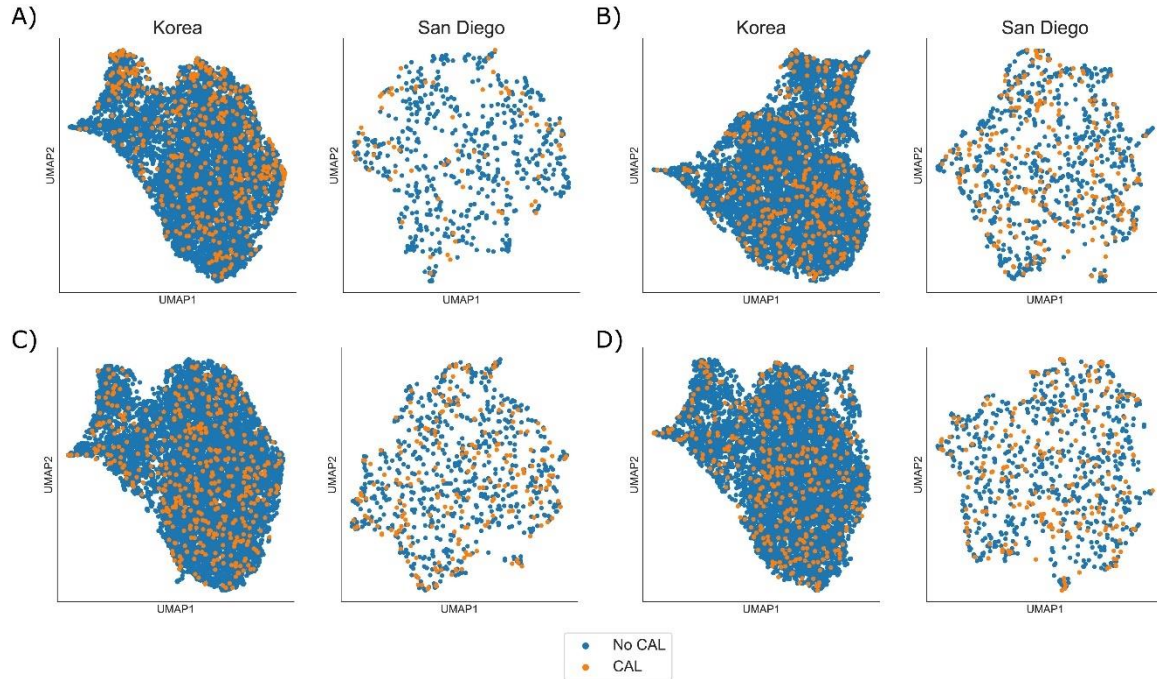## Supplementary Information

*Supplementary Figure 1: UMAP embeddings of KD patients for the Korean and San Diego cohorts using (A) normalized significant laboratory features, (B) normalized significant laboratory features and echocardiographic findings (worst Z-score), (C) normalized significant laboratory features and significant classical KD signs, and (D) normalized significant laboratory features, echocardiographic findings (worst Z-score), and significant classical KD signs labeled by presence of coronary artery lesions (CAL).*

*Supplementary Table S1: Clinical characteristics of the Korean cohort (n=7,101) in order of significance of the difference between responsive and resistant KD patients organized by four categories of variables. Values are median (IQR) for continuous variables and number (percentage) for binary variables.*

| | Responsive (n=5860) | Resistant (n=1241) | P value |
|---|---|---|---|
| **Demographic Variables** | | | |
| Illness Days | 5.0 (4.0-6.0) | 5.0 (4.0-5.0) | 2.20E-12 |
| Weight (kg) | 13.0 (10.3-16.4) | 13.9 (11.2-17.0) | 1.51E-07 |
| Age (months) | 30.0 (14.0-48.0) | 33.0 (19.0-51.0) | 4.72E-07 |
| Height (cm) | 92.0 (79.0-102.7) | 94.0 (83.0-104.4) | 1.45E-06 |
| Sex (male) | 3353 (57.3%) | 762 (61.8%) | 4.21E-03 |
| **Laboratory Results** | | | |
| Neutrophil (%)* | 64.1 (52.1-74.6) | 73.9 (61.9-82.5) | 4.18E-67 |
| Total Bilirubin | 0.38 (0.26-0.55) | 0.5 (0.3-1.19) | 3.43E-53 |
| Alanine Aminotransferase | 25.0 (14.0-92.0) | 60.0 (17.0-189.0) | 5.20E-35 |
| Aspartate Aminotransferase | 35.0 (26.0-61.0) | 48.0 (29.0-135.0) | 2.55E-34 |
| C-Reactive Protein | 5.91 (3.28-10.0) | 8.18 (4.73-12.8) | 9.12E-34 |
| Albumin | 3.9 (3.7-4.2) | 3.8 (3.4-4.1) | 1.17E-21 |
| Sodium | 137.0 (135.0-138.0) | 136.0 (134.0-138.0) | 5.08E-20 |
| Platelet Count | 351.5 (290.0-420.0) | 324.0 (264.0-392.0) | 8.88E-17 |
| Erythrocyte Sedimentation Rate | 54.0 (37.0-73.0) | 57.0 (39.0-76.0) | 2.27E-03 |
| Age-Adjusted Hemoglobin | -0.83 (-1.67-0.0) | -0.89 (-1.8--0.12) | 4.28E-03 |
| Total Protein | 6.6 (6.2-7.0) | 6.6 (6.1-7.0) | 1.42E-01 |
| White Blood Count | 13.72 (10.77-17.19) | 13.82 (10.68-17.7) | 1.66E-01 |
| **Clinical Variables** | | | |
| Rash | 4460 (76.1%) | 1029 (82.9%) | 2.42E-07 |
| Extremity Changes | 3864 (65.9%) | 907 (73.1%) | 1.31E-06 |
| Cervical Lymphadenopathy | 3374 (57.6%) | 806 (64.9%) | 1.92E-06 |
| Pyuria | 2008 (34.3%) | 509 (41.0%) | 7.38E-06 |
| Conjunctival Injection | 5226 (89.2%) | 1067 (86.0%) | 1.49E-03 |
| Oral Changes | 4946 (84.4%) | 1024 (82.5%) | 1.08E-01 |
| **Echocardiogram Findings** | | | |
| Worst Z-Score during hospitalization | 0.29 (-0.28-0.97) | 0.54 (-0.11-1.37) | 1.43E-14 |

*Includes bands

*Supplementary Table S2: Clinical characteristics of the San Diego cohort (n=649) in order of significance of the difference between responsive and resistant KD patients organized by four categories of variables. Values are median (IQR) for continuous variables and number (percentage) for binary variables.*

| | Responsive (n=520) | Resistant (n=129) | P value |
|---|---|---|---|
| **Demographic Variables** | | | |
| Illness Days | 6.0 (4.0-7.0) | 5.0 (4.0-6.0) | 1.52E-03 |
| Height (cm) | 93.0 (81.0-108.0) | 97.0 (85.0-109.1) | 1.86E-01 |
| Age (months) | 2.75 (1.52-4.67) | 2.86 (1.72-4.85) | 2.45E-01 |
| Weight (kg) | 13.7 (10.68-18.02) | 14.01 (11.4-18.9) | 2.88E-01 |
| Sex (male) | 301 (57.9%) | 78 (60.5%) | 6.65E-01 |
| **Laboratory Results** | | | |
| Alanine Aminotransferase | 37.0 (22.0-107.25) | 87.0 (39.0-151.0) | 3.46E-09 |
| Bands (%) | 8.0 (3.0-16.0) | 15.0 (7.0-28.0) | 3.00E-08 |
| Gamma-Glutamyl Transferase | 35.5 (17.0-123.0) | 90.0 (29.0-163.0) | 2.42E-05 |
| Lymphocytes (%) | 21.0 (13.0-32.0) | 16.0 (10.0-24.0) | 2.63E-05 |
| C-Reactive Protein | 6.5 (3.8-14.6) | 8.1 (5.2-18.8) | 1.51E-03 |
| Platelet Count | 359.0 (279.75-453.25) | 324.0 (249.0-420.0) | 3.31E-03 |
| Atypical Lymphocytes (%) | 0.0 (0.0-2.0) | 0.0 (0.0-1.0) | 1.66E-02 |
| Albumin | 3.8 (3.5-4.2) | 3.7 (3.4-4.0) | 3.11E-02 |
| Eosinophils | 2.0 (1.0-4.0) | 2.0 (0.0-4.0) | 8.46E-02 |
| Monocytes (%) | 6.0 (4.0-8.0) | 5.0 (3.0-7.0) | 1.01E-01 |
| Erythrocyte Sedimentation Rate | 59.0 (38.0-75.0) | 53.0 (37.0-66.0) | 1.46E-01 |
| White Blood Count | 13.5 (10.4-16.9) | 12.8 (10.5-16.3) | 3.25E-01 |
| Age-Normalized Hemoglobin | -1.33 (-2.17--0.44) | -1.33 (-2.17-0.0) | 4.93E-01 |
| Neutrophil (%)* | 55.0 (44.0-66.0) | 55.0 (40.0-66.0) | 5.85E-01 |
| **Clinical Variables** | | | |
| Extremity Changes | 407 (78.3%) | 114 (88.4%) | 1.40E-02 |
| Conjunctival Injection | 480 (92.3%) | 126 (97.7%) | 4.59E-02 |
| Oral Changes | 489 (94.0%) | 126 (97.7%) | 1.50E-01 |
| Rash | 480 (92.3%) | 123 (95.3%) | 3.11E-01 |
| Cervical Lymphadenopathy | 179 (34.4%) | 43 (33.3%) | 8.97E-01 |
| **Echocardiographic Findings** | | | |
| Worst initial Z-Score | 1.39 (0.96-1.85) | 1.47 (0.96-2.04) | 2.62E-01 |

*Does not include bands

*Supplementary Table S3: Temporal cross-validation AUC and sensitivity results for the Korean and San Diego cohorts using laboratory findings. Columns represent the years used for the test set. The threshold was set at 93% specificity. AUC: Area under the receiver operator characteristic curve, LR: logistic regression, RF: random forest, GBM: gradient boosting machine, NN: neural network*

| | San Diego | | | | | Korea | | |
|---|---|---|---|---|---|---|---|---|
| **AUC** | **1998-2007** | **2008-2010** | **2011-2013** | **2014-2016** | **2017-2021** | **2015** | **2016** | **2017** |
| LR | 0.649 | 0.72 | 0.725 | 0.638 | 0.662 | 0.715 | 0.709 | 0.682 |
| RF | 0.672 | 0.698 | 0.708 | 0.666 | 0.612 | 0.688 | 0.714 | 0.656 |
| Naïve Bayes | 0.638 | 0.725 | 0.683 | 0.651 | 0.698 | 0.704 | 0.715 | 0.669 |
| GBM | 0.653 | 0.692 | 0.665 | 0.628 | 0.585 | 0.719 | 0.715 | 0.672 |
| NN | 0.663 | 0.742 | 0.734 | 0.666 | 0.668 | 0.729 | 0.723 | 0.696 |
| **Sensitivity** | **1998-2007** | **2008-2010** | **2011-2013** | **2014-2016** | **2017-2021** | **2015** | **2016** | **2017** |
| LR | 0.125 | 0.36 | 0.267 | 0.259 | 0.133 | 0.217 | 0.255 | 0.204 |
| RF | 0.219 | 0.08 | 0.2 | 0.185 | 0.1 | 0.195 | 0.222 | 0.156 |
| Naïve Bayes | 0.031 | 0.28 | 0.333 | 0.222 | 0.1 | 0.152 | 0.227 | 0.166 |
| GBM | 0.062 | 0.04 | 0.067 | 0.148 | 0.033 | 0.217 | 0.214 | 0.19 |
| NN | 0.094 | 0.36 | 0.333 | 0.333 | 0.133 | 0.207 | 0.225 | 0.193 |

*Supplementary Table S4: Median AUC (IQR) from 10-fold stratified cross validation for the Korean and San Diego cohorts using laboratory findings on patients who present with 5 days or less of fever (FEV), with echocardiographic findings (EF), with significant clinical findings (CF), and with echocardiographic and clinical findings (EF+CF). LR: logistic regression, RF: random forest, GBM: gradient boosting machine, NN: neural network*

|  | **FEV** | **EF** | **CF** | **EF+CF** |
|---|---|---|---|---|
| Korea | | | | |
| LR | 0.706 (0.699-0.707) | 0.705 (0.703-0.717) | 0.709 (0.706-0.716) | 0.716 (0.712-0.724) |
| RF | 0.698 (0.689-0.705) | 0.708 (0.693-0.712) | 0.7 (0.689-0.713) | 0.714 (0.709-0.723) |
| Naïve Bayes | 0.696 (0.692-0.699) | 0.705 (0.699-0.712) | 0.706 (0.697-0.714) | 0.709 (0.707-0.717) |
| GBM | 0.707 (0.701-0.718) | 0.712 (0.708-0.719) | 0.707 (0.705-0.723) | 0.72 (0.712-0.726) |
| NN | 0.711 (0.706-0.718) | 0.719 (0.71-0.722) | 0.719 (0.716-0.728) | 0.724 (0.719-0.732) |
| San Diego | | | | |
| LR | 0.645 (0.617-0.698) | 0.697 (0.606-0.724) | 0.702 (0.635-0.731) | 0.704 (0.629-0.729) |
| RF | 0.7 (0.675-0.714) | 0.656 (0.613-0.675) | 0.679 (0.626-0.703) | 0.674 (0.617-0.692) |
| Naïve Bayes | 0.619 (0.601-0.727) | 0.66 (0.591-0.697) | 0.658 (0.634-0.71) | 0.652 (0.623-0.711) |
| GBM | 0.685 (0.621-0.719) | 0.652 (0.58-0.674) | 0.641 (0.599-0.69) | 0.649 (0.585-0.689) |
| NN | 0.676 (0.62-0.702) | 0.703 (0.633-0.725) | 0.713 (0.632-0.722) | 0.727 (0.668-0.75) |