**Support: Table 1**

The *R*2/RMSE of FW- and PCA-ANNs models by separately inverting these four parameters based on synthetic database.

|  |  |  |
| --- | --- | --- |
|   | FW-ANNs (*R*2/RMSE) | PCA-ANNs (*R*2/RMSE) |
|  | Cab | Car | EWT | LMA | Cab | Car | EWT | LMA |
| **D1:***Gaussian distribution considered high correlation among each parameter* |
| R | 0.41/6.992 | 0.30/1.491 | 0.55/0.00133 | 0.70/0.00124 | 0.39/6.471 | 0.37/1.213 | 0.40/0.00221 | 0.21/0.00161 |
| T | 0.45/5.813 | 0.47/1.123 | 0.47/0.00172 | 0.77/0.00111 | 0.51/5.131 | 0.39/0.951 | 0.58/0.00152 | 0.54/0.0011 |
| R & T | 0.54/6.262 | 0.71/1.573 | 0.65/0.00141 | 0.60/7.62e-42 | 0.56/5.243 | 0.67/1.074 |  |  |
| **D2:** *Gaussian distribution*  |
| R | 0.57/21.703 | 0.57/2.701 | 0.70/0.00284 | 0.66/0.00244 | 0.56/11.112 | / | 0.69/0.00253 | 0.30/0.00194 |
| T | 0.56/20.652 | 0.61/4.433 | 0.66/0.00281 | 0.79/0.0021 | 0.53/9.412 | 0.72/2.364 | 0.49/0.0024 | 0.51/0.0013 |
| R & T | 0.74/26.003 | 0.71/6.113 | 0.59/0.0262 | 0.66/0.00323 | / | / | / | / |