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Introduction to Neural Networks and TensorFlow

Practice Assignment: Classification Using Deep Neural Networks

N-grams vs. Sequence Models

✓ **Video:** Lesson Introduction
49 sec

○ **Video:** Traditional Language models
3 min

✓ **Reading:** Traditional Language models
5 min

○ **Video:** Recurrent Neural Networks
4 min

✓ **Reading:** Recurrent Neural Networks
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○ **Video:** Applications of RNNs
3 min

✓ **Reading:** Application of RNNs
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✓ **Lab:** Hidden State Activation

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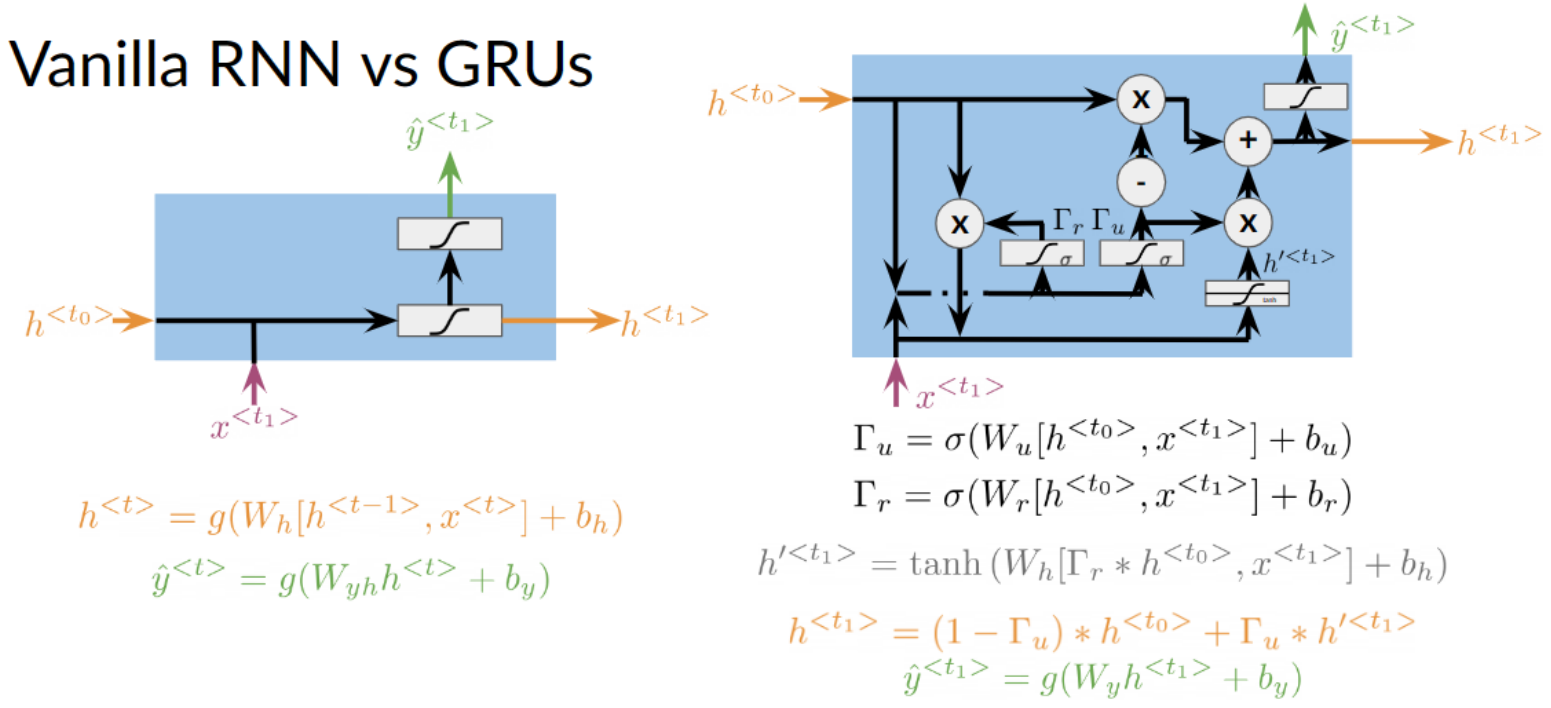
Gated Recurrent Units

Gated recurrent units are very similar to vanilla RNNs, except that they have a "relevance" and "update" gate that allow the model to update and get relevant information. I personally find it easier to understand by looking at the formulas:



Vanilla RNN vs GRUs

$$h^{<t>} = g(W_h[h^{<t-1>}, x^{<t>}] + b_h)$$
$$\hat{y}^{<t>} = g(W_{yh}h^{<t>} + b_y)$$

$$\Gamma_u = \sigma(W_u[h^{<t_0>}, x^{<t_1>}] + b_u)$$
$$\Gamma_r = \sigma(W_r[h^{<t_0>}, x^{<t_1>}] + b_r)$$
$$h'^{<t_1>} = \tanh(W_h[\Gamma_r * h^{<t_0>}, x^{<t_1>}] + b_h)$$
$$h^{<t_1>} = (1 - \Gamma_u) * h^{<t_0>} + \Gamma_u * h'^{<t_1>}$$
$$\hat{y}^{<t_1>} = g(W_y h^{<t_1>} + b_y)$$

To the left, you have the diagram and equations for a simple RNN. To the right, we explain the GRU. Note that we add 3 layers before computing *h* and *y.*

$$\Gamma_u = \sigma\left(W_u\left[h^{<t0>}, x^{<t1>}\right] + b_u\right)$$
$$\Gamma_r = \sigma\left(W_r\left[h^{<t0>}, x^{<t1>}\right] + b_r\right)$$
$$h'^{<t1>} = \tanh\left(W_h\left[\Gamma_r * h^{<t0>}, x^{<t1>}\right] + b_h\right)$$

The first gate Γ_u allows you to decide how much you want to update the weights by. The second gate Γ_r, helps you find a relevance score. You can compute the new h by using the relevance gate. Finally you can compute *h,* using the update gate. GRUs “decide” how to update the hidden state. GRUs help preserve important information.