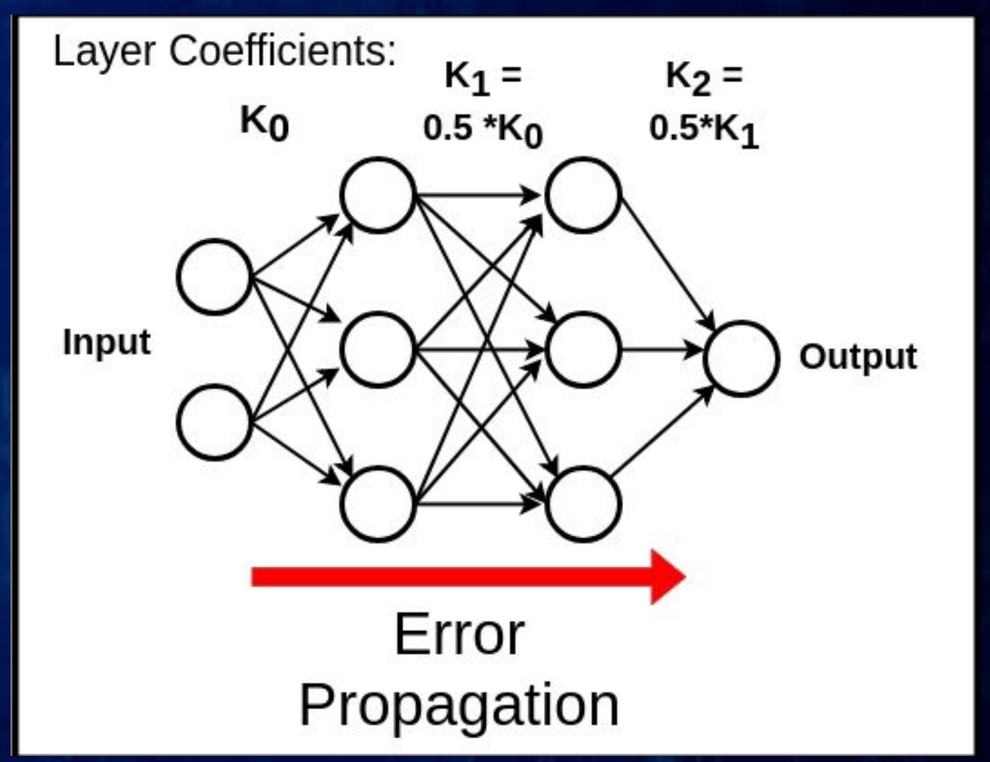
Revised Backpropagation Capstone

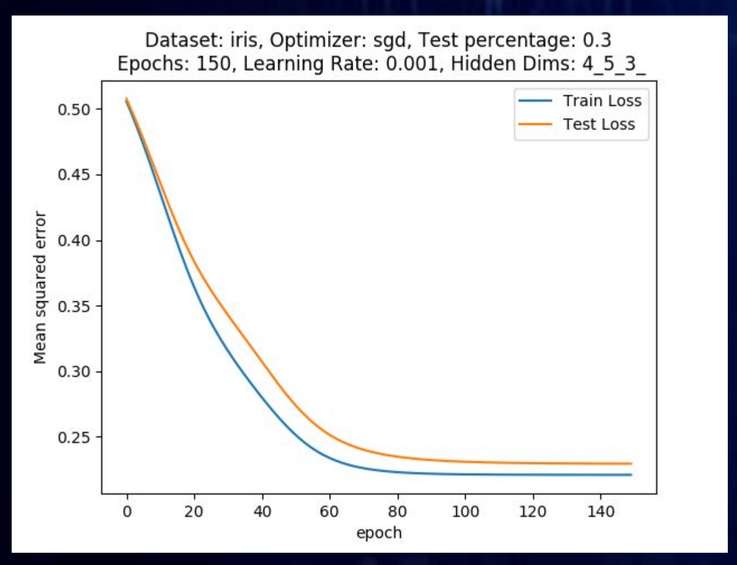
A layer and neuron based adaptive learning rate method

- **Error in weight and biases amplifies and propagates error throughout a network with latter layers receiving the most error. By adding an adaptive learning rate term we can focus learning adjustments in layers and neurons with the most impact on overall error.**

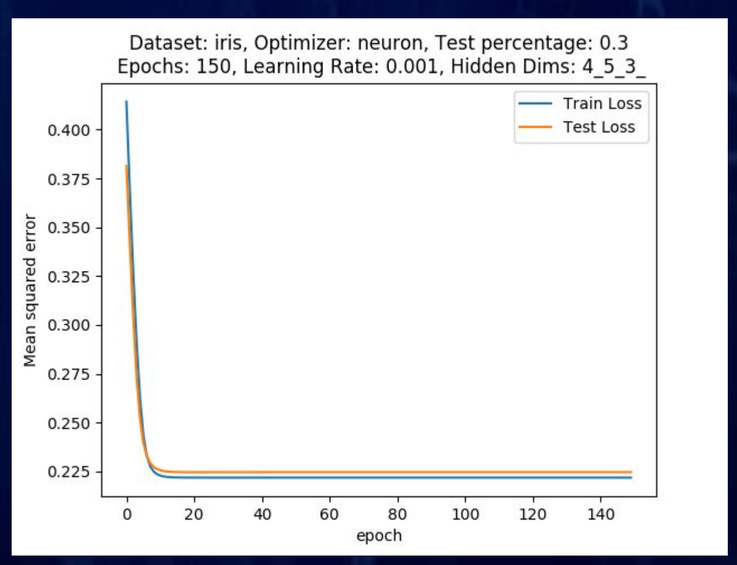
Two main methods explored:

- Error-by-layer method. Uses the update rules,
  - κ^l chosen for each layer as a hyperparameter
  - $w^l_{jk} \mathrel{-}= \eta(a^{l-1}_k \delta^l_j)\kappa^l$, $b^l_j \mathrel{-}= \eta\delta^l_j\kappa^l$
- Error-by-neuron method,
  - $\kappa^l_j = (abs(\delta^l_j)/||\delta^l||)$
  - $w^l_{jk} \mathrel{-}= \eta(a^{l-1}_k \delta^l_j)\kappa^l_j$, $b^l_j \mathrel{-}= \eta\delta^l_j\kappa^l_j$
- Results showed an increase in convergence rate along with promising test results on two simple datasets. More testing is needed to confirm large scale viability.

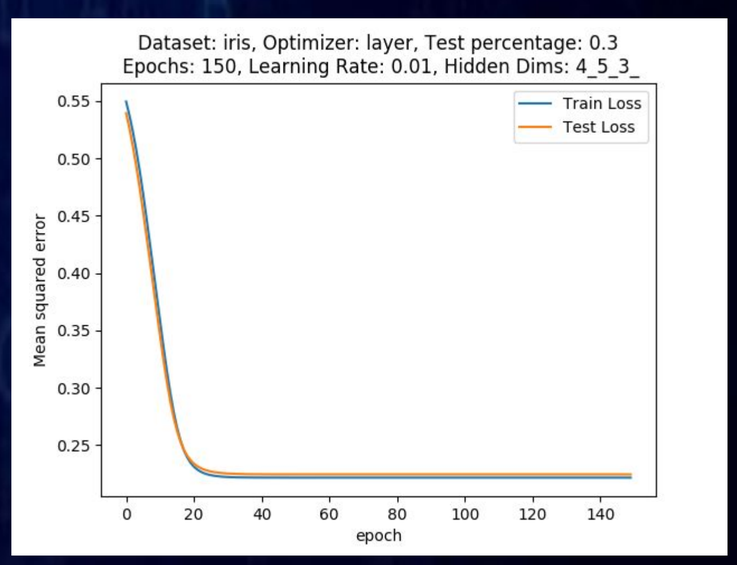




Control network results



Error-by-neuron method



Error-by-layer method

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