Summary Table:

I built few sets of models to do the sentiment analysis of the IMDB reviews, and the validation accuracies are as follows:

1. Using an embedding layer
   1. Simple model with 100 training examples = 54.32%
   2. Simple model with 1000 training examples = 63.38%
   3. Simple model with 2000 training examples = 72.35%
   4. Simple model with 3000 training examples = 78.93%
   5. Simple model with 4000 training examples = 79.95%
   6. Simple model with 5000 training examples = 82.05%
   7. Simple model with 6000 training examples = 82.72%
   8. Simple model with 7000 training examples = 82.71%
   9. Simple model with 10000 training examples = 84.27%
   10. Simple model with 15000 training examples = 84.34%
2. Using pre-trained word embeddings
   1. Simple model with 100 training examples = 52.02%
   2. Simple model with 1000 training examples = 62.26%
   3. Simple model with 2000 training examples = 64.83%
   4. Simple model with 3000 training examples = 65.79%
   5. Simple model with 5000 training examples = 64.19%
   6. Simple model with 7500 training examples = 66.24%
   7. Simple model with 10000 training examples = 65.77%
   8. Simple model with 15000 training examples = 66.82%
3. Simple RNN
   1. Simple model with 100 training examples = 50.2%
   2. Simple model with 1000 training examples = 51.1%
   3. Simple model with 2000 training examples = 53.15%
   4. Simple model with 3000 training examples = 62.12%
   5. Simple model with 5000 training examples = 74.7%
   6. Simple model with 7500 training examples = 77.82%
   7. Simple model with 10000 training examples = 76.47%
   8. Simple model with 15000 training examples = 83.33%
4. Simple LSTM
   1. Simple model with 100 training examples = 50.44%
   2. Simple model with 1000 training examples = 78.24%
   3. Simple model with 2000 training examples = 80.37%
   4. Simple model with 3000 training examples = 82.1%
   5. Simple model with 5000 training examples = 82.92%
   6. Simple model with 7500 training examples = 84.42%
   7. Simple model with 10000 training examples = 81.98%
   8. Simple model with 15000 training examples = 85.86%
5. Simple LSTM with dropout
   1. Simple model with 15000 training examples with dropout and using word cutoff of 500 = 86.02%

Insights:

Using an Embedding Layer:

* The validation accuracy increases as the number of training examples increases.
* The improvement is noticeable, reaching 84.34% with 15,000 training examples.
* Pre-trained word embeddings provide a good foundation for sentiment analysis.

Using Pre-trained Word Embeddings:

* Similar to the above Embedding layer, the validation accuracy generally improves with an increase in training examples.
* Achieves a maximum of 66.82% with 15,000 training examples.

Simple RNN:

* The validation accuracy shows a significant improvement with an increase in training examples.
* Starts at 50.2% with 100 training examples and reaches 83.33% with 15,000 training examples.
* Simple RNNs benefit significantly from a larger training dataset.

Simple LSTM:

* LSTM models consistently outperform other models.
* Validation accuracy increases with the number of training examples.
* Reaches a high of 85.86% with 15,000 training examples.

Simple LSTM with Dropout:

* The inclusion of dropout further improves the model's performance.
* Achieves a high validation accuracy of 86.02% with 15,000 training examples and a word cutoff of 500.
* Dropout helps prevent overfitting and enhances generalization.

Conclusions:

In general, an increase in the number of training examples has a positive impact on model performance.

Complex models like LSTM benefit more from larger datasets.

Dropout regularization proves effective in preventing overfitting, especially in more complex models.