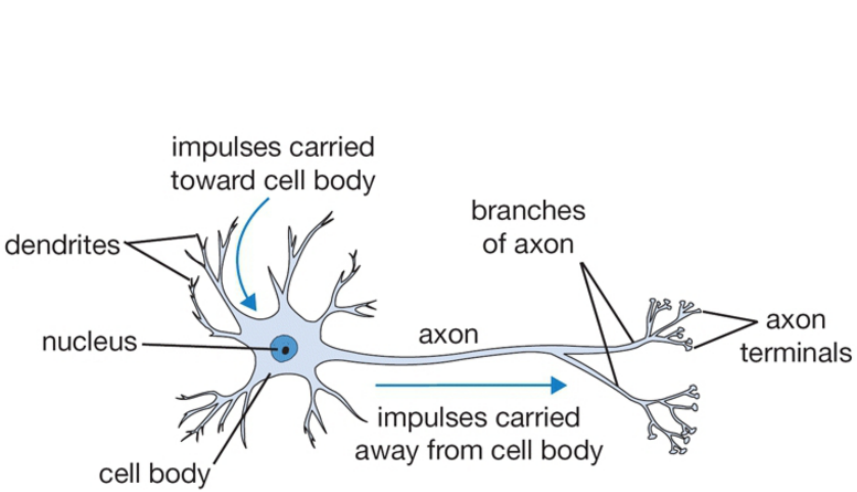
Example: Linear Regression

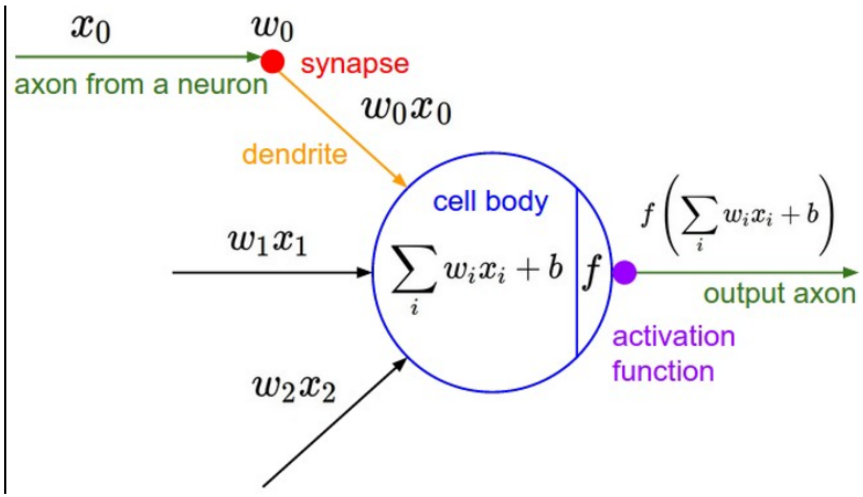
- Can we **predict** y given x, using the model $\hat{\mathbf{y}} = m\mathbf{x} + \mathbf{b}$?



Introduction to Neural Networks

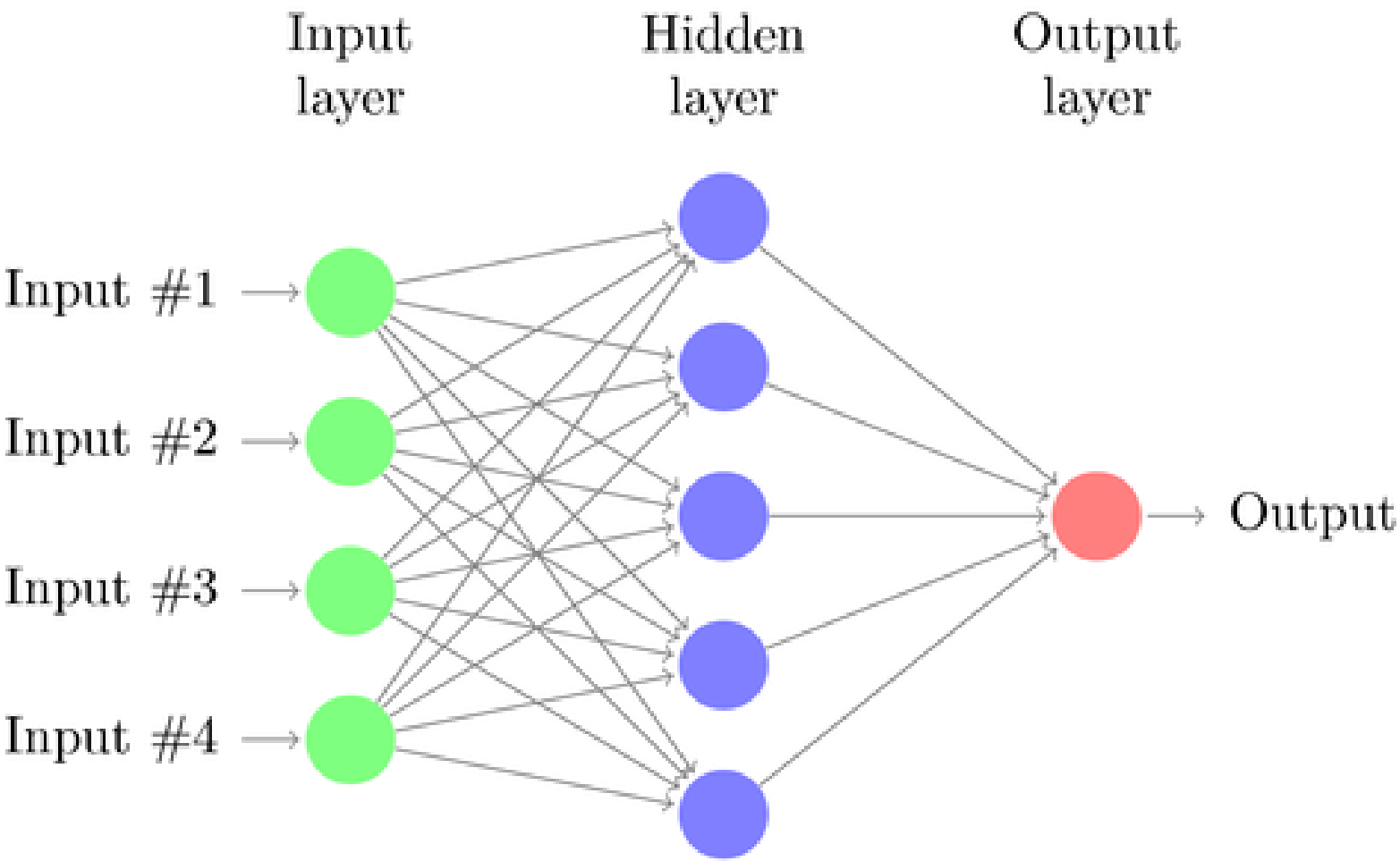
- Neurons are the building blocks of neural networks
- Each neuron is a **function**: $y = f(\mathbf{w}^T\mathbf{x} + \mathbf{b})$



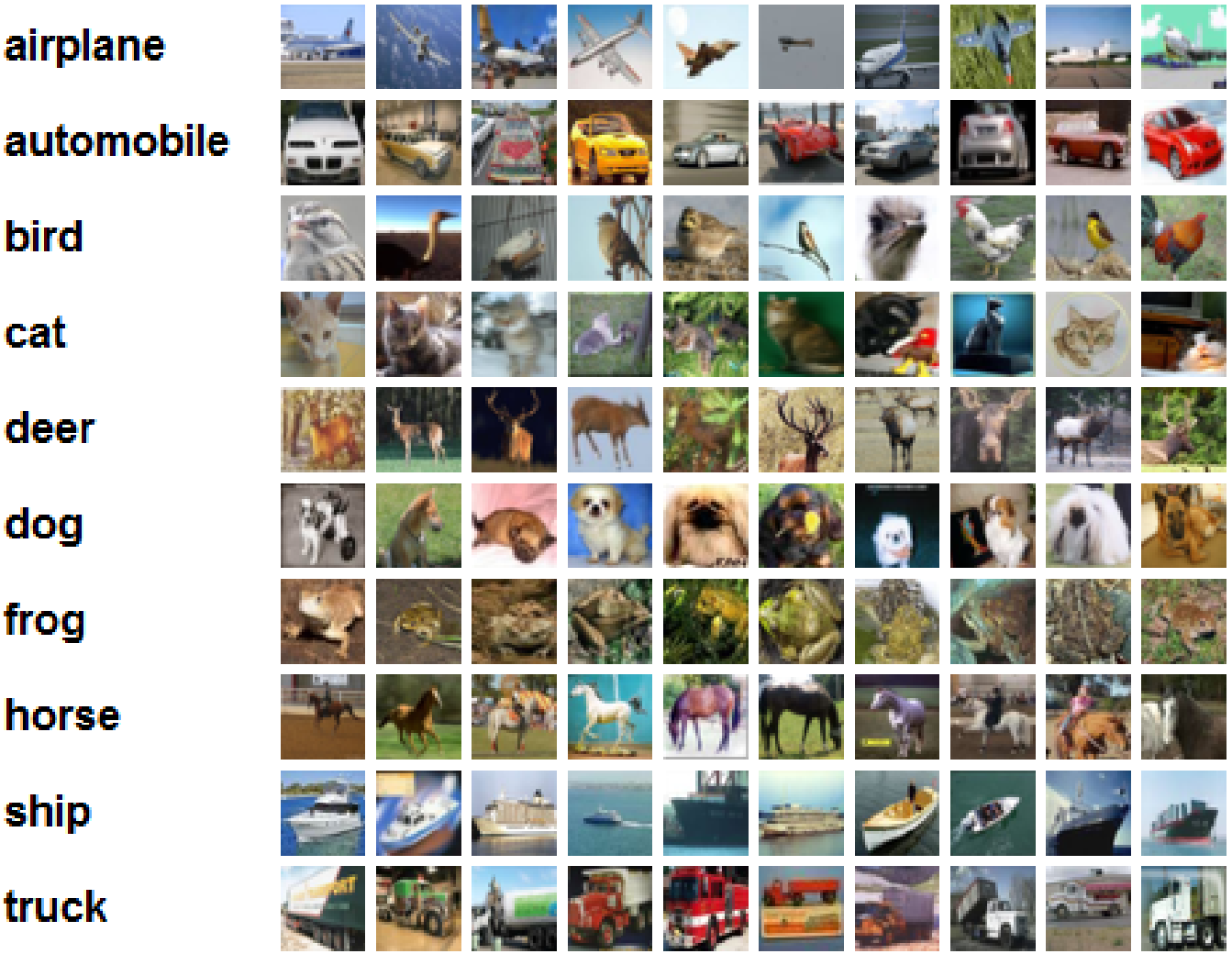


- Note: **neural networks** $\neq$ **neuroscience!!!!!**

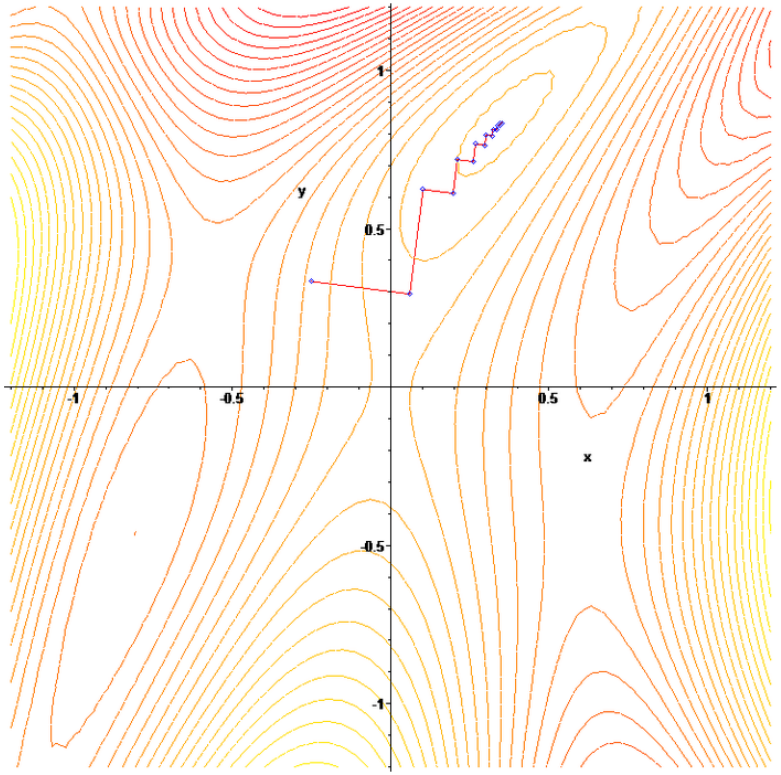
Neural Networks are Layers of Neurons

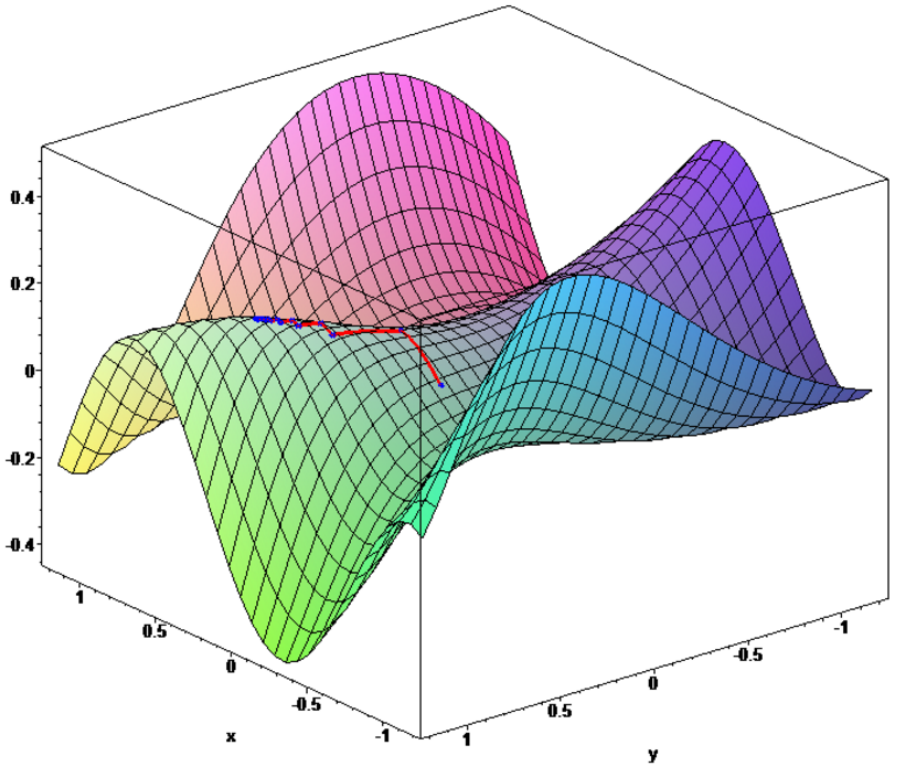


What are Neural Networks Good For?



Training Neural Networks: Gradient Descent





Tutorial

- Time to **build something**!

Thanks!

Resources and references: yixinlin.net/intro-ml