**Real-time forecasting of key coking coal quality parameters using neural networks and artificial intelligence**

**Artur Dyczko**

*Mineral and Energy Economy Research Institute, Polish Academy of Sciences, J. Wybickiego str. 7A, Krakow, PL-31261, Poland,* [*http://orcid.org/0000-0001-6387-5339*](http://orcid.org/0000-0002-1439-1183%20)

**Appendix A. The definition of the input parameters used in the CRI calculation formula.**

N11 = -4.82814 - N442\*0.586002 + N442^2\*0.00229696 + N25\*1.90313 - N25^2\*0.00646533

N25 = 0.70119 + N109^2\*0.00573612 + N118\*0.933795 - N118^2\*0.00467489

N118 = 18.0567 + N853\*N199\*0.03523 - N853^2\*0.016591 - N199^2\*0.00496029

N199 = -4.35821 + N291\*N334\*0.0541739 - N291^2\*0.0210014 + N334\*1.22858 - N334^2\*0.0351035

N334 = 2.55837 + N423\*0.27507 + N423\*N520\*0.0218318 - N423^2\*0.00655897 + N520\*0.47706 - N520^2\*0.0106248

N520 = 4.27049 + N682\*0.408535 - N682\*N759\*0.0265209 + N682^2\*0.0159672 + N759^2\*0.0208846

N759 = -21.9067 + I\*1.03323 - I^2\*0.00251586 + CL\*434.845 - CL^2\*1109.78

N682 = 121.005 - AA\*5.96134 + AA\*S\*6.80517 - S\*162.928 + S^2\*57.7389

N423 = 24.8246 + N636\*N745\*0.0181695 - N745\*0.771694 + N745^2\*0.00929075

N745 = 395.845 - DA\*261.034 + DA\*PA\*1647.52 - PA\*2446.58 + PA^2\*527.823

N636 = -53.8942 - B\*VF\*0.0259398 + B^2\*0.00191463 + VF\*5.34765

N291 = -53.6708 + N871\*2.52973 - N871\*N442\*0.0412606 - N871^2\*0.0228717 + N442\*1.8825 + N442^2\*0.0128618

N871 = 83.2588 - VF^2\*0.0873018

N853 = 189.562 + RO\*A\*6.15898 - RO^2\*32.9834 - A\*13.6552 + A^2\*0.0821562

N109 = -6.85425 - N430\*1.88987 + N430^2\*0.0132365 + N160\*3.29425 - N160^2\*0.0180162

N160 = 2.62104 + N571\*N250\*0.01371 - N571^2\*0.00297179 + N250\*0.744883 - N250^2\*0.00600914

N250 = 63.5255 + VF\*N430\*0.179894 - VF^2\*0.0873916 - N430\*4.29966 + N430^2\*0.0191806

N571 = 1.77455 - N707\*N807\*0.00823317 + N707^2\*0.0138821 + N807\*0.524815 + N807^2\*0.0040645

N807 = 8.0483 + RO\*CL\*1447.16 - CL\*1387.74 - CL^2\*1288.68

N707 = 113.693 - VT\*0.363279 - S\*142.936 + S^2\*76.6012

N430 = -40.9536 + N645\*N809\*0.0228738 + N809\*2.70479 - N809^2\*0.0377656

N809 = 65.0789 - AA\*12.1431 + AA^2\*0.658324 + CL\*278.596 - CL^2\*677.045

N442 = -35.4345 - N645\*0.55255 + N645\*N850\*0.0256891 + N645^2\*0.00601594 + N850\*2.84216 - N850^2\*0.0404353

N850 = 3932.72 - QIA\*0.247212 + QIA^2\*3.89373e-06 + CL\*302.687 - CL^2\*695.103

N645 = 58.9886 - B\*0.285371 + B\*PA\*1.23439 + B^2\*0.000505332 - PA\*225.912 + PA^2\*119.925

N370 = 16.4767 + N434\*N508\*0.0133538

N508 = -47.4196 + N736\*N812\*0.02343 + N812\*2.98364 - N812^2\*0.0409352

N812 = 64.5508 + CL\*277.566 - CL^2\*674.076 - AD\*11.8632 + AD^2\*0.635298

N736 = 5.92242 + I\*1.76665 - I\*PA\*6.39127 - I^2\*0.0150643 + PA^2\*329.979

N434 = 24.4575 + N617\*N750\*0.0345807 - N617^2\*0.00904489 - N750\*0.654778

N750 = 19.6176 - PA\*333.228 + PA^2\*788.125 + CL\*479.815 - CL^2\*1262.39

N617 = 91.3375 - B\*0.298106 + B^2\*0.00110104 - S\*109.573 + S^2\*58.8124