Lecture 10: Neural Networks and Deep Learning

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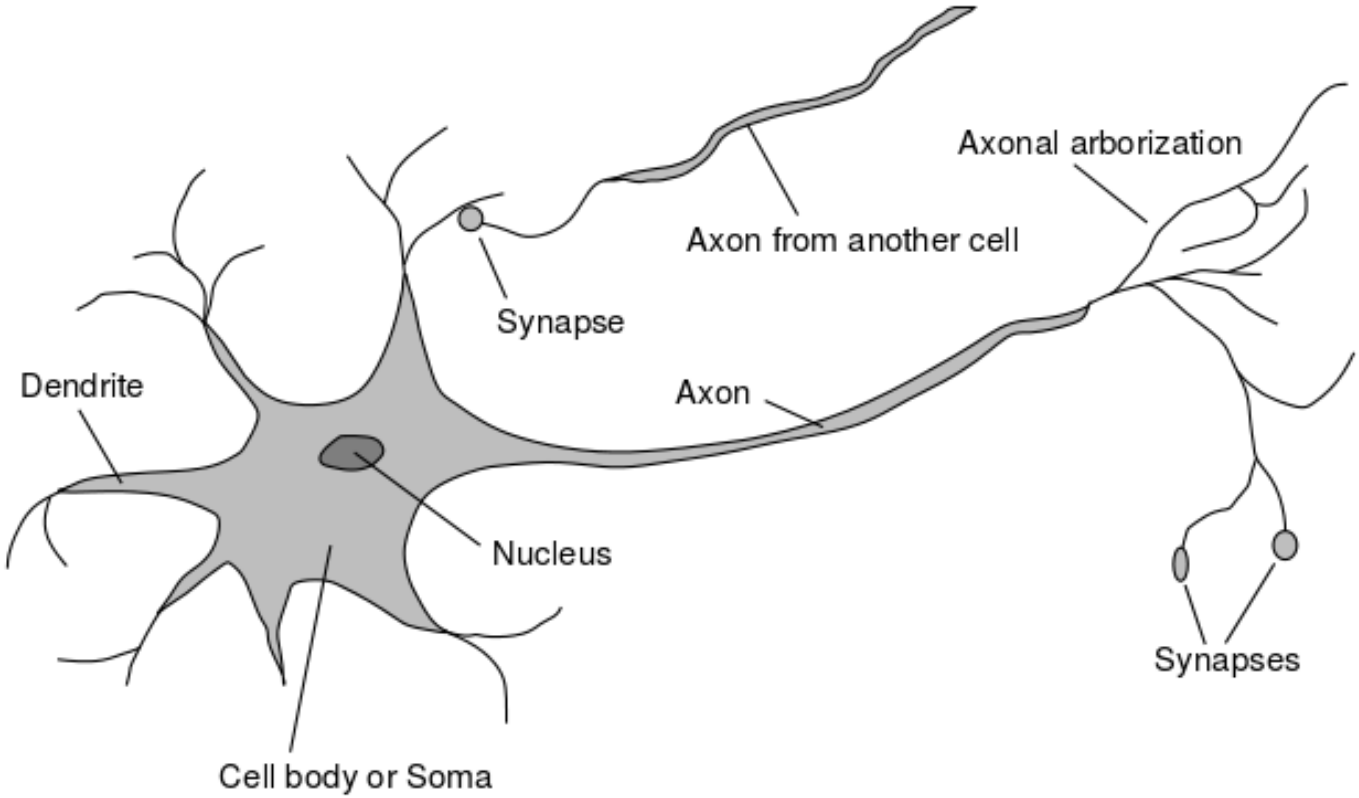
Outline

1. Perceptron
2. Neural Networks
3. Deep Learning

Neural Networks

Brains[1]

10^{11} neurons of > 20 types, 10^{14} synapses, 1ms–10ms cycle time
Signals are noisy "spike trains" of electrical potential



[1] http://pages.cs.wisc.edu/~jerryzhu/cs540/handouts/neural.pdf

Terminator 2 (1991)

JOHN: Can you learn? So you can be... you know. More human. Not such a dork all the time.

TERMINATOR: My CPU is a neural-net processor... a learning computer. But **Skynet** presets the switch to "read-only" when we are sent out alone.

...

We'll learn how to **set** the neural net

TERMINATOR Basically. (starting the engine, backing out) The **Skynet** funding bill is passed. The system goes on-line August 4th, 1997. Human decisions are removed from strategic defense. **Skynet** begins to learn, at a geometric rate. It becomes **self-aware** at 2:14 a.m. eastern time, August 29. In a panic, they try to pull the plug.

SARAH: And **Skynet** fights back.

TERMINATOR: Yes. It launches its ICBMs against their targets in Russia.

SARAH: Why attack Russia?

TERMINATOR: Because **Skynet** knows the Russian counter-strike will remove its enemies here.

[2] http://pages.cs.wisc.edu/~jerryzhu/cs540/handouts/neural.pdf

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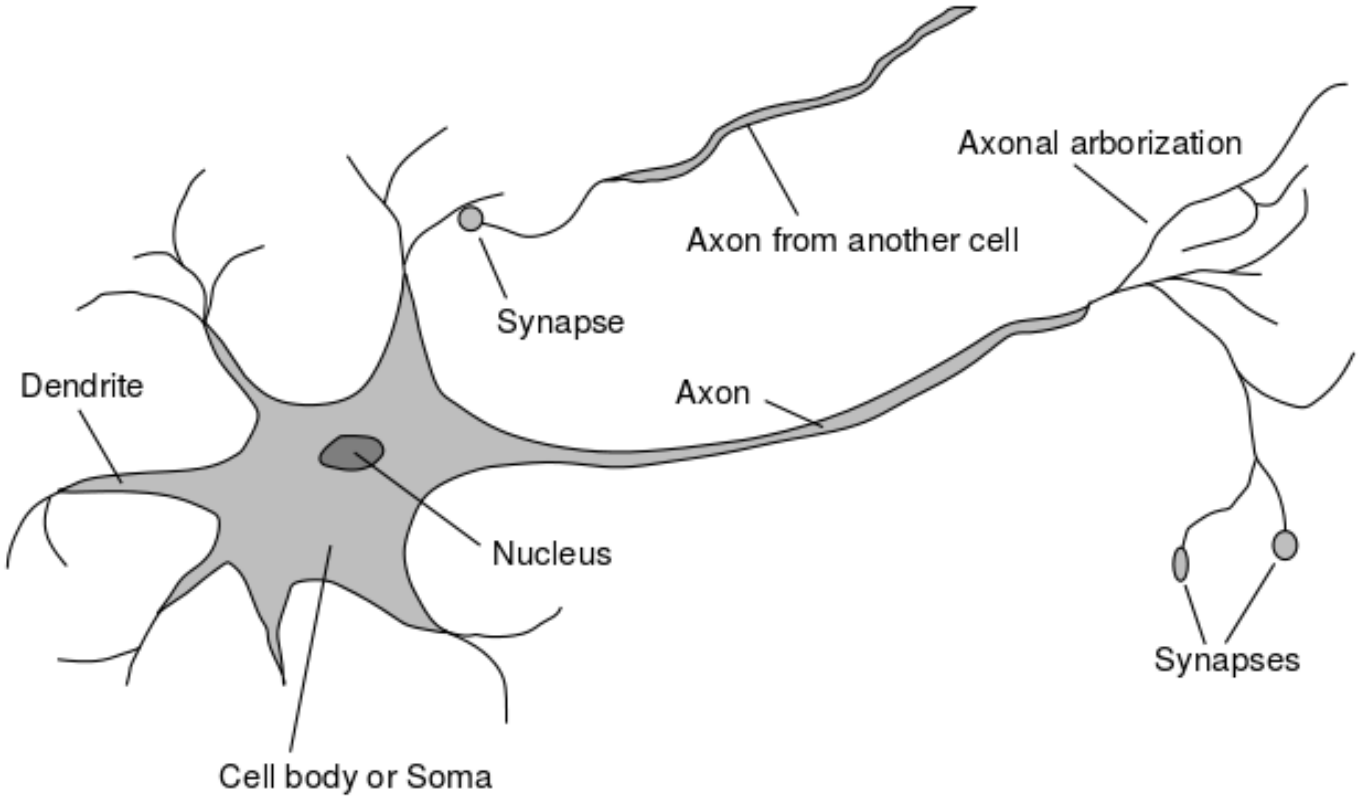

Summary

Major Concepts:

- Probabilistic interpretation of Classification
- Bayesian Classifiers
- Naive Bayes Classifier
- Support Vector Machines (SVM)
- Kernels

Slide Material References

- Slides from TSK Book, Chapter 5
- Slides from Piyush Rai
- See also the footnotes