Predicting NBA Win Percentages with Federated Learning

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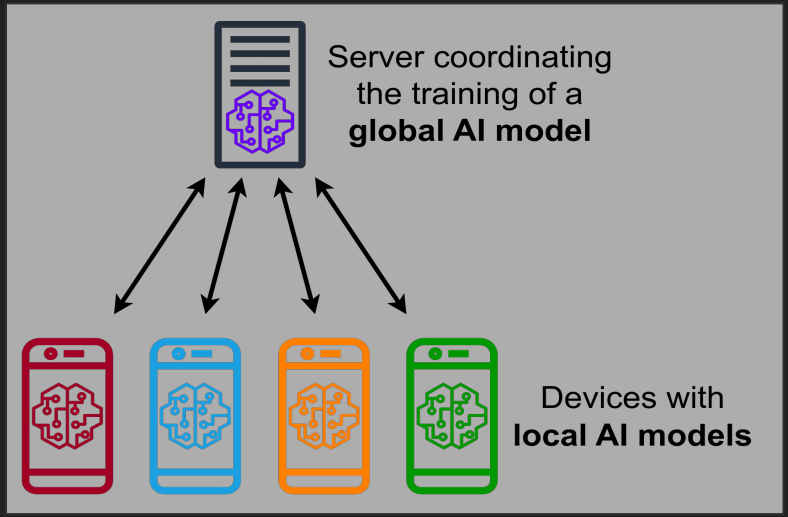
Linear Regression

- Model Objective: Predict NBA Team's Win Percentage Based on Season Stats
- 6 Features - [3-Point %, 3-Point Attempts, Field Goal %, Turnovers, Assists, Offensive Rebounds]
- Data - Season stats from the 2000s obtained from NBA.com

Federated Learning

- Train models using sensitive user data while ensuring privacy
- Apple using your fitness data to train a fitness prediction model
- Each NBA team is sent the model, a gradient is calculated using team data, and is sent to the central server to be averaged



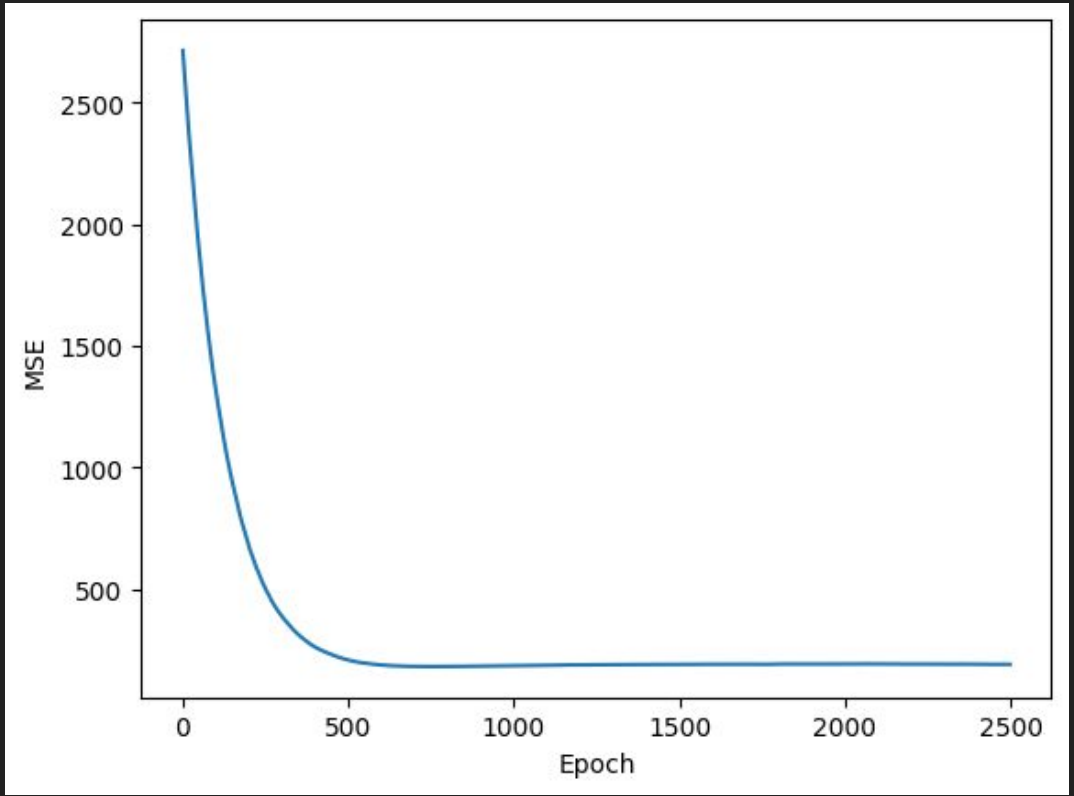
Algorithm 1 `FederatedAveraging`. The K clients are indexed by k; B is the local minibatch size, E is the number of local epochs, and η is the learning rate.

Server executes:
initialize w_0
for each round $t = 1, 2, \dots$ **do**
  $m \leftarrow \max(C \cdot K, 1)$
  $S_t \leftarrow$ (random set of m clients)
  for each client $k \in S_t$ **in parallel do**
    $w_{t+1}^k \leftarrow \text{ClientUpdate}(k, w_t)$
  $m_t \leftarrow \sum_{k \in S_t} n_k$
  $w_{t+1} \leftarrow \sum_{k \in S_t} \frac{n_k}{m_t} w_{t+1}^k$ // *Erratum*[4]

ClientUpdate(k, w): // *Run on client* k
$\mathcal{B} \leftarrow$ (split $\mathcal{P}_k$ into batches of size B)
for each local epoch i from 1 to E **do**
  for batch $b \in \mathcal{B}$ **do**
    $w \leftarrow w - \eta \nabla \ell(w; b)$
return w to server

Results

- Average Percent Error (MAPE): 29.36%
- Average Error (MAE): 11.387
- Average Error, Each Error Squared (MSE): 185.29
- MSE Square Rooted (RMSE): 13.6
- Convergence at 600



Epoch vs MSE Federated Learning Linear Regression Model