

CSCI 252: Neural Nets
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The Appeal of PDP

Why Neural Nets?

(*PDP* Vol. 1, Chap. 1)

- Why are people smarter than machines?
 - Can't be *speed* (circuits much faster than neurons)
 - Can't be *precision* (neurons use just a few bits)
- Could be the *architecture* (wiring) of the nervous system
- People are also much better than machines at *learning* new skills, concepts etc.
- Maybe human intelligence is an *emergent* property of the brain, rather than being pre-wired.

Why Neural Nets?

Multiple Simultaneous Constraints

- Mutual influence of syntax & semantics:

*I saw the Grand Canyon **flying to New York**.*

*I saw **the sheep grazing in the field**.*

- Mutual influence of words in sentence:

I like the joke.

I like to joke.

I like the drive.

I like to drive.

*I like to **mud***

Why Neural Nets?

Multiple Simultaneous Constraints

Mutual influence of letters in word:

TAE CAT

RED

SPOT

FISH

DEBT

Why Neural Nets?

The PDP Approach

- *Parallel Distributed Processing*: Instead of a single, fast, powerful, serial processor (CPU), use many slow, simple, parallel processors.
- All that each processor can do is *inhibit* or *reinforce* other processors.
- Complex behavior *emerges* from interaction of processors (c.f. bees, ants, economies)

Why Neural Nets?

The PDP Approach

- “Inspired” by nervous system, but not meant to be a model of it.
- Other nice features include
 - *Graceful degradation*: Noise in the input or connections doesn't immediately “crash” the system.
 - *Content addressability*: Can access a memory based on any of its features (“tip of tongue” phenomena)