**Supplementary Table 1**. Risk Factor Variables and the Abbreviations Used in the Analysis

|  |  |  |  |
| --- | --- | --- | --- |
|  | Factors related to the prenatal environment and pregnancy (23 factor variables) | Factors associated with delivery and the period immediately after birth (21 factor variables) | Factors recorded after birth (3 factor variables) |
| Continuous variables | Maternal age (M\_AGE, year); premature rupture of membranes (PROM(h), hour); gestational age (GA, week) | Birth weight (WT, g); birth height (HT, cm); birth head circumference (HC, cm); body temperature at birth (TEMP, ℃); hydrogen ion concentration in the blood within 1 hour after birth (pH); base excess within 1 hour after birth (BE) |  |
| Ordinal variables | Gravida (GRAV); paternal education level (F\_EDU); maternal education level (M\_EDU); multiple gestation (MULTI); order of multiple births (MULTI(th)); antenatal steroid use (ANS, never administered/incomplete administration/complete administration) | Apgar score at 1 minute (1\_AS); Apgar score at 5 minutes (5\_AS) | Number of administered surfactants (SFT(n)) |
| Nominal variables | Parity (PARITY); oligohydramnios (OLIGO); polyhydramnios (POLY); maternal country of origin (M\_COUN); Paternal country of origin (F-COUN); marital status (MRG, cohabitation/separation); pregnancy process (PREP, natural pregnancy/in vitro fertilization); gestational diabetes mellitus (G\_DM); overt diabetes mellitus (O\_DM); pregnancy-induced hypertension (PIH); chronic hypertension (HTN); histological chorioamnionitis (CA); premature rupture of membranes (PROM); delivery mode (C-SEC, virginal delivery/cesarean section) | Birth place (BPL, in the hospital/outside the hospital); need for initial resuscitation (CPR\_R); need for oxygen supplementation at birth (O2\_R); need for cardiac massage at birth (CM\_R); epinephrine administration at birth (EPI\_R); need for endotracheal intubation at birth (INT\_R); need for continuous positive airway pressure at birth (PPV\_R); respiratory distress syndrome (RDS); need for surfactant (SFT); invasive mechanical ventilation (I\_VENT); noninvasive mechanical ventilation (NI\_VENT); supplemental oxygen (O2); congenital infection (C\_INF) | Sepsis (SEPS); fungal infection before PDA treatment (FUNG) |

**Supplementary Table 2**. Full Rankings of Important Variables in the Artificial Intelligence Analysis

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **RF** | **SHAP value** | **L-GBM** | **SHAP value** | **MLP** | **SHAP value** | **SVM** | **SHAP value** | **K-NN** | **SHAP value** |
| **sPDA**  **vs**  **nPDA** | I\_VENT  GA  SEPS  WT  SFT(n)  HT  INT\_R  SFT  RDS  BE  5\_AS  HC  NI\_VENT  pH  TEMP  MULTI  PROM  ANS  OLIGO  PROM(h)  PPV\_R  PARITY  1\_AS  MULTI(th)  GRAV  O2  M\_AGE  CA  M\_EDU  PREP  O2\_R  PIH  BPL  F\_EDU  CPR\_R  C-SEC  G\_DM  CM\_R  EPI\_R  M\_COUN  FUNG  POLY  F\_COUN  HTN  O\_DM  C\_INF  MRG | 0.061  0.050  0.038  0.034  0.024  0.023  0.014  0.012  0.009  0.009  0.008  0.007  0.007  0.006  0.006  0.006  0.006  0.005  0.004  0.004  0.003  0.003  0.003  0.003  0.003  0.002  0.002  0.002  0.002  0.002  0.002  0.001  0.001  0.001  0.001  0.001  0.001  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000 | I\_VENT  GA  SEPS  WT  SFT(n)  HT  NI\_VENT  BE  MULTI  TEMP  PROM  pH  HC  O2  5\_AS  ANS  OLIGO  1\_AS  M\_AGE  PARITY  GRAV  INT\_R  PROM(h)  MULTI(th)  RDS  BPL  CA  M\_EDU  O2\_R  PREP  F\_EDU  PIH  G\_DM  PPV\_R  M\_COUN  CM\_R  C-SEC  CPR\_R  POLY  SFT  FUNG  F\_COUN  O\_DM  HTN  EPI\_R  C\_INF  MRG | 0.095  0.073  0.052  0.028  0.026  0.022  0.015  0.013  0.009  0.009  0.009  0.007  0.007  0.007  0.006  0.006  0.006  0.005  0.005  0.005  0.004  0.004  0.004  0.003  0.003  0.003  0.003  0.003  0.002  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000 | GA  I\_VENT  WT  SEPS  SFT(n)  PROM  PARITY  HT  HC  GRAV  BE  1\_AS  SFT  5\_AS  pH  NI\_VENT  O\_DM  MULTI  TEMP  MULTI(th)  O2  INT\_R  ANS  M\_AGE  M\_EDU  BPL  OLIGO  PPV\_R  F\_EDU  CA  G\_DM  O2\_R  PIH  PROM(h)  C-SEC  RDS  CPR\_R  F\_COUN  PREP  EPI\_R  M\_COUN  CM\_R  POLY  MRG  FUNG  C\_INF  HTN | 0.113  0.091  0.049  0.041  0.036  0.031  0.031  0.028  0.027  0.022  0.020  0.020  0.019  0.016  0.016  0.015  0.011  0.011  0.011  0.011  0.010  0.010  0.009  0.009  0.008  0.005  0.005  0.005  0.005  0.004  0.004  0.004  0.003  0.003  0.003  0.002  0.002  0.002  0.001  0.001  0.001  0.001  0.001  0.001  0.000  0.000  0.000 | GA  I\_VENT  WT  SFT(n)  SEPS  HT  PROM  BE  pH  5\_AS  SFT  PARITY  HC  1\_AS  GRAV  INT\_R  M\_AGE  F\_EDU  ANS  MULTI(th)  TEMP  MULTI  NI\_VENT  OLIGO  O2\_R  O2  CA  PROM(h)  PREP  M\_EDU  RDS  PIH  BPL  G\_DM  C-SEC  CPR\_R  EPI\_R  PPV\_R  FUNG  F\_COUN  HTN  CM\_R  POLY  O\_DM  MRG  M\_COUN  C\_INF | 0.101  0.067  0.056  0.040  0.035  0.035  0.022  0.018  0.017  0.016  0.015  0.015  0.013  0.011  0.011  0.008  0.008  0.008  0.007  0.007  0.007  0.006  0.006  0.005  0.004  0.004  0.004  0.004  0.003  0.003  0.003  0.003  0.003  0.002  0.002  0.002  0.001  0.001  0.001  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000 | GA  WT  I\_VENT  SFT(n)  HT  ANS  HC  M\_AGE  MULTI  SFT  5\_AS  RDS  pH  1\_AS  BE  M\_EDU  GRAV  INT\_R  F\_EDU  O2  PROM  TEMP  MULTI(th)  PARITY  SEPS  C-SEC  CA  NI\_VENT  PREP  PIH  PROM(h)  O2\_R  PPV\_R  OLIGO  CPR\_R  M\_COUN  O\_DM  G\_DM  BPL  CM\_R  EPI\_R  HTN  F\_COUN  FUNG  C\_INF  MRG  POLY | 0.042  0.035  0.030  0.029  0.028  0.022  0.021  0.018  0.017  0.017  0.016  0.016  0.016  0.014  0.013  0.013  0.013  0.012  0.012  0.011  0.011  0.011  0.010  0.010  0.010  0.009  0.009  0.009  0.006  0.006  0.005  0.005  0.005  0.005  0.003  0.002  0.001  0.001  0.001  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000 |
| **sPDA\_tx**  **vs**  **sPDA\_nontx** | SEPS  O2  O2\_R  NI\_VENT  TEMP  PARITY  F\_EDU  ANS  GRAV  INT\_R  OLIGO  M\_EDU  C-SEC  M\_AGE  1\_AS  WT  SFT(n)  MULTI  GA  5\_AS  PPV\_R  HT  BE  CA  MULTI(th)  HC  PIH  PREP  F\_COUN  pH  PROM(h)  SFT  BPL  CPR\_R  RDS  PROM  M\_COUN  G\_DM  I\_VENT  FUNG  CM\_R  HTN  EPI\_R  POLY  C\_INF  MRG  O\_DM | 0.045  0.042  0.026  0.020  0.018  0.018  0.014  0.014  0.011  0.011  0.010  0.008  0.006  0.006  0.006  0.006  0.006  0.005  0.005  0.003  0.003  0.003  0.003  0.003  0.002  0.002  0.002  0.002  0.002  0.002  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.001  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000 | SEPS  O2  O2\_R  TEMP  ANS  NI\_VENT  GA  M\_AGE  PARITY  HT  OLIGO  WT  GRAV  INT\_R  PPV\_R  5\_AS  M\_EDU  1\_AS  SFT(n)  pH  BE  F\_COUN  HC  C-SEC  PROM  MULTI  F\_EDU  PROM(h)  CA  BPL  PIH  PREP  MULTI(th)  RDS  G\_DM  SFT  M\_COUN  CM\_R  CPR\_R  FUNG  POLY  O\_DM  HTN  EPI\_R  I\_VENT  C\_INF  MRG | 0.075  0.035  0.028  0.020  0.016  0.015  0.015  0.015  0.014  0.014  0.013  0.012  0.012  0.012  0.010  0.009  0.009  0.008  0.008  0.007  0.007  0.007  0.006  0.006  0.005  0.005  0.005  0.004  0.004  0.004  0.003  0.002  0.002  0.002  0.001  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000 | SEPS  PROM  O2  TEMP  O2\_R  GRAV  MULTI  HC  MULTI(th)  5\_AS  WT  HT  BE  SFT(n)  pH  M\_AGE  GA  1\_AS  PROM(h)  ANS  F\_EDU  M\_EDU  PPV\_R  PIH  PARITY  C-SEC  NI\_VENT  CA  INT\_R  CM\_R  PREP  BPL  OLIGO  EPI\_R  F\_COUN  CPR\_R  RDS  G\_DM  I\_VENT  SFT  M\_COUN  POLY  HTN  C\_INF  FUNG  O\_DM  MRG | 0.146  0.049  0.048  0.045  0.044  0.040  0.035  0.033  0.032  0.032  0.032  0.032  0.029  0.029  0.028  0.024  0.023  0.021  0.021  0.020  0.019  0.019  0.019  0.017  0.017  0.015  0.014  0.014  0.013  0.011  0.010  0.008  0.007  0.007  0.007  0.005  0.004  0.004  0.003  0.002  0.002  0.001  0.001  0.001  0.001  0.001  0.001 | SEPS  O2  O2\_R  NI\_VENT  TEMP  GRAV  F\_EDU  PARITY  SFT(n)  WT  HC  M\_AGE  MULTI  1\_AS  5\_AS  HT  BE  ANS  PPV\_R  MULTI(th)  M\_EDU  PROM  GA  OLIGO  pH  CA  INT\_R  PROM(h)  BPL  C-SEC  CPR\_R  PIH  PREP  F\_COUN  I\_VENT  CM\_R  SFT  EPI\_R  HTN  G\_DM  M\_COUN  POLY  MRG  C\_INF  O\_DM  RDS  FUNG | 0.130  0.068  0.064  0.044  0.043  0.043  0.038  0.032  0.031  0.026  0.024  0.024  0.020  0.020  0.018  0.017  0.017  0.017  0.016  0.016  0.016  0.016  0.015  0.012  0.011  0.010  0.010  0.009  0.006  0.006  0.005  0.005  0.004  0.003  0.002  0.002  0.002  0.001  0.001  0.001  0.001  0.001  0.001  0.000  0.000  0.000  0.000 | O2  SFT(n)  ANS  TEMP  MULTI  GRAV  SEPS  MULTI(th)  WT  5\_AS  BE  1\_AS  M\_AGE  M\_EDU  F\_EDU  HT  GA  PROM  PARITY  HC  NI\_VENT  O2\_R  C-SEC  CA  pH  PREP  PIH  PROM(h)  INT\_R  PPV\_R  BPL  CM\_R  OLIGO  EPI\_R  SFT  RDS  I\_VENT  G\_DM  CPR\_R  M\_COUN  F\_COUN  HTN  POLY  MRG  C\_INF  FUNG  O\_DM | 0.043  0.033  0.032  0.031  0.029  0.027  0.025  0.024  0.023  0.023  0.022  0.022  0.022  0.021  0.020  0.020  0.019  0.018  0.017  0.016  0.015  0.015  0.015  0.014  0.013  0.011  0.009  0.006  0.006  0.004  0.004  0.004  0.004  0.003  0.002  0.002  0.001  0.001  0.001  0.000  0.000  0.000  0.000  0.000  0.000  0.000  0.000 |

Abbreviations: PDA, patent ductus arteriosus; sPDA, symptomatic PDA; sPDA\_tx, sPDA with any treatment; RF, random forest; L-GBM, light gradient boosting machine; MLP, multilayer perceptron; SVM, support vector machine; K-NN, k-nearest neighbors. The abbreviations of all factors are shown in SupplementaryTable 1.

a Feature importance values describe how relevant a factor is to the model's predictions. These are listed in descending order in terms of the average absolute SHAP values ​​for the artificial intelligence algorithms.