

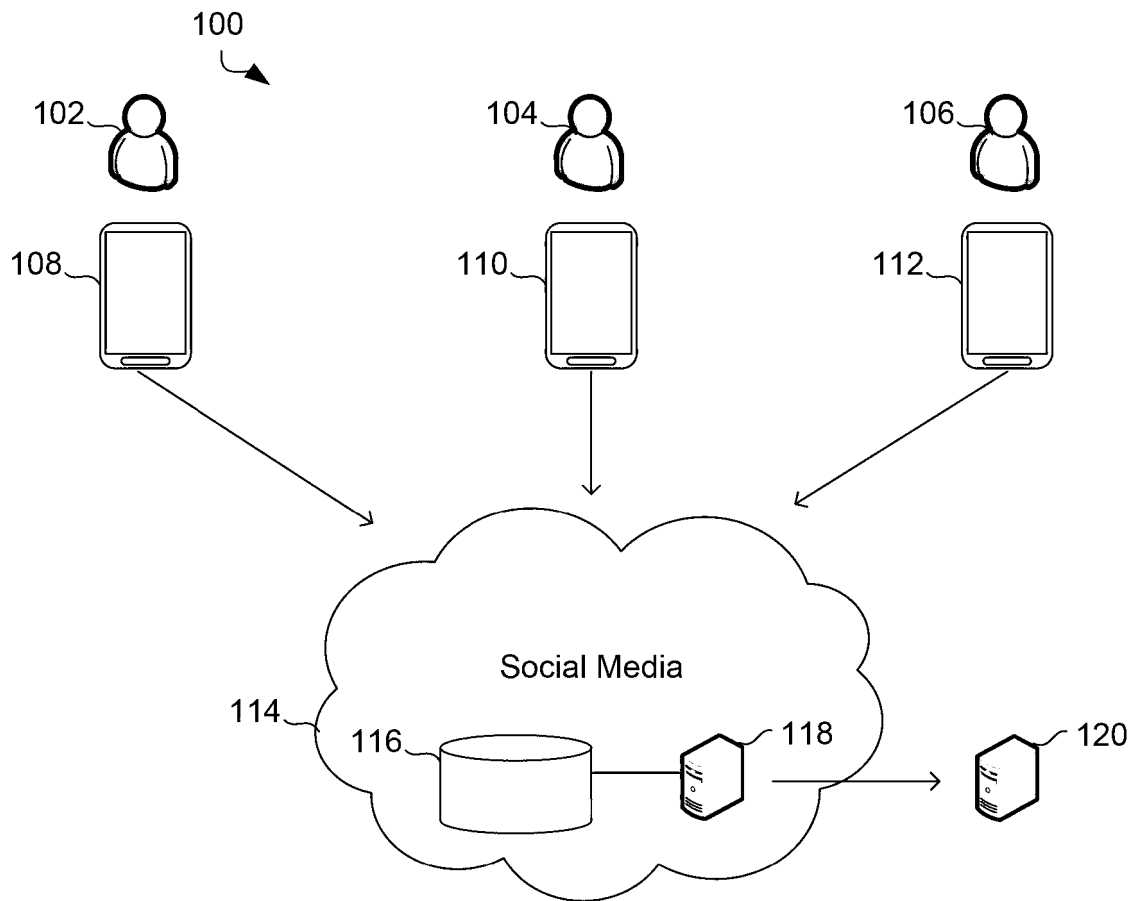


Fig. 1

PRIOR ART

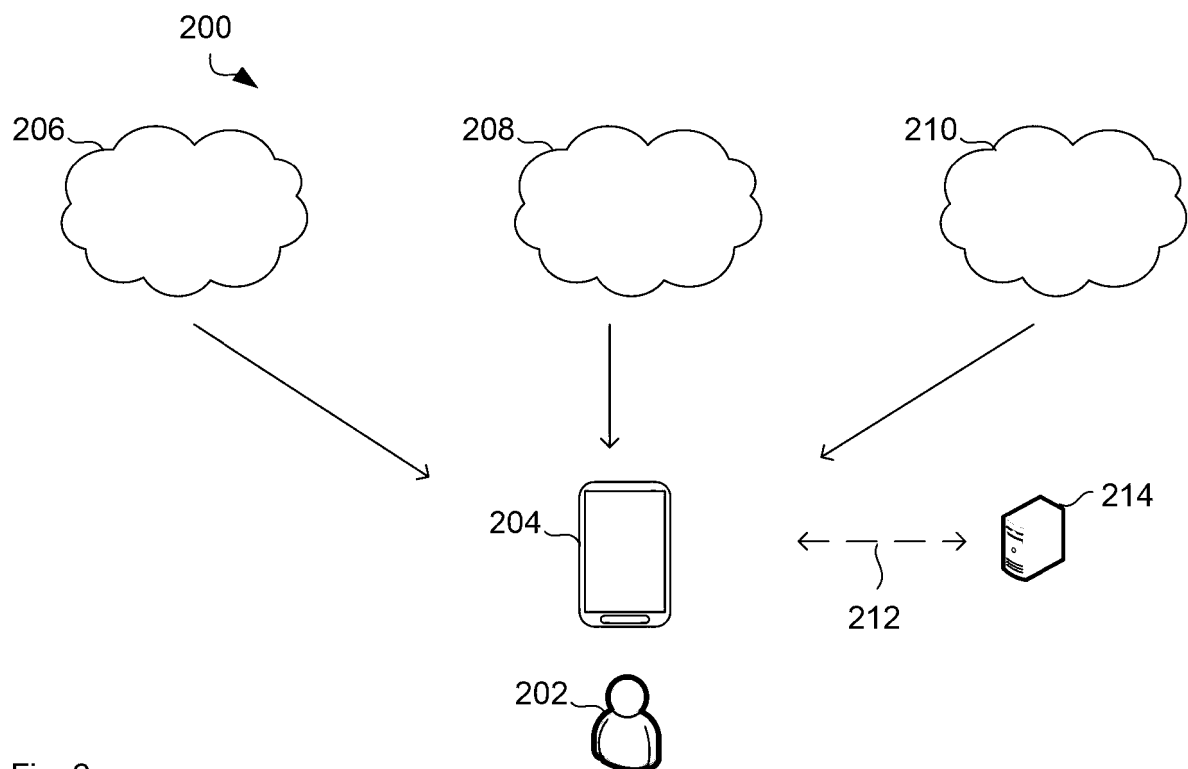


Fig. 2

The results of your test are below.

These results were sent on March 4, 2013
to **Dr Zaius**

Test algorithm

4.037, ..., -7.501

Genome map

CCC TGT GGA C...

Test algorithm

93908615294...

Result

9017345234

Test algorithm

50690534234

Result

9017345234

Result

6298464613

Final Result

Clinical Dose (mg/wk) 57

Genetic Dose (mg/wk) 23

You have a **Warfarin Dose** request

Please select genome map and check
if your settings are still valid

Select File

Age 23

Height (cm) 157

Weight (kg) 70

European

Are you taking enzyme inducers? No

Are you taking amiodarone? No

Calculate

Fig. 3(A)

Fig. 3(B)

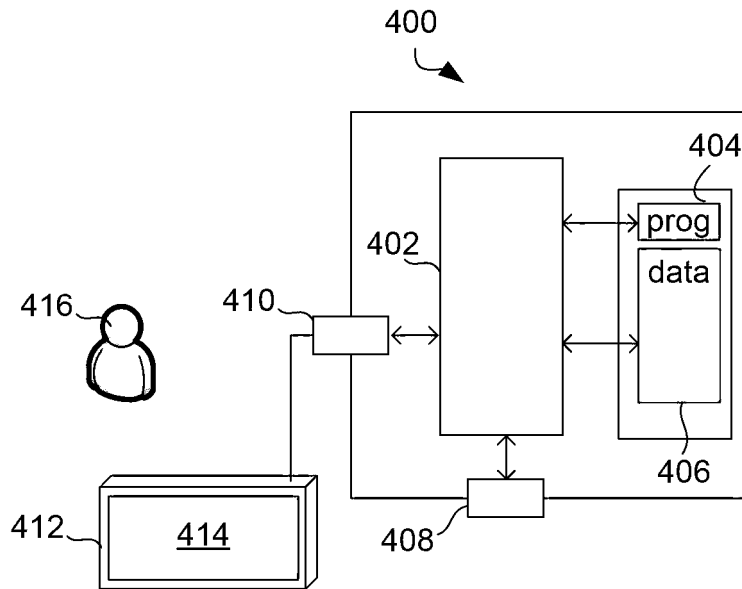


Fig. 4

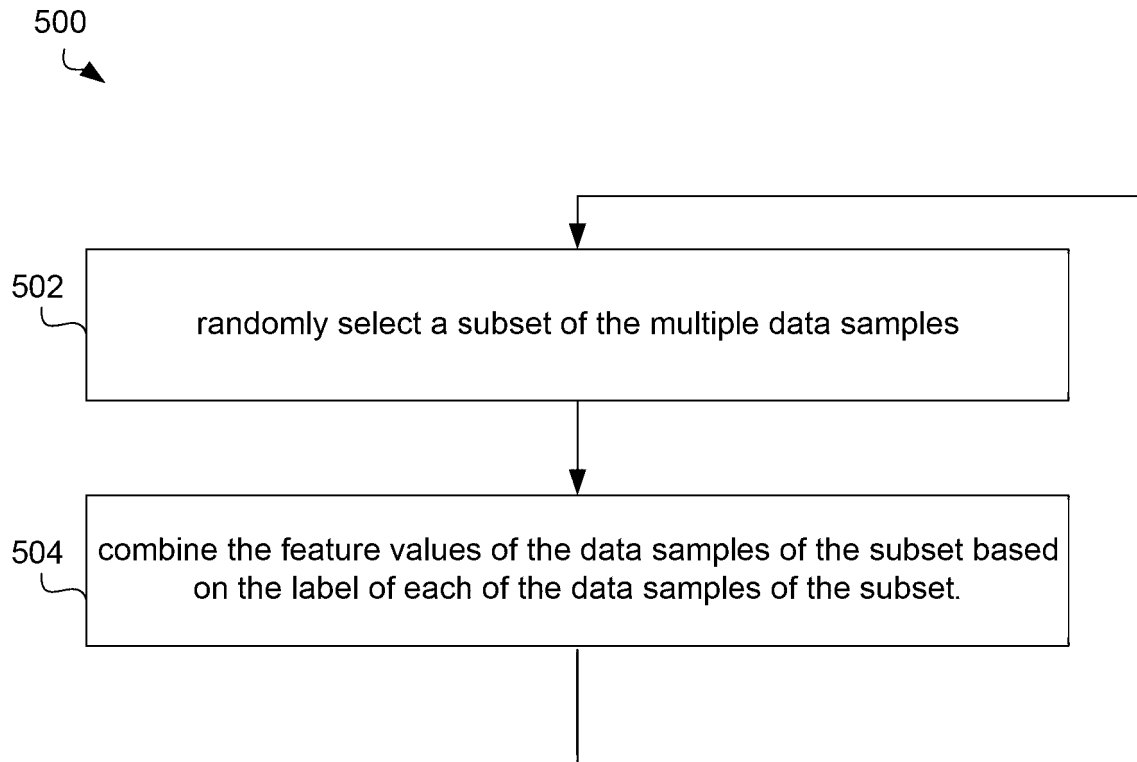


Fig. 5

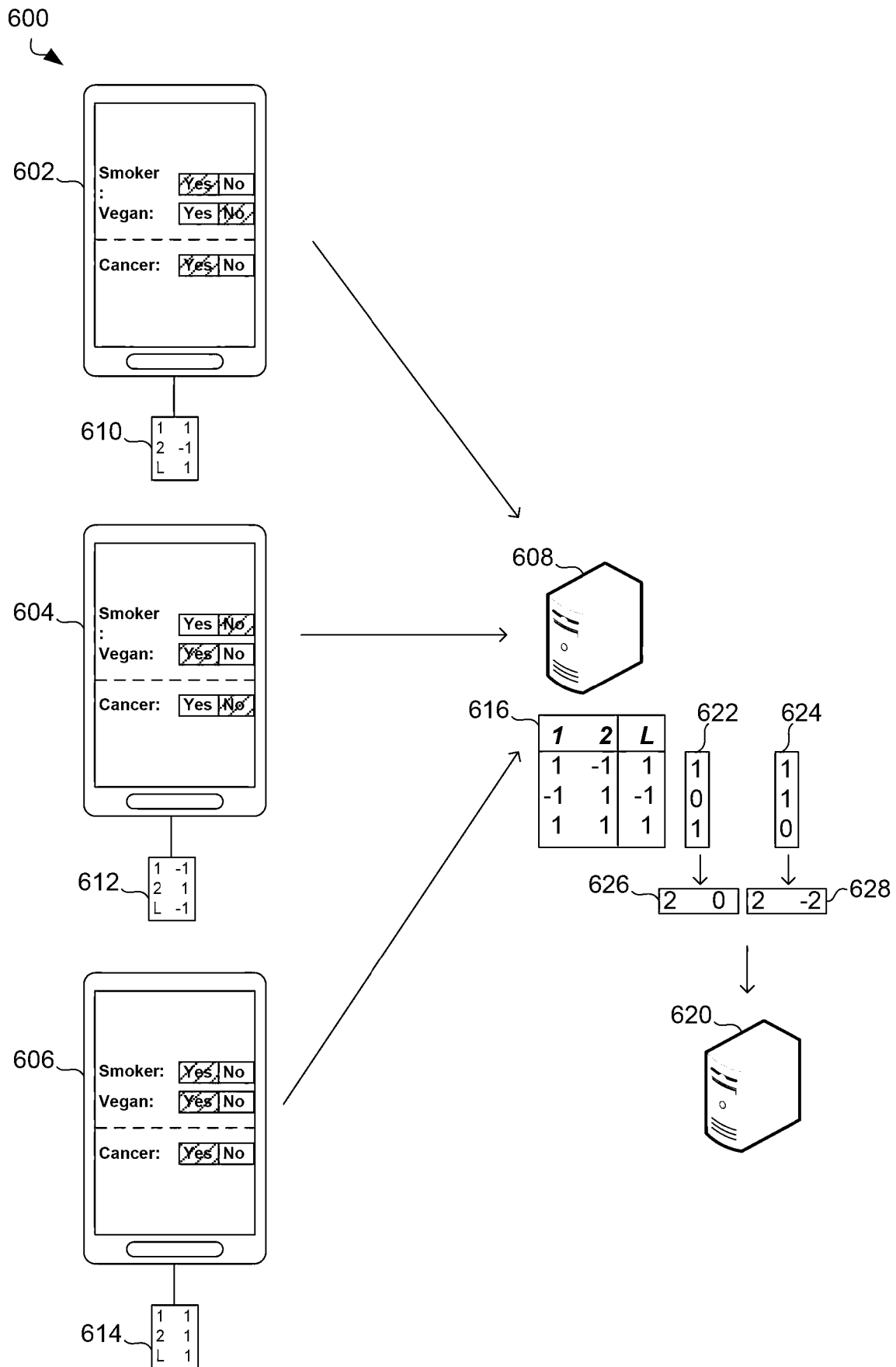


Fig. 6

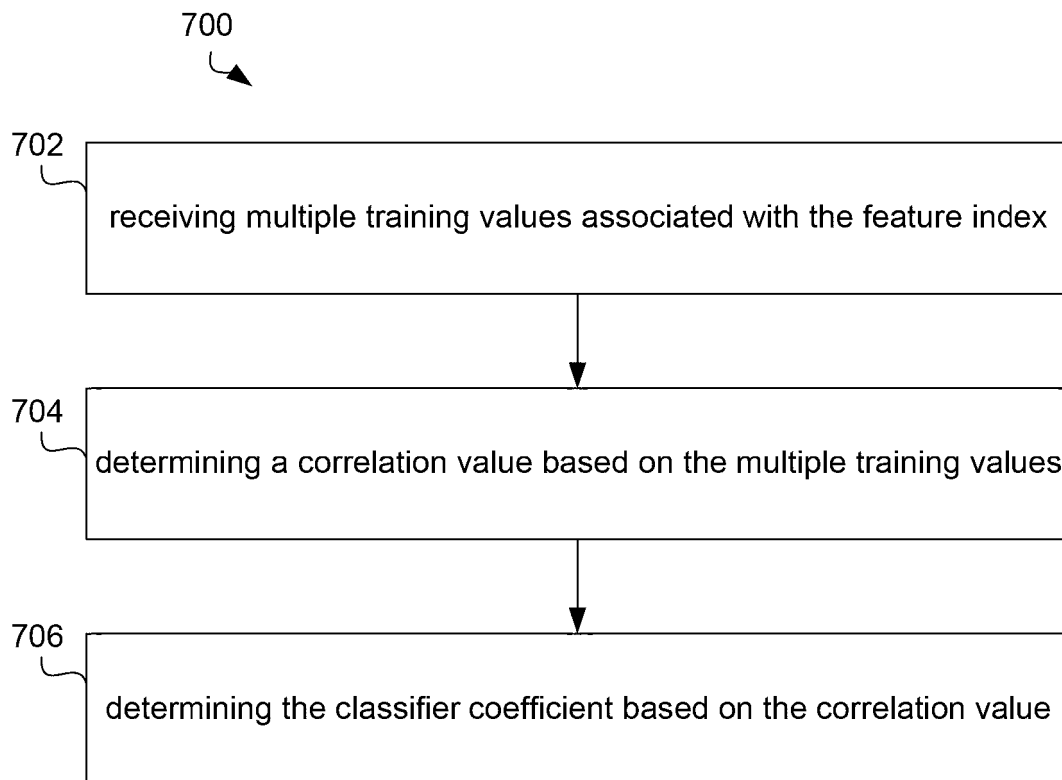


Fig. 7

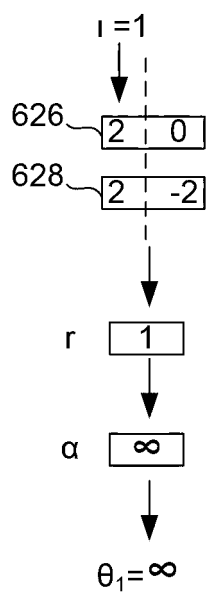


Fig. 8(A)

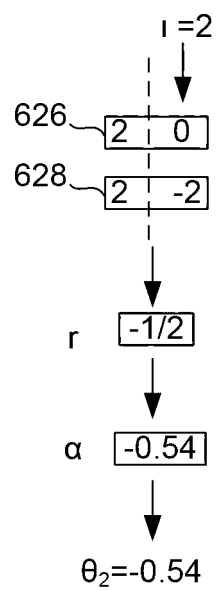


Fig. 8(B)

900



Algorithm 1 Rademacher operator boosting (RadoBoost)

Input set of centered random S_* with $\text{card}(S_*) = n$, number of iterations $T \in \mathbb{N}_+$; $\sim$ 702

Step 1 : let $\theta_0 \leftarrow 0$, $w_0 \leftarrow (1/n)\mathbf{1}$; // initial classifier and weights

Step 2 : **for** $t = 1, 2, \dots, T$

 Step 2.1 : $[d] \ni i(t) \leftarrow \text{wFI}(S_*, w_t)$; // get weak feature predictor index $i(t)$

 Step 2.2 : let

$$r_t \leftarrow \frac{1}{\pi_{*i(t)}} \sum_{j=1}^n w_{tj} \pi_{ji(t)} ; \quad (19)$$

$$\alpha_t \leftarrow \frac{1}{\pi_{*i(t)}} \log \frac{1 + r_t}{1 - r_t} ; \quad (20)$$

 Step 2.3 : **for** $j = 1, 2, \dots, n$

$$w_{(t+1)j} \leftarrow w_{tj} \cdot \left(\frac{1 - \frac{r_t \pi_{ji(t)}}{\pi_{*i(t)}}}{1 - r_t^2} \right) ; \quad (21)$$

Return θ_T defined by:

$$\theta_{Tk} \doteq \sum_{t: i(t)=k} \alpha_t, \forall k \in [d] ; \quad (22)$$

Fig. 9

500
↙

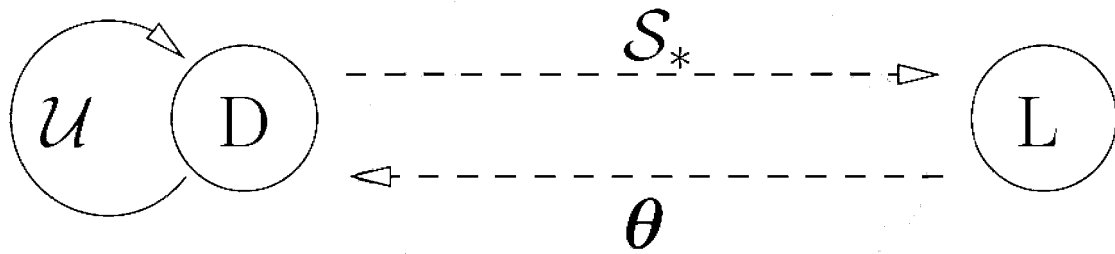


Fig. 10

500
↙

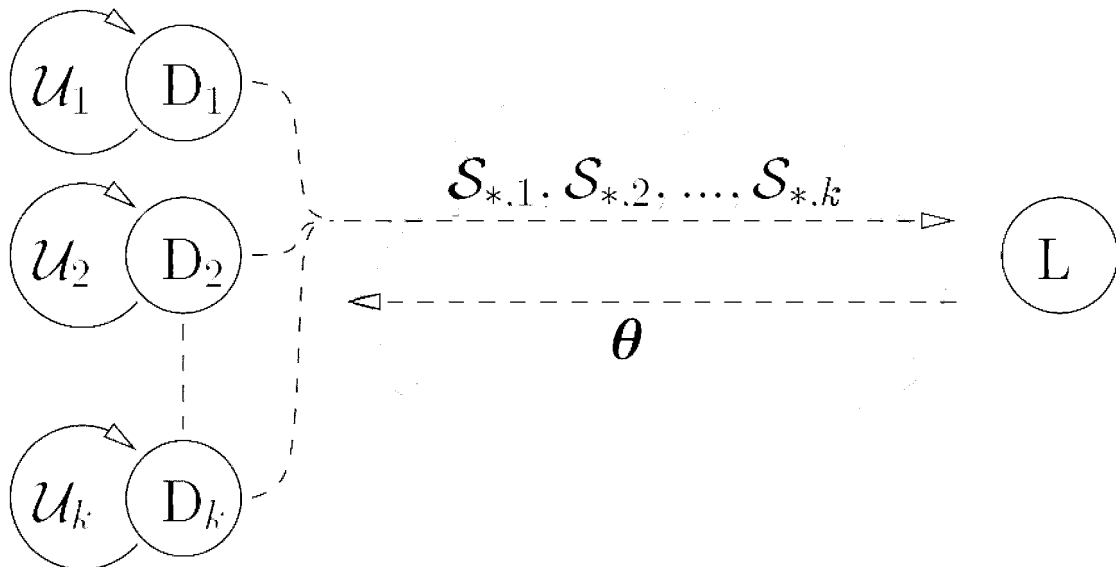


Fig. 11

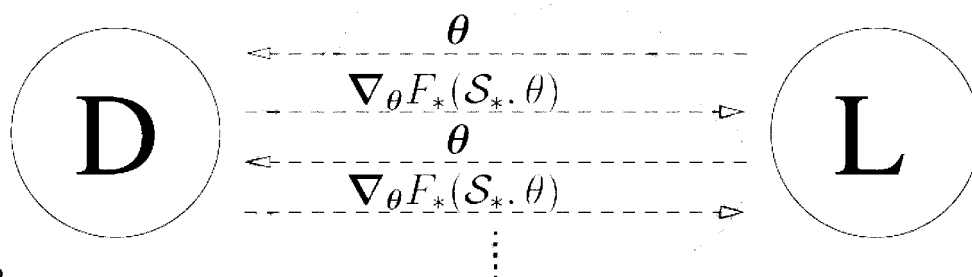


Fig. 12

1300



Algorithm 2 Feature-wise differential privacy compliant releasing of rados (DP-FEAT)

Input set of examples $\mathcal{S}$, target feature k , number of rados n , differential privacy parameter $\epsilon > 0$;
 Step 1 : let $\beta \leftarrow 1/(1 + \exp(\epsilon/2)) \in [0, 1/2)$;
 Step 2 : **If** $m < (1 + 2\beta)/(1 - 2\beta)$ **then**
 multiply each example $m_\beta \doteq \lceil (1 + 2\beta)/((1 - 2\beta)m) \rceil$ times in $\mathcal{S}$;
 Step 3 : let

$$\Sigma_{m,\beta} \doteq \left\{ \sigma \in \Sigma_m : -(m - m_k(+)) + \beta(m + 1) \leq \frac{1}{2} \cdot (\pi_\sigma^y)_k \leq m_k(+) - \beta(m + 1) \right\} . \quad (30)$$

Step 4 : sample $\sigma_1, \sigma_2, \dots, \sigma_n$ i.i.d. (uniform) in $\Sigma_{m,\beta}$;

Return set of rados $\{\pi_\sigma^y : \sigma \text{ sampled in Step 4}\}$;

Fig. 13

1400 ↗

#	$\ell_e(z, \mu_e)$	$\ell_r(z, \mu_r)$	$\varphi_r(z)$	μ_e and μ_r	α_e	Ref
I	$\sum_{i \in [m]} \log(1 + \exp(z_i^e))$	$\sum_{j \in [m]} \exp(z_j^r)$	$z \log z - z$	$\forall \mu_e = \mu_r$	μ_e	Cor. 7
II	$\sum_{i \in [m]} (1 + z_i^e)^2$	$-(\mathbb{E}_{\mathcal{J}}[-z_j^r] - \mu_r \cdot \mathbb{V}_{\mathcal{J}}[-z_j^r])$	$(1/2) \cdot z^2$	$\forall \mu_e = \mu_r$	$\mu_e/4$	Cor. 9
III	$\sum_{i \in [m]} \max\{0, z_i^e\}$	$\max\{0, \max_{j \in [m]} \{z_j^r\}\}$	$X_{[0,1]}(z)$	$\forall \mu_e, \mu_r$	μ_e	Cor. 11
IV	$\sum_i z_i^e$	$\mathbb{E}_{\mathcal{J}}[z_j^r]$	$X_{[\frac{1}{2^m}, \frac{1}{2}]}(z)$	$\forall \mu_e, \mu_r$	μ_e	Cor. 13

Fig. 14

1500

**Algorithm 1** Ω -R.ADA BOOST

Input set of rados $\mathcal{S}_r \doteq \{\pi_1, \pi_2, \dots, \pi_n\}; T \in \mathbb{N}_*; \omega \in \mathbb{R}_+; \gamma \in \mathbb{R}^p$;

Step 1 : let $\theta_0 \leftarrow \mathbf{0}, w_0 \leftarrow (1/n)\mathbf{1}$;

Step 2 : **for** $t = 1, 2, \dots, T$

Step 2.1 : call the weak learner

$$(\iota(t), r_t) \leftarrow \Omega\text{-WL}(\mathcal{S}_r, w_t, \gamma, \omega, \theta_{t-1}) \quad (27)$$

Step 2.2 : let

$$\alpha_{\iota(t)} \leftarrow \frac{1}{2\pi_{*\iota(t)}} \log \frac{1+r_t}{1-r_t} ; \quad (28)$$

$$\delta_t \leftarrow \omega \cdot (\Omega(\theta_t) - \Omega(\theta_{t-1})) : \quad (29)$$

Step 2.3 : **for** $j = 1, 2, \dots, n$

$$w_{tj} \leftarrow \frac{w^{(t-1)j}}{Z_t} \cdot \exp(-\alpha_t \pi_{j\iota(t)} + \delta_t) \quad (30)$$

Return θ_T ;

Fig. 15

1600

**Algorithm 2** Ω -WL, for $\Omega \in \{\|\cdot\|_1, \|\cdot\|_F^2, \|\cdot\|_\infty\}$

Input set of rados $\mathcal{S}_r \doteq \{\pi_1, \pi_2, \dots, \pi_n\}$; weights $w \in \Delta_n$; parameters $\gamma \in (0, 1), \omega \in \mathbb{R}_+$; classifier $\theta \in \mathbb{R}^d$;

Step 1 : pick weak feature $\iota_* \in [d]$;

Optional — use preference order:

$$\iota \succeq \iota' \Leftrightarrow |r_\iota| - \delta_\iota \geq |r_{\iota'}| - \delta_{\iota'} : \quad (31)$$

$$(\delta_\iota \doteq \omega \cdot (\Omega(\theta + \alpha_\iota \cdot \mathbf{1}_\iota) - \Omega(\theta)))$$

// r_ι is given in (34), α_ι is given in (28)

Step 2 : **if** $\Omega = \|\cdot\|_F^2$ **then**

$$r_* \leftarrow \begin{cases} r_{\iota_*} & \text{if } r_{\iota_*} \in [-\gamma, \gamma] \\ \text{sign}(r_{\iota_*}) \cdot \gamma & \text{otherwise} \end{cases} \quad (32)$$

else $r_* \leftarrow r_{\iota_*}$;

Return (ι_*, r_*) ;

Fig. 16

1700



Algorithm 3 DP-RADOS

Input set of rados $\mathcal{S}_r \doteq \{\pi_1, \pi_2, \dots, \pi_n\}$: radius $r_e > 0$.
 privacy budget $\varepsilon > 0$;

Step 1 : let $\mathcal{S}_r^{\text{DP}} \leftarrow \emptyset$;

Step 2 : **for** $j = 1, 2, \dots, n$

Step 2.1 : sample z_j as $z_{jk} \sim \text{Lap}(nr_e/\varepsilon), \forall k \in [d]$;

Step 2.2 : $\mathcal{S}_r^{\text{DP}} \leftarrow \mathcal{S}_r^{\text{DP}} \cup \{\pi_j + z_j\}$;

Return $\mathcal{S}_r^{\text{DP}}$;

Fig. 17