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| #################EXPERT OPINION AND VIF ############################  ###eXPERT OPİNİON AND vıf COVARİATE analysis  ###################RF-----Fe---------------#################  # Internal validation  > goof(observed = RF\_Micro\_Scenario\_models\_dataset$Fe[Training\_RF\_Micro\_scenario], predicted = KhavrRF\_Micro\_Fe\_expert\_Internal , plot.it = TRUE)  R2 concordance MSE RMSE bias  1 0.7739052 0.8119273 0.09507308 0.3083392 0.00546295  > # externalvalidation  > goof(observed = RF\_Micro\_Scenario\_models\_dataset$Fe[-Training\_RF\_Micro\_scenario], predicted = KhavrRF\_Micro\_Fe\_expert\_\_External, plot.it = TRUE)  R2 concordance MSE RMSE bias  1 0.1276612 0.2028042 0.4239036 0.6510788 -0.1819331  > #training  > nrmse(KhavrRF\_Micro\_Fe\_expert\_Internal, RF\_Micro\_Scenario\_models\_dataset$Fe[Training\_RF\_Micro\_scenario])  [1] 47  > MAPE(KhavrRF\_Micro\_Fe\_expert\_Internal, RF\_Micro\_Scenario\_models\_dataset$Fe[Training\_RF\_Micro\_scenario])  [1] 0.1172916  > ##testing  > nrmse(KhavrRF\_Micro\_Fe\_expert\_\_External, RF\_Micro\_Scenario\_models\_dataset$Fe[-Training\_RF\_Micro\_scenario])  [1] 91.1  > MAPE(KhavrRF\_Micro\_Fe\_expert\_\_External, RF\_Micro\_Scenario\_models\_dataset$Fe[-Training\_RF\_Micro\_scenario])  [1] 0.1985986 |
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| #################EXPERT OPINION AND VIF ############################  ###eXPERT OPİNİON AND vıf COVARİATE analysis  ###################RF-----Cu---------------#################  # Internal validation  > goof(observed = RF\_Micro\_Scenario\_models\_dataset$Cu[Training\_RF\_Micro\_scenario], predicted = KhavrRF\_Micro\_Cu\_expert\_Internal , plot.it = TRUE)  R2 concordance MSE RMSE bias  1 0.8474633 0.8781477 0.01229867 0.1108994 3.997163e-05  > # externalvalidation  > KhavrRF\_Micro\_Cu\_expert\_External <- predict(KhavrRF\_Micro\_Cu\_expert, newdata = RF\_Micro\_Scenario\_models\_dataset[-Training\_RF\_Micro\_scenario, ])  > goof(observed = RF\_Micro\_Scenario\_models\_dataset$Cu[-Training\_RF\_Micro\_scenario], predicted = KhavrRF\_Micro\_Cu\_expert\_External, plot.it = TRUE)  R2 concordance MSE RMSE bias  1 -0.2192527 0.1110213 0.09857755 0.3139706 0.0916581  > #training  > nrmse(KhavrRF\_Micro\_Cu\_expert\_Internal, RF\_Micro\_Scenario\_models\_dataset$Cu[Training\_RF\_Micro\_scenario])  [1] 38.6  > MAPE(KhavrRF\_Micro\_Cu\_expert\_Internal, RF\_Micro\_Scenario\_models\_dataset$Cu[Training\_RF\_Micro\_scenario])  [1] 0.07800009  > ##testing  > nrmse(KhavrRF\_Micro\_Cu\_expert\_External, RF\_Micro\_Scenario\_models\_dataset$Cu[-Training\_RF\_Micro\_scenario])  [1] 107.8  > MAPE(KhavrRF\_Micro\_Cu\_expert\_External, RF\_Micro\_Scenario\_models\_dataset$Cu[-Training\_RF\_Micro\_scenario])  [1] 0.2615985 |
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#################EXPERT OPINION AND VIF ############################

###eXPERT OPİNİON AND vıf COVARİATE analysis

###################RF-----Mn---------------#################

> # Internal validation

> goof(observed = RF\_Micro\_Scenario\_models\_dataset$Mn[Training\_RF\_Micro\_scenario], predicted = KhavrRF\_Micro\_Mn\_expert\_Internal , plot.it = TRUE)

R2 concordance MSE RMSE bias

1 0.7407217 0.7840779 4.471764 2.114655 0.064846

> # externalvalidation

> goof(observed = RF\_Micro\_Scenario\_models\_dataset$Mn[-Training\_RF\_Micro\_scenario], predicted = KhavrRF\_Micro\_Mn\_expert\_External, plot.it = TRUE)

R2 concordance MSE RMSE bias

1 0.06876799 0.1413892 12.95164 3.598839 0.07296539

> #training

> nrmse(KhavrRF\_Micro\_Mn\_expert\_Internal, RF\_Micro\_Scenario\_models\_dataset$Mn[Training\_RF\_Micro\_scenario])

[1] 50.4

> MAPE(KhavrRF\_Micro\_Mn\_expert\_Internal, RF\_Micro\_Scenario\_models\_dataset$Mn[Training\_RF\_Micro\_scenario])

[1] 0.2364894

> ##testing

> nrmse(KhavrRF\_Micro\_Mn\_expert\_External, RF\_Micro\_Scenario\_models\_dataset$Mn[-Training\_RF\_Micro\_scenario])

[1] 94.2

> MAPE(KhavrRF\_Micro\_Mn\_expert\_External, RF\_Micro\_Scenario\_models\_dataset$Mn[-Training\_RF\_Micro\_scenario])

[1] 0.499234

#################EXPERT OPINION AND VIF ############################

###eXPERT OPİNİON AND vıf COVARİATE analysis

###################RF----**-Zn**---------------#################

# Internal validation

> goof(observed = RF\_Micro\_Scenario\_models\_dataset$Zn[Training\_RF\_Micro\_scenario], predicted = KhavrRF\_Micro\_Zn\_expert\_Internal , plot.it = TRUE)

R2 concordance MSE RMSE bias

1 0.7920537 0.8312719 2.64374 1.625958 0.05683034

> # externalvalidation

> goof(observed = RF\_Micro\_Scenario\_models\_dataset$Zn[-Training\_RF\_Micro\_scenario], predicted = KhavrRF\_Micro\_Zn\_expert\_External, plot.it = TRUE)

R2 concordance MSE RMSE bias

1 0.1322997 0.1877477 14.80987 3.84836 -0.5722101

> #training

> nrmse(KhavrRF\_Micro\_Zn\_expert\_Internal, RF\_Micro\_Scenario\_models\_dataset$Zn[Training\_RF\_Micro\_scenario])

[1] 45.1

> MAPE(KhavrRF\_Micro\_Zn\_expert\_Internal, RF\_Micro\_Scenario\_models\_dataset$Zn[Training\_RF\_Micro\_scenario])

[1] 1.184954

> ##testing

> nrmse(KhavrRF\_Micro\_Zn\_expert\_External, RF\_Micro\_Scenario\_models\_dataset$Zn[-Training\_RF\_Micro\_scenario])

[1] 90.9

> MAPE(KhavrRF\_Micro\_Zn\_expert\_External, RF\_Micro\_Scenario\_models\_dataset$Zn[-Training\_RF\_Micro\_scenario])

[1] 2.100977

#################EXPERT OPINION AND VIF ############################

###eXPERT OPİNİON AND vıf COVARİATE analysis

**###################SVR**-----Fe---------------#################

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| goof(observed = RF\_Micro\_Scenario\_models\_dataset$Fe[Training\_RF\_Micro\_scenario], predicted = KhavrSVR\_Micro\_Fe\_expert\_Internal , plot.it = TRUE)  R2 concordance MSE RMSE bias  1 0.9899572 0.9734082 0.004223003 0.06498464 0.002209801  > # externalvalidation  > goof(observed = RF\_Micro\_Scenario\_models\_dataset$Fe[-Training\_RF\_Micro\_scenario], predicted = KhavrSVR\_Micro\_Fe\_expert\_External, plot.it = TRUE)  R2 concordance MSE RMSE bias  1 -0.01159037 0.102857 0.4915714 0.7011216 -0.2348101  > #training  > nrmse(KhavrSVR\_Micro\_Fe\_expert\_Internal, RF\_Micro\_Scenario\_models\_dataset$Fe[Training\_RF\_Micro\_scenario])  [1] 9.9  > MAPE(KhavrSVR\_Micro\_Fe\_expert\_Internal, RF\_Micro\_Scenario\_models\_dataset$Fe[Training\_RF\_Micro\_scenario])  [1] 0.03127651  > ##testing  > nrmse(KhavrSVR\_Micro\_Fe\_expert\_External, RF\_Micro\_Scenario\_models\_dataset$Fe[-Training\_RF\_Micro\_scenario])  [1] 98.2  > MAPE(KhavrSVR\_Micro\_Fe\_expert\_External, RF\_Micro\_Scenario\_models\_dataset$Fe[-Training\_RF\_Micro\_scenario])  [1] 0.2068545 |
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#################EXPERT OPINION AND VIF ############################

###eXPERT OPİNİON AND vıf COVARİATE analysis

**###################SVR**-----Zn---------------#################

> # Internal validation

> goof(observed = RF\_Micro\_Scenario\_models\_dataset$Zn[Training\_RF\_Micro\_scenario], predicted = KhavrSVR\_Micro\_Zn\_expert\_Internal , plot.it = TRUE)

R2 concordance MSE RMSE bias

1 0.9901467 0.973552 0.125271 0.3539365 0.1812468

> # externalvalidation

> goof(observed = RF\_Micro\_Scenario\_models\_dataset$Zn[-Training\_RF\_Micro\_scenario], predicted = KhavrSVR\_Micro\_Zn\_expert\_External, plot.it = TRUE)

R2 concordance MSE RMSE bias

1 0.05918933 0.08164861 16.05772 4.007208 -0.2745352

> #training

> nrmse(KhavrSVR\_Micro\_Zn\_expert\_Internal, RF\_Micro\_Scenario\_models\_dataset$Zn[Training\_RF\_Micro\_scenario])

[1] 9.8

> MAPE(KhavrSVR\_Micro\_Zn\_expert\_Internal, RF\_Micro\_Scenario\_models\_dataset$Zn[Training\_RF\_Micro\_scenario])

[1] 0.4345082

> ##testing

> nrmse(KhavrSVR\_Micro\_Zn\_expert\_External, RF\_Micro\_Scenario\_models\_dataset$Zn[-Training\_RF\_Micro\_scenario])

[1] 94.7

> MAPE(KhavrSVR\_Micro\_Zn\_expert\_External, RF\_Micro\_Scenario\_models\_dataset$Zn[-Training\_RF\_Micro\_scenario])

[1] 2.345906

#################EXPERT OPINION AND VIF ############################

###eXPERT OPİNİON AND vıf COVARİATE analysis

**###################SVR**-----Cu---------------#################

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| # Internal validation  > KhavrSVR\_Micro\_Cu\_expert\_Internal <- predict(KhavrSVR\_Micro\_Cu\_expert, newdata = RF\_Micro\_Scenario\_models\_dataset[Training\_RF\_Micro\_scenario, ])  > goof(observed = RF\_Micro\_Scenario\_models\_dataset$Cu[Training\_RF\_Micro\_scenario], predicted = KhavrSVR\_Micro\_Cu\_expert\_Internal , plot.it = TRUE)  R2 concordance MSE RMSE bias  1 0.9898588 0.9733306 0.0008176621 0.02859479 -0.0007343466  > goof(observed = RF\_Micro\_Scenario\_models\_dataset$Cu[-Training\_RF\_Micro\_scenario], predicted = KhavrSVR\_Micro\_Cu\_expert\_External, plot.it = TRUE)  R2 concordance MSE RMSE bias  1 0.02962973 0.1329627 0.07845521 0.2800986 0.07925889  > #training  > nrmse(KhavrSVR\_Micro\_Cu\_expert\_Internal, RF\_Micro\_Scenario\_models\_dataset$Cu[Training\_RF\_Micro\_scenario])  [1] 10  > MAPE(KhavrSVR\_Micro\_Cu\_expert\_Internal, RF\_Micro\_Scenario\_models\_dataset$Cu[Training\_RF\_Micro\_scenario])  [1] 0.02547616  > ##testing  > nrmse(KhavrSVR\_Micro\_Cu\_expert\_External, RF\_Micro\_Scenario\_models\_dataset$Cu[-Training\_RF\_Micro\_scenario])  [1] 96.1  > MAPE(KhavrSVR\_Micro\_Cu\_expert\_External, RF\_Micro\_Scenario\_models\_dataset$Cu[-Training\_RF\_Micro\_scenario])  [1] 0.2299463 |
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#################EXPERT OPINION AND VIF ############################

###eXPERT OPİNİON AND vıf COVARİATE analysis

**###################SVR**-----Mn---------------#################

goof(observed = RF\_Micro\_Scenario\_models\_dataset$Mn[Training\_RF\_Micro\_scenario], predicted = KhavrSVR\_Micro\_Mn\_expert\_Internal , plot.it = TRUE)

R2 concordance MSE RMSE bias

1 0.7020582 0.7621176 5.138592 2.266846 -0.5446919

> goof(observed = RF\_Micro\_Scenario\_models\_dataset$Mn[-Training\_RF\_Micro\_scenario], predicted = KhavrSVR\_Micro\_Mn\_expert\_External, plot.it = TRUE)

R2 concordance MSE RMSE bias

1 -0.01494982 -5.56171e-07 14.116 3.757126 -0.4559769

> #training

> nrmse(KhavrSVR\_Micro\_Mn\_expert\_Internal, RF\_Micro\_Scenario\_models\_dataset$Mn[Training\_RF\_Micro\_scenario])

[1] 54

> MAPE(KhavrSVR\_Micro\_Mn\_expert\_Internal, RF\_Micro\_Scenario\_models\_dataset$Mn[Training\_RF\_Micro\_scenario])

[1] 0.106529

> ##testing

> nrmse(KhavrSVR\_Micro\_Mn\_expert\_External, RF\_Micro\_Scenario\_models\_dataset$Mn[-Training\_RF\_Micro\_scenario])

[1] 98.3

> MAPE(KhavrSVR\_Micro\_Mn\_expert\_External, RF\_Micro\_Scenario\_models\_dataset$Mn[-Training\_RF\_Micro\_scenario])

[1] 0.4438327