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Technical Note

A Tool for the Automatic Aggregation and Validation of the Results of Physically Based Distributed Slope Stability Models

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Supplementary Material: The contingency matrix tables were imported in a spreadsheet to calculate some skill scores that are commonly used as quantitative indicators of model performances [1,2]:

Efficiency = (TP + TN) / (TP + TN + FP + FN)

Misclassification rate = (FP + FN) / (TP + TN + FN + FP)

Odds ratio = (TP + TN) / (FP + FN)

Positive predictive power = TP / (TP + FP)

Negative predictive power = TN/ (FN + TN)

Sensitivity = TP / (TP + FN)

Specificity = TN / (FP + TN)

False positive rate = FP / (FP + TN)

False negative rate = FN / (TP + FN)

Likelihood ratio = Sensitivity / (1 - Specificity)

Where TP are true positives, TN are true negatives, FP are false positives and FN are false negatives (as explained in the main text).

The following table reports a summary of all the skill scores calculated starting from the contingency matrixes.

Citation: Bulzinetti, M.A.; Segoni, S.; Pappafico, G.; Masi, E.B.; Rossi, G.; Tofani, V. A Tool for the Automatic Aggregation and Validation of the Results of Physically Based Distributed Slope Stability Models. *Water* **2021**, *13*, 2313. https://doi.org/10.3390/w13172313

Academic Editor: Yu Huang

Received: 13 July 2021
Accepted: 21 August 2021
Published: 24 August 2021

Table S1. Skill scores resulting from all the DTVT configuration tested.

	IDT = 3%					
Quantitative Indicators	FPT 60%	FPT 70%	FPT 75%	FPT 80%	FPT 85%	FPT 90%
a(TP)	105	105	105	105	105	105
b(FP)	182	170	158	143	135	121
c(FN)	0	0	0	0	0	0
d(TN)	233	245	257	272	280	294
Efficiency	0.650	0.673	0.696	0.725	0.740	0.767
Misclassification rate	0.350	0.327	0.304	0.275	0.260	0.233
Odds ratio	1.857	2.059	2.291	2.636	2.852	3.298
Positive predictive power	0.366	0.382	0.399	0.423	0.438	0.465
Negative predictive power	1.000	1.000	1.000	1.000	1.000	1.000
Sensitivity	1.000	1.000	1.000	1.000	1.000	1.000
Specificity	0.561	0.590	0.619	0.655	0.675	0.708
False positive rate	0.439	0.410	0.381	0.345	0.325	0.292
False negative rate	0.000	0.000	0.000	0.000	0.000	0.000
Likelihood ratio	2.280	2.441	2.627	2.902	3.074	3.430

	IDT = 5%					
Quantitative Indicators	FPT 60%	FPT 70%	FPT 75%	FPT 80%	FPT 85%	FPT 90%
a(TP)	105	105	105	105	105	101
b(FP)	152	138	128	110	95	88
c(FN)	0	0	0	0	0	4
d(TN)	263	277	287	305	320	327
Efficiency	0.708	0.735	0.754	0.788	0.817	0.823
Misclassification rate	0.292	0.265	0.246	0.212	0.183	0.177
Odds ratio	2.421	2.768	3.063	3.727	4.474	4.652
Positive predictive power	0.409	0.432	0.451	0.488	0.525	0.534
Negative predictive power	1.000	1.000	1.000	1.000	1.000	0.988
Sensitivity	1.000	1.000	1.000	1.000	1.000	0.962
Specificity	0.634	0.667	0.692	0.735	0.771	0.788
False positive rate	0.366	0.333	0.308	0.265	0.229	0.212
False negative rate	0.000	0.000	0.000	0.000	0.000	0.038
Likelihood ratio	2.730	3.007	3.242	3.773	4.368	4.536

	IDT = 10%					
Quantitative Indicators	FPT 60%	FPT 70%	FPT 75%	FPT 80%	FPT 85%	FPT 90%
a(TP)	100	97	95	95	87	81
b(FP)	97	85	75	67	56	42
c(FN)	5	8	10	10	18	24
d(TN)	318	330	340	348	359	373
Efficiency	0.804	0.821	0.837	0.852	0.858	0.873
Misclassification rate	0.196	0.179	0.163	0.148	0.142	0.127
Odds ratio	4.098	4.591	5.118	5.753	6.027	6.879
Positive predictive power	0.508	0.533	0.559	0.586	0.608	0.659
Negative predictive power	0.985	0.976	0.971	0.972	0.952	0.940
Sensitivity	0.952	0.924	0.905	0.905	0.829	0.771
Specificity	0.766	0.795	0.819	0.839	0.865	0.899
False positive rate	0.234	0.205	0.181	0.161	0.135	0.101
False negative rate	0.048	0.076	0.095	0.095	0.171	0.229
Likelihood ratio	4.075	4.510	5.006	5.604	6.140	7.622
	IDT = 15%					
Quantitative Indicators	FPT 60%	FPT 70%	FPT 75%	FPT 80%	FPT 85%	FPT 90%
a(TP)	95	95	81	81	68	68
b(FP)	68	55	43	33	27	21
c(FN)	10	10	24	24	37	37
d(TN)	347	360	372	382	388	394
Efficiency	0.850	0.875	0.871	0.890	0.877	0.888
Misclassification rate	0.150	0.125	0.129	0.110	0.123	0.112
Odds ratio	5.667	7.000	6.761	8.123	7.125	7.966
Positive predictive power	0.583	0.633	0.653	0.711	0.716	0.764
Negative predictive power	0.972	0.973	0.939	0.941	0.913	0.914
Sensitivity	0.905	0.905	0.771	0.771	0.648	0.648
Specificity	0.836	0.867	0.896	0.920	0.935	0.949
False positive rate	0.164	0.133	0.104	0.080	0.065	0.051
False negative rate	0.095	0.095	0.229	0.229	0.352	0.352
Likelihood ratio	5.522	6.827	7.445	9.701	9.954	12.798

References

1. Beguería, S. Validation and evaluation of predictive models in hazard assessment and risk management. *Nat. Hazards* **2006**, *37*, 315–329, doi:10.1007/s11069-005-5182-6.
2. Martelloni, G.; Segoni, I.S.; Fanti, I.R.; Catani, I.F. Rainfall thresholds for the forecasting of landslide occurrence at regional scale. **2012**, *9*, 485–495, doi:10.1007/s10346-011-0308-2.

{Bibliography}