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Initial Model Training

- **Training & Validation Accuracy:** Accuracy starts to low around 0.4955 and slowly increases to 0.5049 by Epoch 10.
- **Training & Validation Loss:** There is a notable drop in the loss from 377.2423 to 1.1065.
- **Observation:** The validation accuracy varies somewhat between 0.4922 and 0.5036, indicating a gradual improvement. The accuracy is almost unchanged despite the decrease in loss, indicating that the model is having trouble generalizing to the validation set.

Hidden Layers:

a. **Model with One Hidden Layer**
   - **Training & Validation Accuracy:** Although it doesn't substantially exceed the first model, accuracy begins at 0.5040 and progressively increases to 0.4998 by the final epoch.
   - **Training & Validation Loss:** The decline in loss from 302.7050 to 0.8849 is substantial.
   - **Observation:** The accuracy doesn't show much increase, just like in the first model, but there is a more consistent pattern of the validation loss decreasing, which would suggest better fitting.

b. **Model with Multiple Hidden Layers**
   - **Training & Validation Accuracy:** The accuracy initially hovers around 0.5034, improving slightly to 0.5127 in the later epochs.
   - **Training & Validation Loss:** Loss decreases from 310.7643 to 1.2979.
   - **Observation:** Although the accuracy has slightly improved, it is still essentially unchanged from the initial model. While adding more hidden layers doesn't appear to significantly increase accuracy, the model may be more adept at fitting the data based on the drop in loss.

Model with MSE Loss Function

- **Training & Validation Accuracy:** With little improvement, accuracy stays mostly unchanged between 0.4935 and 0.5073.

- **Training & Validation Loss:** The loss varies, decreasing somewhat in the final stages (0.5040 to 0.4994).
- **Observation:** This section shows that the model is not appreciably improved by employing MSE loss. Even when the validation loss marginally improves, the accuracy is fairly constant and the model doesn't demonstrate any significant advancements.

Model with Tanh Activation

- **Training & Validation Accuracy:** Between 0.4952 and 0.5168, accuracy varies with little improvement.
- **Training & Validation Loss:** With just slight improvements, the loss remains relatively constant (0.7584 to 0.6931).
- **Observation:** The model appears to be marginally improved by using the tanh activation function, but the accuracy remains unchanged. In contrast to earlier chunks, the loss curve exhibits more consistent behavior.

Model with Regularization and Dropout

- **Training & Validation Accuracy:** The range of accuracy is 0.4947 to 0.5061.
- **Training & Validation Loss:** The loss drops to 1.5815 from 381.0123.
- **Observation:** Dropout and regularization are added, but the accuracy of the model remains mostly unchanged. The validation accuracy remains nearly constant despite a discernible decrease in training loss, indicating that the model has difficulty generalizing to the validation data.

Summary of Overall Findings

- **Accuracy Trends:** No configuration produces a notable breakthrough, and accuracy generally stabilizes in the low 50% range across all setups.
- **Loss Trends:** All models have an overall decrease in loss, although this does not necessarily translate into a noticeable increase in accuracy. Some models appear to match the data better, but not significantly (particularly when regularization and dropout are included).
- **Key Insight:** Despite a little reduction in loss, it seems that the models are struggling to generalize, which suggests that tweaks like adding more intricate architectures, adjusting hyperparameters, or enhancing regularization techniques could help the model perform better overall.