

Supporting Information

Mapping the Flammability Space of Sustainable Refrigerant Mixtures Through an Artificial Neural Network based on Molecular Descriptors

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Number of figures: 4 (Figures S1-S4)

Number of tables: 1 (Table S1)

Number of pages: 9 (S1-S9)

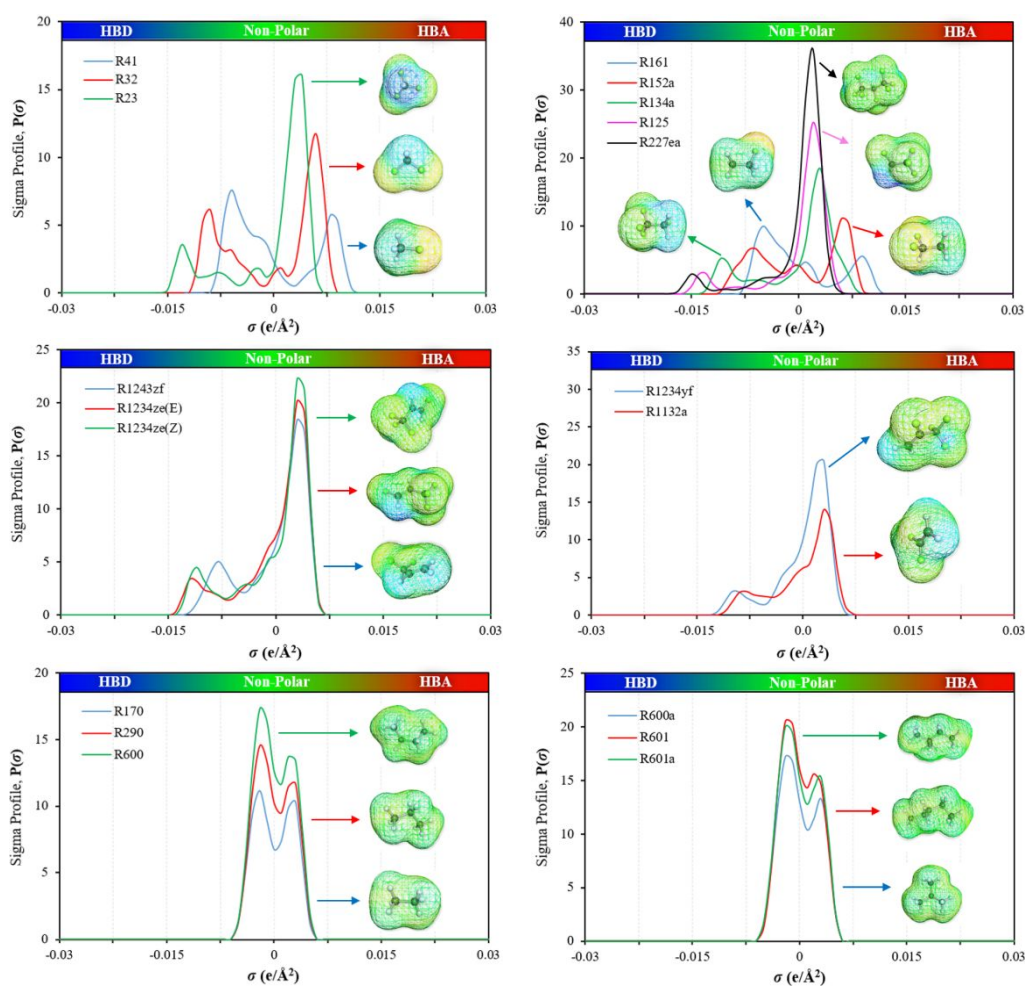
| General Binaries | | | | |
|------------------|-----------|-----------|----------|------------|
| HFC+HFC | HFO+HFO | sHC+sHC | HO+HO | RE170+R744 |
| HFC+HFO | HFO+sHC | sHC+HO | HO+R744 | |
| HFC+sHC | HFO+HO | sHC+R744 | HO+RE170 | |
| HFC+HO | HFO+R744 | sHC+RE170 | | |
| HFC+R744 | HFO+RE170 | | | |
| HFC+RE170 | | | | Total |

| General Binaries | | | | |
|------------------|-----|----|---|------|
| 402 | 144 | 30 | 0 | 0 |
| 611 | 29 | 3 | 0 | |
| 74 | 0 | 0 | 1 | |
| 1 | 91 | 2 | | |
| 111 | 0 | | | |
| 1 | | | | 1500 |

| General Ternaries | | | | | | | | | | |
|-------------------|--------------|--------------|-------------|--------------|--------------|-------------|--------------|-------------|------------|-------|
| HFC+HFC+HFC | HFO+HFO+HFO | | | | | | | | | Total |
| HFC+HFC+HFO | HFC+HFC+sHC | HFC+HFC+HO | HFC+HFO+HFO | HFC+HFO+sHC | HFC+HFO+HO | HFO+HFO+sHC | | | | |
| HFC+sHC+sHC | HFC+sHC+HO | HFO+HFO+HO | HFO+sHC+sHC | HFO+sHC+HO | sHC+sHC+HO | | | | | |
| R744+HFC+HFC | R744+HFC+HFO | R744+HFC+sHC | R744+HFC+HO | R744+HFO+HFO | R744+HFO+sHC | R744+HFO+HO | R744+sHC+sHC | R744+sHC+HO | R744+HO+HO | |
| RE170+HFC+sHC | | | | | | | | | | |

| General Ternaries | | | | | | | | | | |
|-------------------|-----|----|-----|-----|----|----|---|---|---|------|
| 127 | 24 | | | | | | | | | 1607 |
| 374 | 110 | 53 | 221 | 127 | 72 | 21 | | | | |
| 18 | 35 | 7 | 9 | 13 | 1 | | | | | |
| 88 | 146 | 52 | 22 | 36 | 29 | 14 | 0 | 7 | 0 | |
| 1 | | | | | | | | | | |

Figure S1. Database array for binary and ternary blends used in the developed ANN model.



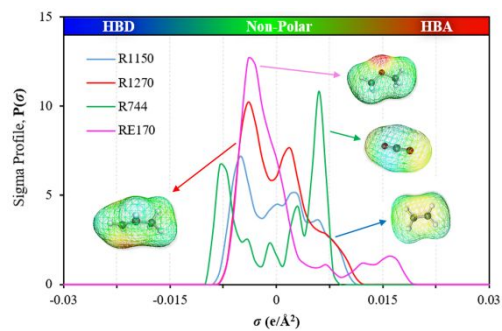


Figure S2. σ -profiles of the 23 single-component refrigerants used in this work.

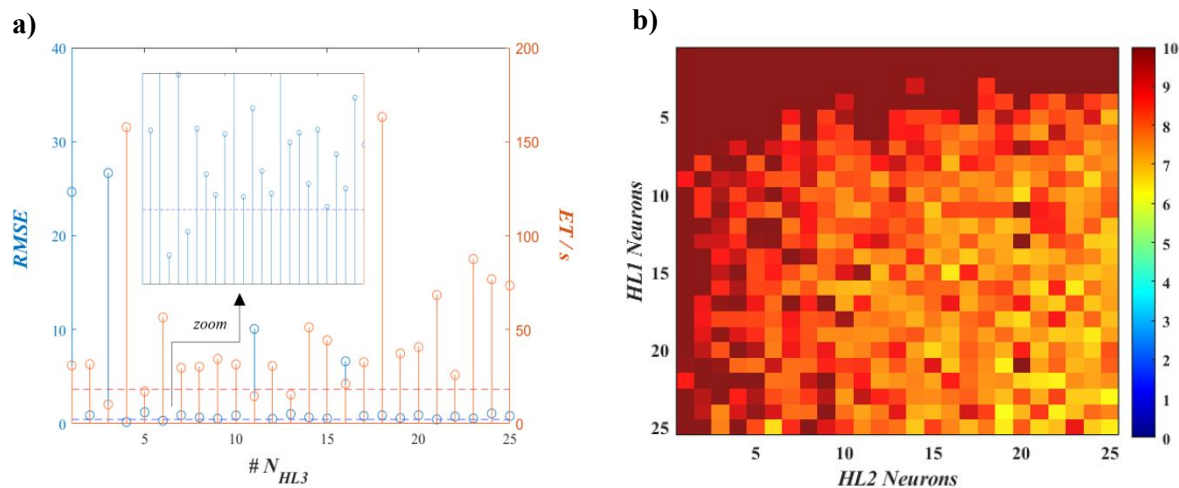
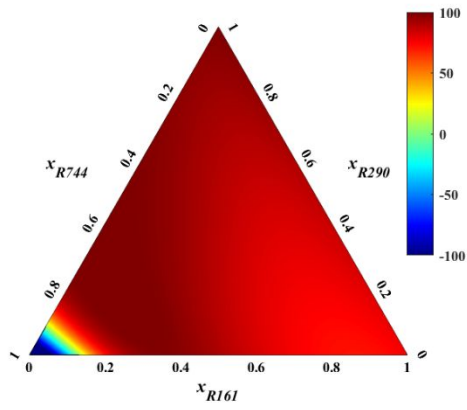
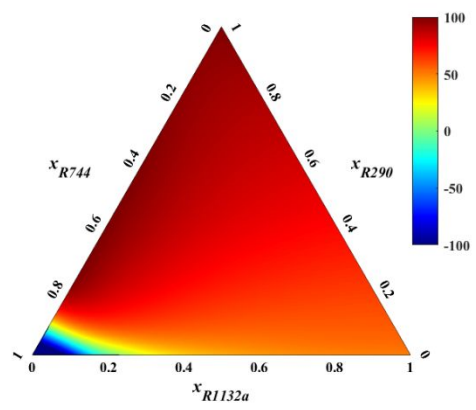


Figure S3. **a)** RMSE and elapsed time per epoch for $[61 (I) \times 14 (HL1) \times 24 (HL2) \times X (HL3) \times 1 (O)]$ ANN architecture as a function of number of neurons in third hidden layer (HL3), and **b)** Mapping of the RMSE variation in relation to the number of neurons in hidden layers 1 and 2 when using 8 input molecular descriptors.

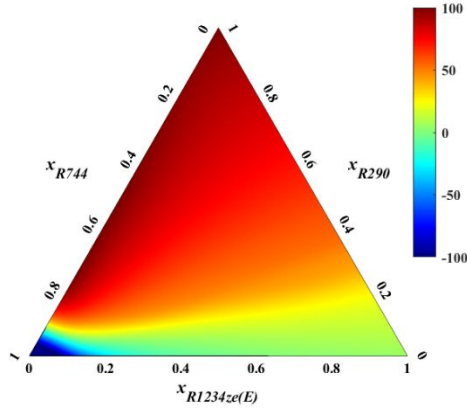
a)



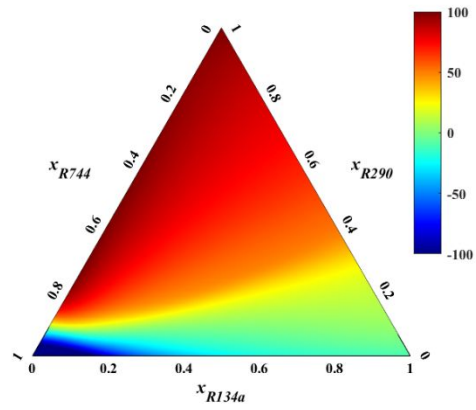
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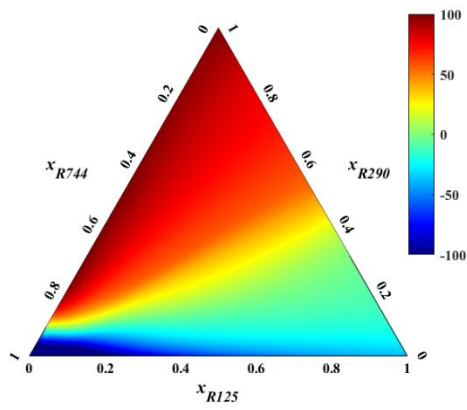
c)



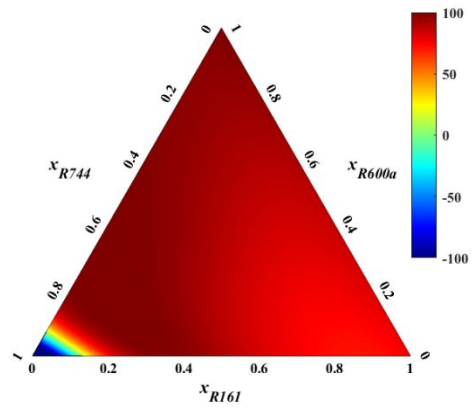
d)



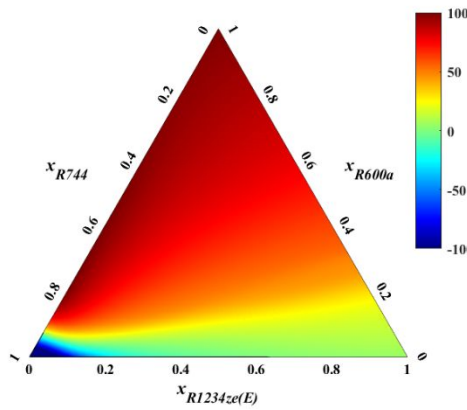
e)



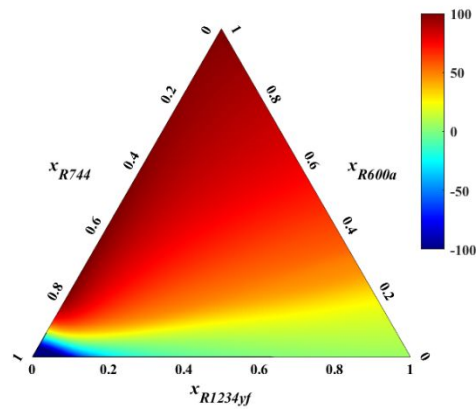
f)



g)



h)



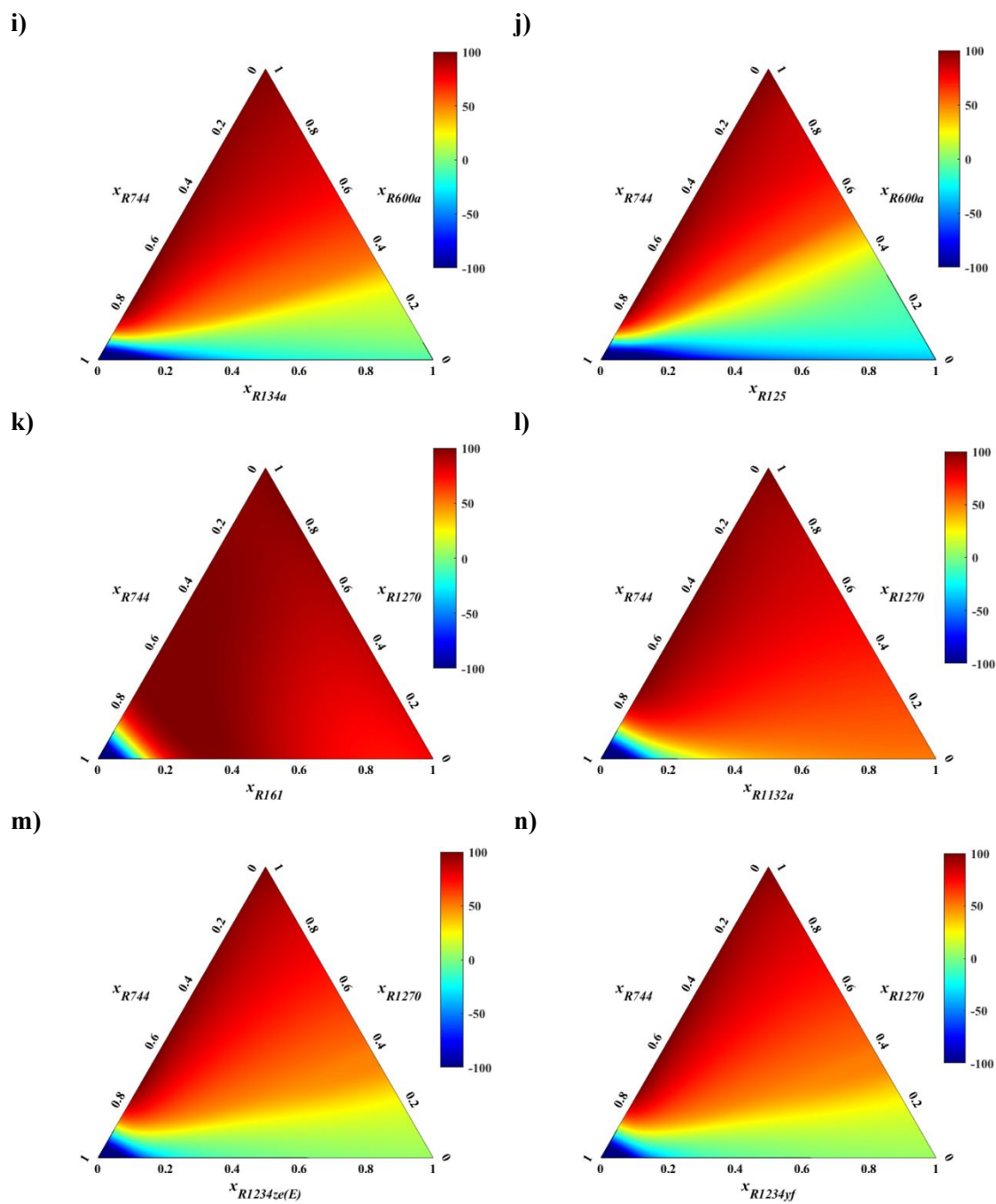


Figure S4. Ternary contour plots generated by multitask ANN, depicting predictions of NFI for various CO_2 blends, including **a)** R290 + R161, **b)** R290 + R1132a, **c)** R290 + R1234ze(E), **d)** R290 + R134a, **e)** R290 + R125, **f)** R600a + R161, **g)** R600a + R1234ze(E), **h)** R600a + R1234yf, **i)** R600a + R134a, **j)** R600a + R125, **k)** R1270 + R161, **l)** R1270 + R1132a, **m)** R1270 + R1234ze(E), and **n)** R1270 + R1234yf.

Table S1. Developed ANN's weights and biases in addition to the output function enabling external predictions.

| <i>Hidden Layer 1</i> | | | | | | | | | | | | | | |
|-----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | H₁ | H₂ | H₃ | H₄ | H₅ | H₆ | H₇ | H₈ | H₉ | H₁₀ | H₁₁ | H₁₂ | H₁₃ | H₁₄ |
| S₁ | | | | | | | | | | | | | | |
| S₂ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S₃ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S₄ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S₅ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S₆ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S₇ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S₈ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S₉ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S₁₀ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S₁₁ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S₁₂ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S₁₃ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S₁₄ | 0.8458 | -2.8818 | -1.0014 | 1.0280 | 0.0565 | -2.4029 | -1.8018 | 2.8284 | -1.3958 | -2.6598 | -1.2253 | 1.5103 | -2.4375 | -0.4681 |
| S₁₅ | -0.2075 | 0.5565 | -0.4336 | -0.3225 | 0.8986 | -1.4568 | 0.0141 | -0.5083 | -0.6832 | -0.9620 | 0.0730 | -0.5960 | -0.7045 | -0.3797 |
| S₁₆ | -0.0420 | -0.9716 | 0.1980 | 0.2326 | 0.4817 | -0.5778 | 0.1160 | -0.1190 | -0.2024 | -0.8362 | -0.4973 | 0.3534 | -0.0101 | -0.2451 |
| S₁₇ | -0.1242 | -0.6831 | -0.3918 | 0.0612 | 0.4498 | 0.9127 | 0.3810 | 0.1004 | -0.1382 | 0.0039 | -0.2620 | 0.4858 | 0.0129 | 0.3271 |
| S₁₈ | -0.2648 | 0.7208 | 0.0489 | -0.4739 | 0.3182 | -0.9774 | -0.4748 | 0.6585 | -0.0579 | 0.1070 | 0.3020 | 0.0031 | -0.2046 | -0.0182 |
| S₁₉ | 0.5436 | -0.2822 | 0.1789 | 0.0545 | -0.3789 | 0.3121 | 0.2268 | -0.1822 | -0.0223 | -1.0864 | 0.2265 | -0.1448 | -0.6931 | -0.1322 |
| S₂₀ | -0.0544 | -0.1080 | -0.2226 | 0.1345 | -0.2125 | 0.8676 | 0.1626 | -0.4861 | 0.3767 | 0.2059 | -0.4288 | 0.0671 | 0.2071 | 0.0781 |
| S₂₁ | -0.1340 | 0.1226 | -0.0720 | -0.1219 | 0.1343 | -0.6544 | -0.3892 | -0.1006 | 0.3139 | 0.4365 | -0.2181 | -0.0986 | 0.5160 | 0.0535 |
| S₂₂ | 0.3013 | -0.0026 | 0.3618 | 0.1885 | -0.4095 | 0.7669 | 0.2337 | 0.0294 | -0.8519 | -0.8500 | 0.9069 | 0.0183 | -0.5814 | 0.0328 |
| S₂₃ | 0.0989 | -0.7800 | 0.3459 | 0.1297 | -0.4147 | 0.8101 | -0.1587 | -0.3154 | -0.0937 | 0.6298 | -1.1329 | 0.5140 | 0.0257 | 0.2170 |
| S₂₄ | 0.0783 | 0.3142 | -0.4355 | -0.0218 | -0.0870 | -0.6036 | -0.0510 | -0.1005 | 0.7059 | 0.6007 | 0.2707 | -0.4815 | 0.0817 | -0.2435 |
| S₂₅ | -0.3056 | 1.3469 | -0.0593 | -0.0752 | 0.0691 | -0.4876 | -0.3930 | 0.2413 | -0.6005 | 0.5594 | 1.0563 | -0.3262 | 0.2841 | 0.0201 |
| S₂₆ | -0.6668 | -0.5203 | 0.1390 | 0.1239 | 0.0474 | 0.4045 | 0.0559 | 0.1043 | -0.6262 | 1.6126 | -0.4221 | 0.4299 | 0.3607 | -0.0431 |
| S₂₇ | 0.3305 | -0.0070 | -0.1061 | 0.2185 | 0.0385 | 0.3718 | 0.0391 | -0.0966 | 0.1564 | -1.2582 | 0.5244 | -0.0936 | -0.0046 | 0.1240 |
| S₂₈ | -0.1911 | 0.2889 | -0.1037 | 0.0308 | -0.3479 | -0.7942 | -0.3377 | 0.2884 | -0.0728 | 0.5285 | -0.5527 | -0.1052 | 0.3868 | -0.0964 |
| S₂₉ | -0.7246 | -0.3970 | -0.3013 | 0.1151 | -0.5175 | -0.3552 | 0.4574 | 0.1324 | -0.5002 | 2.5340 | 0.2442 | 0.0971 | 0.3455 | -0.5602 |
| S₃₀ | -0.0133 | 0.4186 | 0.5083 | 0.2190 | 0.3684 | 1.0784 | -0.5578 | -0.2062 | -0.6011 | -1.1690 | 0.4780 | 0.2896 | 0.0142 | 0.8000 |
| S₃₁ | 0.3900 | -0.2749 | 0.0112 | -0.4003 | 0.2787 | -0.1079 | 0.0516 | 0.0322 | 0.8641 | -0.8075 | -0.8632 | -0.1145 | 0.0146 | -0.0451 |
| S₃₂ | 0.3012 | 0.1685 | -0.3948 | 0.0012 | -0.2608 | -0.3707 | 0.3654 | -0.5010 | 0.3648 | 0.0772 | 0.2757 | -0.2886 | -0.0134 | -0.5134 |

| | | | | | | | | | | | | | | |
|----------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| S ₃₃ | -0.3695 | 0.2555 | 0.3861 | 0.3996 | 0.1019 | 0.7585 | -0.3733 | -0.1764 | -0.4813 | -0.0184 | 0.2333 | 0.1530 | 0.2254 | 0.6138 |
| S ₃₄ | 0.1128 | -0.5109 | -0.0800 | -0.5002 | 0.3694 | -0.6640 | 0.3490 | 0.5210 | 0.2498 | -0.2953 | -0.1726 | 0.0795 | -0.3850 | -0.2771 |
| S ₃₅ | 0.1812 | 0.7339 | -0.1567 | 0.1618 | -0.2162 | -0.2073 | -0.1199 | -0.3285 | -0.1126 | -0.0944 | 0.4139 | -0.1916 | 0.1889 | -0.1669 |
| S ₃₆ | -0.4721 | -0.6985 | 0.2856 | 0.2656 | 0.1084 | 0.5206 | -0.0305 | -0.2051 | 0.1354 | 0.7381 | -0.5957 | 0.1159 | 0.5055 | 0.3921 |
| S ₃₇ | 0.2246 | 0.4807 | -0.3618 | -0.5902 | 0.2549 | -0.6401 | 0.1568 | 0.5597 | -0.1226 | -0.9058 | 0.8417 | 0.0656 | -0.3964 | -0.0706 |
| S ₃₈ | 0.0929 | 0.0432 | 0.1408 | 0.2417 | -0.0592 | -0.1697 | -0.0024 | -0.3407 | -0.0637 | 0.2076 | -0.4002 | -0.0228 | -0.0229 | -0.2159 |
| S ₃₉ | 0.2257 | -1.1726 | 0.4945 | 0.2524 | -0.0465 | 0.8416 | 0.2879 | -0.5317 | 0.9494 | 0.2598 | -0.8329 | -0.0505 | 0.0145 | 0.2459 |
| S ₄₀ | 0.6905 | 0.2610 | -0.1590 | -0.2942 | -0.0081 | 0.2651 | 0.2368 | 0.0789 | 0.1985 | -1.6810 | 0.8810 | 0.0659 | -0.5303 | 0.1440 |
| S ₄₁ | 0.4459 | -0.3950 | 0.3738 | -0.1648 | 0.3883 | -0.9344 | -0.1096 | -0.0361 | -0.9516 | -0.6250 | -1.0354 | 0.7487 | -0.4512 | 0.0779 |
| S ₄₂ | 0.2501 | 0.1639 | 0.6585 | -0.4493 | -0.0411 | -1.0826 | -0.8020 | 0.3601 | -0.7561 | -0.5254 | -1.1717 | -0.1687 | -0.3834 | -0.3302 |
| S ₄₃ | -0.7899 | 0.6348 | 0.1914 | 0.6987 | -0.5303 | -0.4871 | 0.3696 | 0.0225 | 0.3617 | -0.2846 | 0.1156 | 0.3481 | -0.3268 | -0.6428 |
| S ₄₄ | 0.6794 | -0.7828 | -0.0959 | -0.1586 | 0.7576 | -0.4573 | 0.1760 | -0.6900 | -0.0469 | -0.7902 | -0.5326 | -0.7873 | 0.4142 | -0.0299 |
| S ₄₅ | 0.2992 | 0.4066 | 0.2741 | -0.6989 | -0.6230 | -0.1659 | 0.5104 | 0.1735 | -0.0891 | 0.4978 | 0.0956 | 0.2860 | -0.3166 | 0.3128 |
| S ₄₆ | -0.4264 | -0.0579 | 0.2603 | 0.4627 | 0.6417 | 0.1776 | -0.2646 | 0.4489 | 0.5059 | 0.2361 | 0.3559 | 0.5683 | -0.1049 | -0.2904 |
| S ₄₇ | 0.0468 | -0.0539 | -0.7060 | 0.2142 | -0.0446 | -0.5711 | 0.3175 | -0.1118 | -0.4560 | 0.0912 | -0.2672 | -0.4591 | -0.1369 | -0.3181 |
| S ₄₈ | -0.6722 | -0.2767 | 0.5550 | -0.0732 | 0.6714 | -0.7642 | -0.0076 | 0.5971 | 0.1949 | -0.1274 | 0.2126 | 0.4536 | -0.3957 | -0.2523 |
| S ₄₉ | -0.9666 | 0.2498 | -0.0633 | 0.7506 | 0.1629 | 0.3114 | 1.2805 | 0.0397 | -0.3651 | -0.0011 | 0.2802 | 0.5257 | 0.5121 | 0.7068 |
| S ₅₀ | 0.2117 | 4.8667 | -6.7478 | 5.8320 | -4.7707 | -0.8295 | 6.7468 | 5.7124 | 8.0412 | 0.2563 | 5.8112 | 5.9861 | 1.3188 | -7.6719 |
| S ₅₁ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S ₅₂ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S ₅₃ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S ₅₄ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S ₅₅ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S ₅₆ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S ₅₇ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S ₅₈ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S ₅₉ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S ₆₀ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| S ₆₁ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| b₁ | 0.1353 | -2.2195 | -0.1200 | -3.2270 | 1.4274 | 1.6435 | 0.5930 | -0.5451 | 2.4942 | -2.4254 | -3.1677 | -0.7024 | -0.9291 | -0.0244 |

| <i>Hidden Layer 2</i> | | | | | | | | | | | | |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|------------------------|------------------------|
| | HH₁ | HH₂ | HH₃ | HH₄ | HH₅ | HH₆ | HH₇ | HH₈ | HH₉ | HH₁₀ | HH₁₁ | HH₁₂ |
| H₁ | -0.9736 | -0.9666 | -0.2496 | -1.0789 | -1.7361 | 0.8504 | 0.1465 | -0.0989 | 0.4060 | 0.6723 | -0.0490 | 0.5446 |
| H₂ | -0.1403 | -0.1408 | -0.5551 | -0.3780 | 0.5694 | -0.1034 | -0.2616 | 0.5531 | 1.2341 | -0.1411 | 0.1482 | 1.0281 |
| H₃ | 0.9141 | -0.5179 | 0.5083 | 0.3097 | 1.1655 | -0.1528 | -1.0784 | 0.0616 | -0.8161 | -0.7366 | 1.1396 | -0.4722 |
| H₄ | -0.0151 | 0.8341 | 0.1691 | -0.1395 | -0.6732 | -1.1298 | -0.0353 | -0.4870 | -0.0799 | -0.7731 | 0.0268 | -0.0450 |
| H₅ | -0.4041 | -0.3617 | -1.2703 | -0.7659 | -1.3013 | -0.1552 | 0.0511 | 0.0172 | 1.1414 | 0.6586 | -0.7818 | 1.6466 |
| H₆ | -1.5985 | 0.8163 | 0.0733 | -0.9836 | 0.1540 | -0.0187 | 0.3907 | -1.3976 | -0.8624 | -0.8776 | -0.6272 | -0.4068 |
| H₇ | -0.3881 | 0.6095 | 0.0643 | -0.3551 | 0.6241 | 0.4422 | 0.0965 | 0.0174 | -0.4386 | -0.3572 | 0.2783 | 0.0528 |
| H₈ | -0.4478 | -1.3546 | 0.3756 | -0.3951 | -0.5737 | -0.4195 | 0.1443 | -0.2789 | -0.5951 | -0.3784 | -0.9224 | -0.9357 |
| H₉ | 0.0216 | -0.3010 | -0.1021 | -1.6722 | -1.3522 | 0.2581 | -0.5431 | 0.2483 | 0.4768 | -0.3070 | 0.0820 | 0.5090 |
| H₁₀ | 1.0890 | -0.2895 | 0.4189 | 0.7706 | -0.8508 | 0.1307 | -0.1802 | 0.3936 | 0.2069 | 0.3856 | 0.5033 | -0.0787 |
| H₁₁ | -0.3058 | 0.0690 | 0.2709 | 0.5627 | -1.0444 | -0.7898 | -0.6406 | -1.1523 | 0.0305 | 0.4805 | 0.3936 | -1.7033 |
| H₁₂ | -0.0054 | 0.0633 | -0.6880 | 1.9224 | -0.1050 | -1.0584 | 0.1281 | -0.4816 | 0.6330 | 1.2022 | -0.1686 | 1.1883 |
| H₁₃ | 1.1005 | -0.8841 | -0.0160 | 0.5523 | 1.0234 | 0.5340 | -0.7862 | 0.0010 | 0.9427 | -0.1897 | -0.8109 | 2.0533 |
| H₁₄ | 0.4210 | -0.7273 | -0.5702 | 0.5410 | 0.9315 | -0.6775 | -0.0949 | 1.2565 | -0.9530 | -0.2399 | -0.5506 | -0.6708 |
| b₂ | 1.4354 | 1.2921 | 1.3947 | 1.1705 | 1.4242 | -0.1033 | 1.2042 | -0.1800 | 1.3800 | 0.2428 | 0.6424 | 0.2635 |

| <i>Hidden Layer 2 (continuation)</i> | | | | | | | | | | | | |
|--------------------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| | HH₁₃ | HH₁₄ | HH₁₅ | HH₁₆ | HH₁₇ | HH₁₈ | HH₁₉ | HH₂₀ | HH₂₁ | HH₂₂ | HH₂₃ | HH₂₄ |
| H₁ | 0.1277 | 0.3547 | -0.5744 | -0.1646 | -0.6186 | -0.2490 | 1.2647 | -0.1917 | -0.2853 | -0.0538 | 0.5955 | 1.0445 |
| H₂ | 0.9935 | 0.4954 | -0.1891 | 0.3422 | -1.5464 | -1.4037 | 0.5618 | 0.4680 | 0.3774 | -0.0625 | 0.6502 | 0.7284 |
| H₃ | -0.3273 | 0.4333 | 1.0209 | -1.0051 | -0.0063 | 0.5486 | -1.0028 | 0.5176 | 1.5267 | 0.1244 | 1.0048 | 1.6874 |
| H₄ | -1.7088 | -0.7940 | 0.1285 | -0.0501 | 0.6612 | -0.7574 | 0.0097 | 0.0305 | 0.5573 | -0.1345 | 0.1096 | -0.5886 |
| H₅ | -0.5840 | 0.1511 | 0.2030 | -0.0389 | -1.4057 | 0.2793 | 0.5602 | 0.3263 | -0.3398 | 0.0903 | -0.7871 | 1.0246 |
| H₆ | -0.4323 | 0.0185 | -0.3368 | 0.3474 | 2.6329 | 1.9890 | 0.9805 | 0.3673 | 0.7953 | 0.9229 | 0.8087 | -0.6728 |
| H₇ | 0.1431 | 0.9938 | 0.4666 | -0.2076 | 1.1721 | 0.1023 | -0.6531 | 0.4515 | 0.2532 | 0.1245 | 0.1330 | -0.8273 |
| H₈ | 1.5987 | -0.4215 | -1.5950 | 0.0558 | 0.5198 | 0.1864 | -1.6606 | -0.3550 | -0.4185 | 0.9727 | 0.0257 | 0.1225 |
| H₉ | -0.0561 | 0.8727 | -0.5854 | -0.7616 | -0.1307 | 1.3431 | 1.0849 | 0.3158 | 0.3652 | 0.1168 | -1.2679 | -0.5087 |
| H₁₀ | -0.1359 | -0.4421 | 1.9128 | -0.2665 | 2.8886 | 0.9070 | -0.0831 | -0.6031 | -0.2184 | -1.5533 | -0.3674 | -0.1274 |
| H₁₁ | 1.8617 | -1.5216 | -0.6076 | -0.4293 | -0.4676 | -0.0239 | 0.6304 | 0.3375 | -0.4912 | -0.0163 | 0.1674 | -0.9631 |
| H₁₂ | 0.0334 | 0.0001 | -0.4204 | 0.2932 | 0.7984 | 1.0063 | 0.4212 | 1.0249 | 0.7497 | 0.7885 | 0.2674 | -0.8087 |
| H₁₃ | -0.1975 | -1.1089 | -0.0487 | 1.1674 | -0.5084 | 0.0914 | -1.5168 | -0.0703 | 0.1331 | 0.6427 | -0.7398 | 0.2498 |
| H₁₄ | -0.2919 | 1.3184 | -1.1254 | 1.6070 | 1.0834 | -0.9243 | -1.2359 | -0.0689 | -0.2937 | 0.7242 | 0.6219 | 0.0282 |
| b₂ | 0.4595 | 1.6282 | -0.0898 | -0.8157 | 0.0004 | -1.7517 | 0.6497 | -0.5375 | -1.0831 | -2.0170 | 1.4198 | 2.5383 |

Output Layer

$$\begin{aligned} NFI_{predicted} = & 0.248097(HH_1) - 0.319464(HH_2) + 0.162838(HH_3) + 0.008849(HH_4) + 1.808459(HH_5) + 0.085165(HH_6) + 0.205977(HH_7) \\ & + 0.264793(HH_8) - 0.620327(HH_9) - 0.029470(HH_{10}) - 0.221097(HH_{11}) + 0.488371(HH_{12}) - 0.178911(HH_{13}) - 0.272909(HH_{14}) \\ & + 0.123859(HH_{15}) - 0.151293(HH_{16}) + 0.029668(HH_{17}) + 0.055991(HH_{18}) - 0.209633(HH_{19}) + 0.237560(HH_{20}) + 0.126407(HH_{21}) + 0.166035(HH_{22}) + 0.1 \\ & - 0.433878 \end{aligned}$$
