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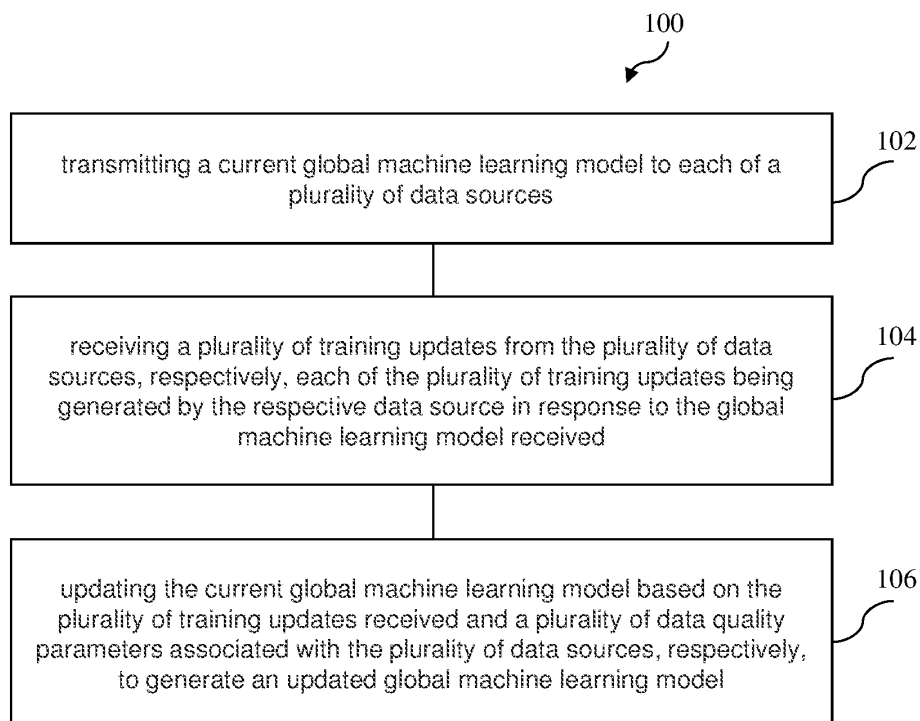


FIG. 1

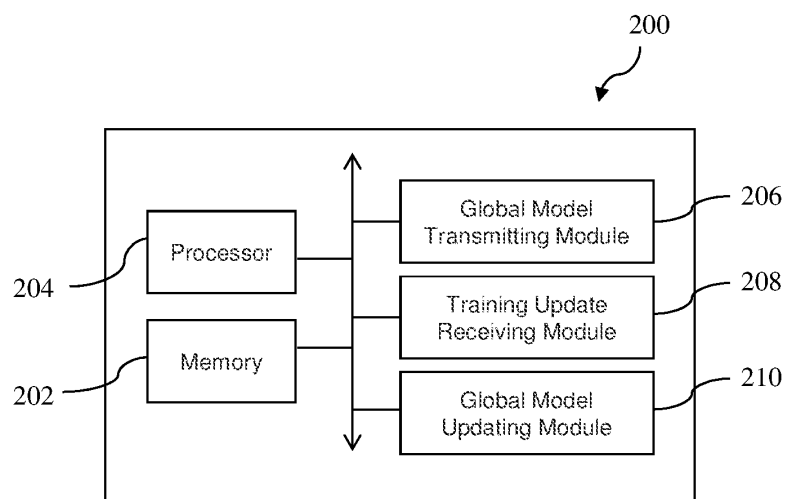


FIG. 2

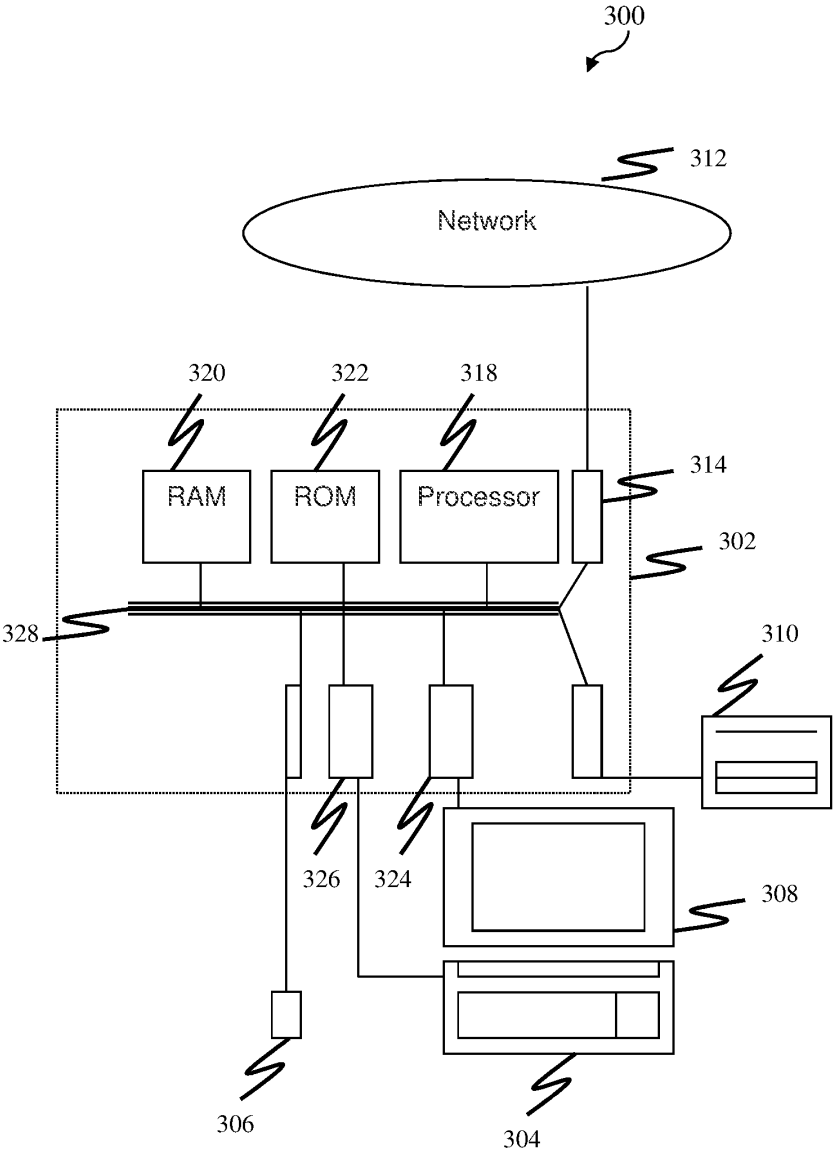
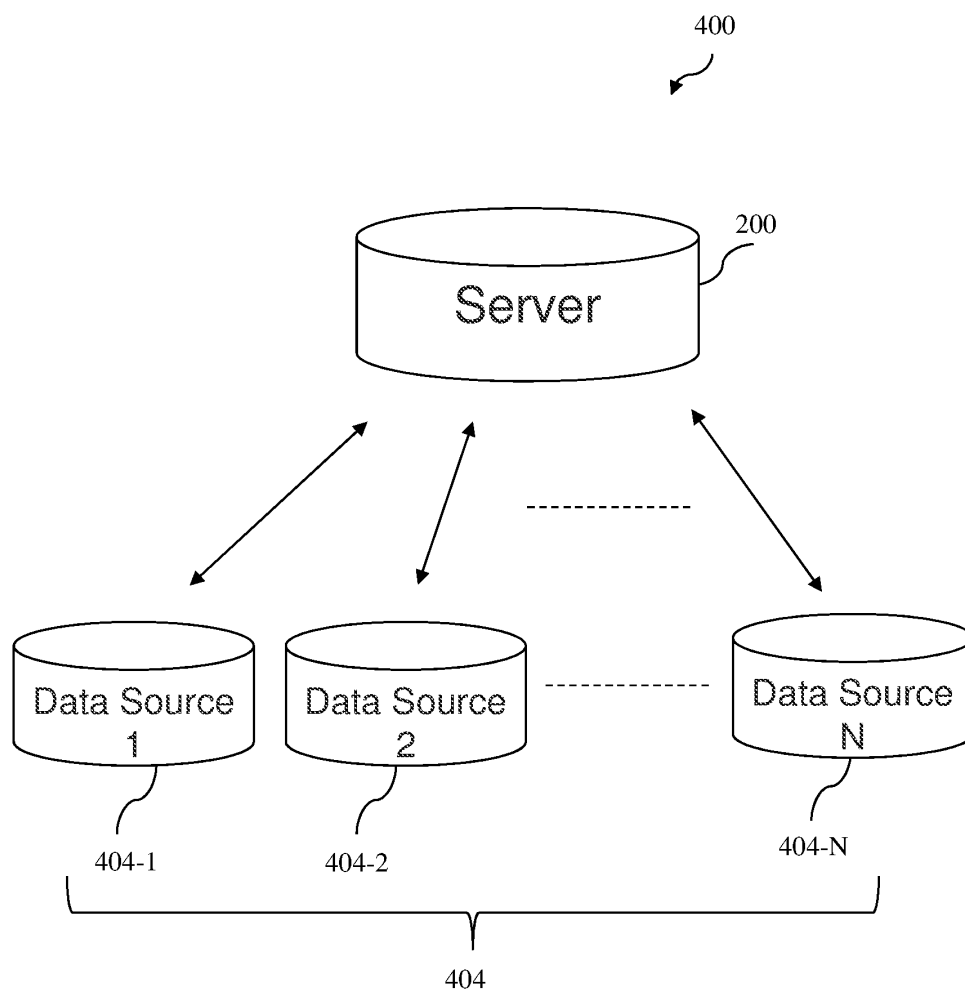


FIG. 3

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**FIG. 4**

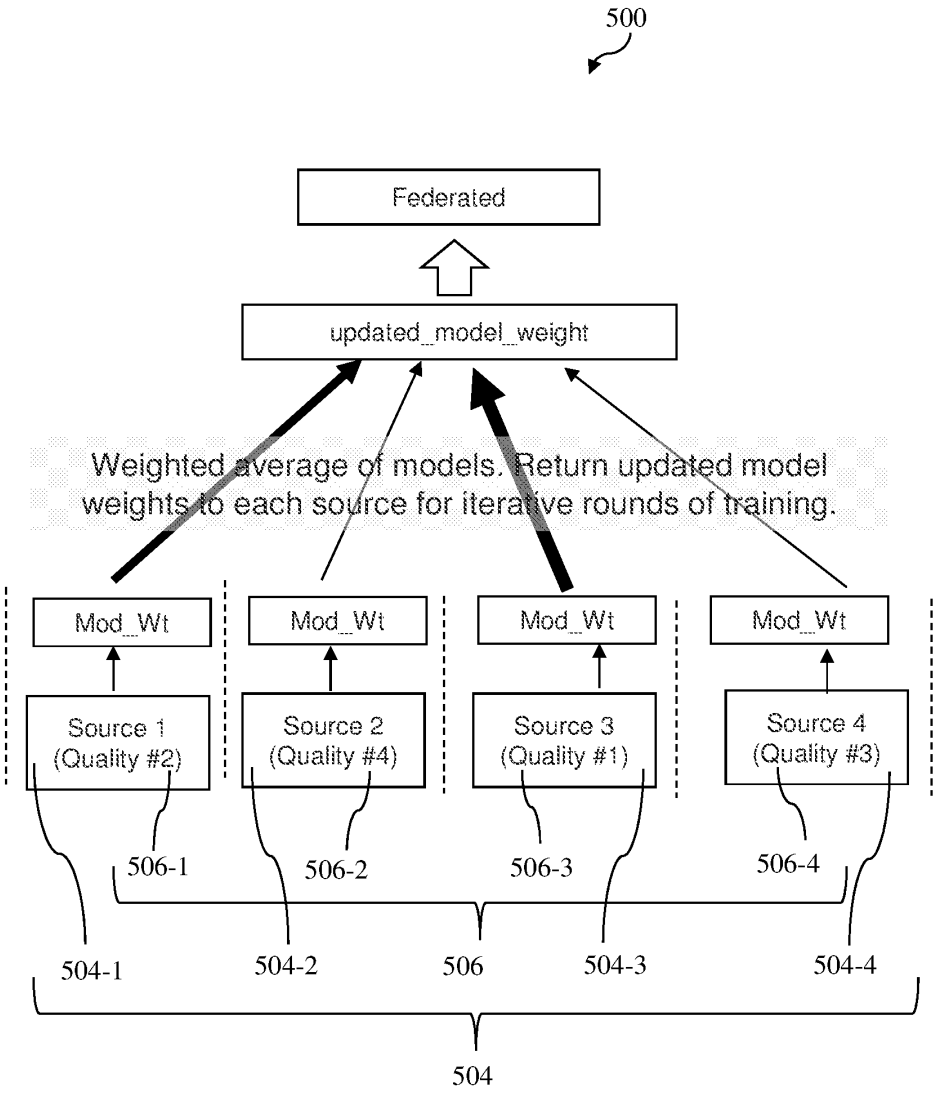


FIG. 5

| Weighted Federated Learning |                                                                                   |                                 |
|-----------------------------|-----------------------------------------------------------------------------------|---------------------------------|
| 1:                          | for Round $t = 1:T$ do                                                            |                                 |
| 2:                          | function AGGSERVER( $\Delta_{LS}^t, G^{t-1}, M, \eta, N$ )                        | ▷ Global Update                 |
| 3:                          | $G^t \leftarrow G^{t-1} + \frac{\eta}{N} \sum_{m=1}^M W_m \Delta_{LS}^t(m)$       | ▷ Update Global Model           |
| 4:                          | $B \leftarrow [Q_1, Q_2, \dots, Q_K]$                                             | ▷ Bin Sources by Quality Ranges |
| 5:                          | if $M \geq K$ then                                                                |                                 |
| 6:                          | $S \leftarrow \text{genRandomInt}[M : 1, K]$                                      | ▷ Select Sources by Quality     |
| 7:                          | else                                                                              |                                 |
| 8:                          | $S \leftarrow \text{genRandomInt}[M : 1, N]$ s.t. $S \cap Q_k$ finite $\forall k$ |                                 |
| 9:                          | return $G^t, S$                                                                   | ▷ For Local Servers             |
| 10:                         | function LOCSERVER( $\Delta_{LS}^t, G^t, E, lr, bs$ )                             | ▷ Local Update                  |
| 11:                         | $\Delta_{LS}^{t+1} \leftarrow []$                                                 | ▷ Initialize                    |
| 12:                         | for Local Server $m = 1:M$ do                                                     |                                 |
| 13:                         | $L^{t+1}(m) \leftarrow G^t$                                                       |                                 |
| 14:                         | $l^m \leftarrow \mathcal{L}_{\text{class}}(L^{t+1}, D_m)$                         | ▷ Data $D_m$                    |
| 15:                         | for epoch $e \in E$ do                                                            | ▷ Retraining                    |
| 16:                         | for batch $b \in D_m$ do                                                          | ▷ batches of $D_m$              |
| 17:                         | $L^{t+1}(m) \leftarrow L^{t+1}(m) - lr \cdot \nabla l^m(L^{t+1}(m), b)$           |                                 |
| 18:                         | $\sigma_m^2 \leftarrow \text{Data Quality Index}$                                 | ▷ Derived with Chosen Strategy  |
| 19:                         | $\Delta_{LS}^{t+1} \leftarrow [\Delta_{LS}^{t+1}, L_i^{t+1}(m) - G^t]$            | ▷ Difference vs. Global         |
| 20:                         |                                                                                   |                                 |
| 21:                         | $W_m \leftarrow \sqrt{\frac{1}{\sigma_m^2}}$                                      | ▷ Federation Weights            |
| 22:                         | return $\Delta_{LS}^{t+1}, W_m$                                                   | ▷ For Global Servers            |

FIG. 6

Centre quality index ( $Q_c$ ) = Centre reputation ( $R$ ) x  
Annotator competence ( $C$ ) x Method of annotation ( $M$ )

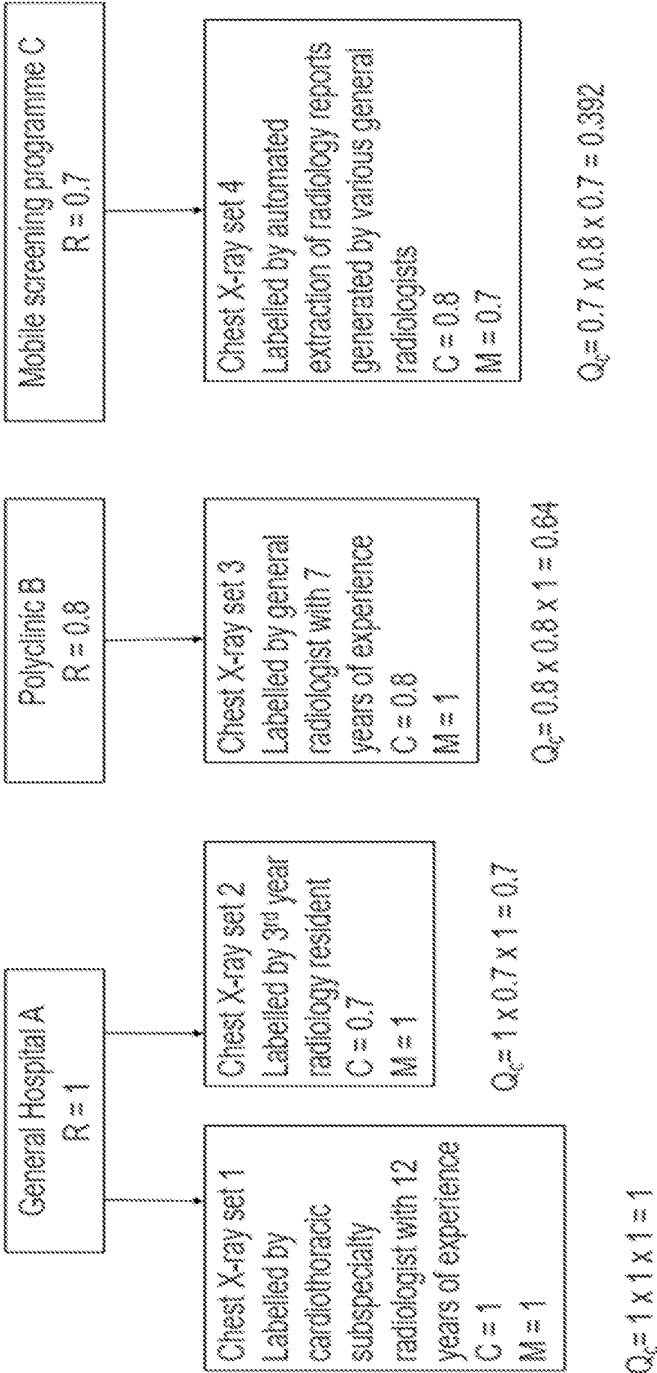


FIG. 7A

Image quality index ( $Q_i$ ) = Intrinsic factors (I)  
x Extrinsic factors (E)

MRI liver images acquired with a latest model scanner using optimised protocols on outpatients. Random sample of images reveal good image quality.

I = 1  
E = 1

MRI liver images extracted from MRI abdomen studies acquired with an old scanner of lower field strength on a mixture of outpatients and inpatients. Random sample of images reveal 15% of images have artifacts which may affect labelling accuracy.

I = 0.8  
E = 0.85

$Q_i = 1 \times 1 = 1$

$Q_i = 0.8 \times 0.85 = 0.68$

FIG. 7B

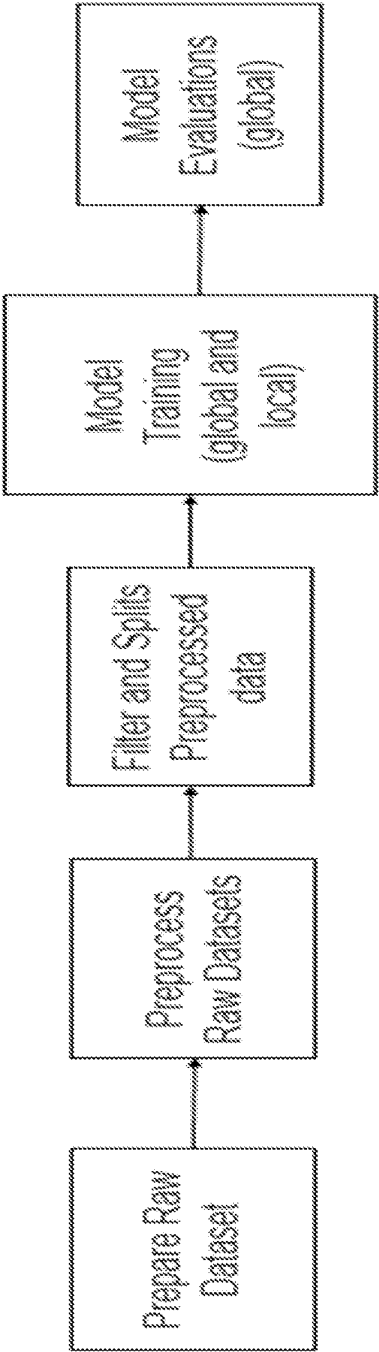


FIG. 8

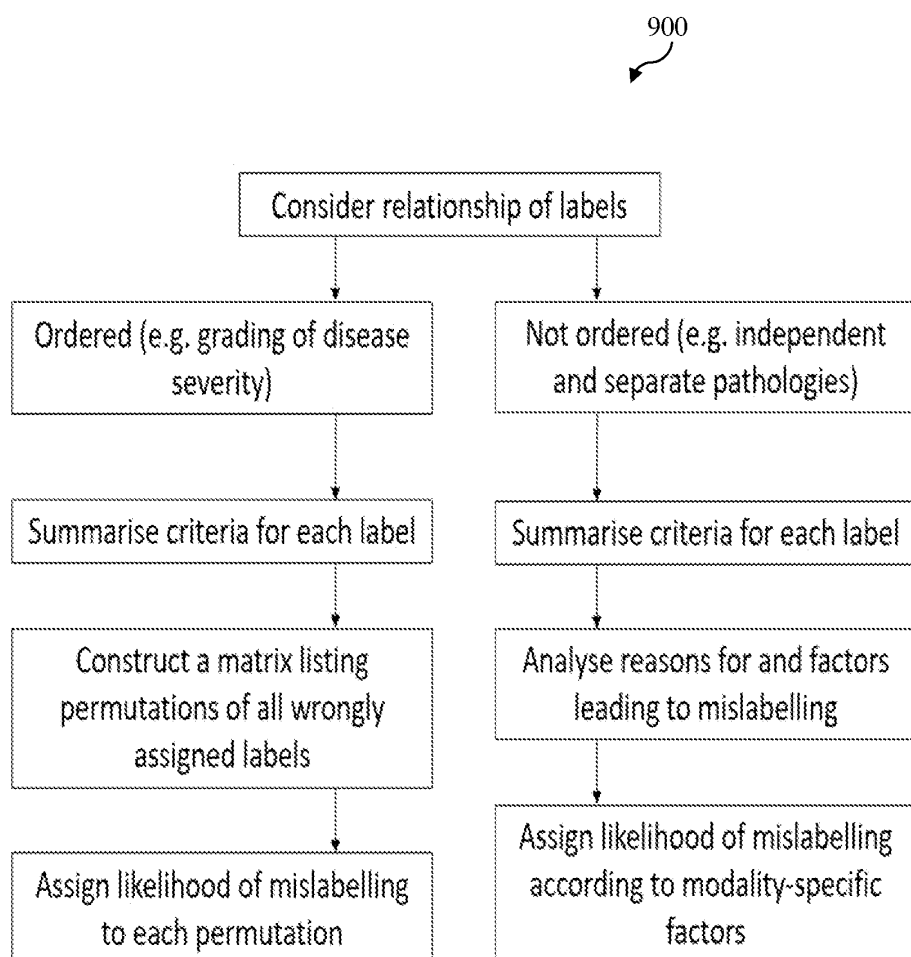


FIG. 9