Introduction to Neural Networks

Hunter Glanz

OUTLINE

Overview

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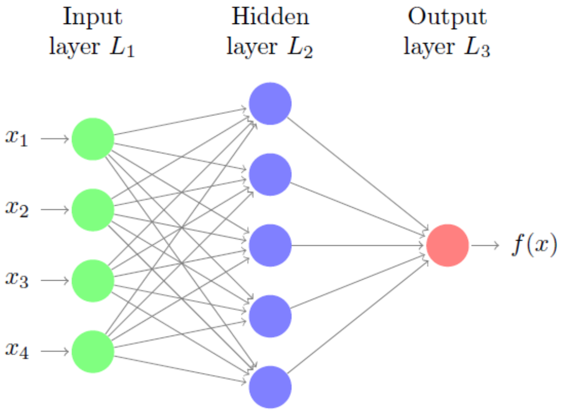
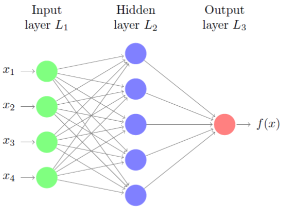


More Detail



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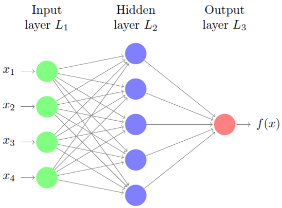

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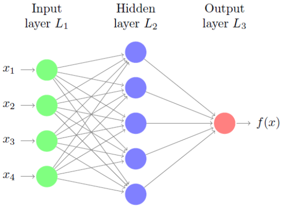

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- Five hidden units $a_\ell = g(w_{\ell 0}^{(1)} + \sum_{j=1}^{4} w_{\ell j}^{(1)} x_j)$

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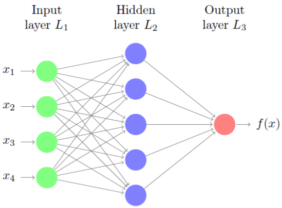

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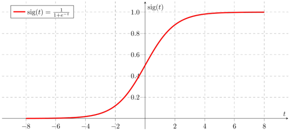

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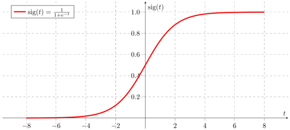

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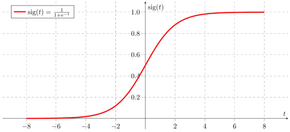

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How are neural networks different from the ensemble methods we've discussed this term?

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- **Iteratively fit the weights** to minimize some loss function, L
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  - L depends on your problem, but think of RSS or classification error
- In fact...we want to minimize:

$$\text{minimize}_{\mathcal{W}} \quad \frac{1}{n}\sum_{i=1}^{n} L[y_i, f(x_i; \mathcal{W})] + \lambda J(\mathcal{W}) \tag{1.1}$$

where $\mathcal{W}$ is the collection of weights, J is a nonnegative regularization term, and $\lambda \geq 0$ is a tuning parameter

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A little bit of cross-validation

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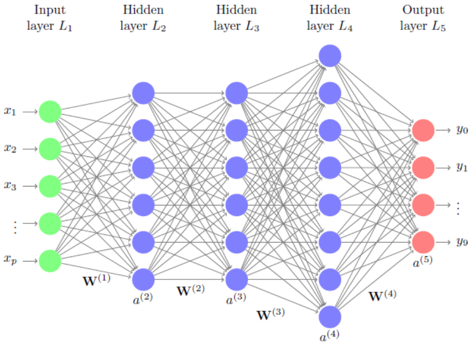
  - Stopping time can also be determined with **cross-validation**, but is less of a problem with regularization
  - Choice of starting weight values can affect movement of the algorithm and where it ends up
    - Shouldn't be zero
    - Shouldn't be large
    - Try multiple sets

More Complex



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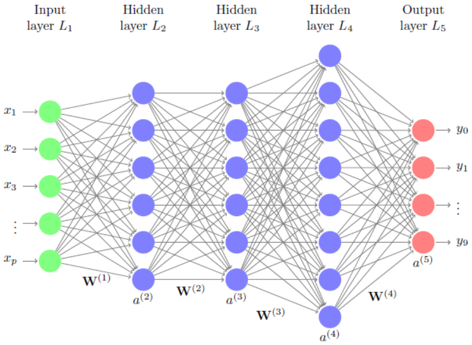

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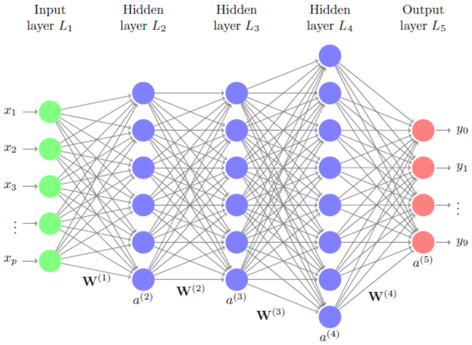

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- From very regularized and constrained, to very flexible