**The impact of class imbalance in classification performance metrics based on the binary confusion matrix.**

# Supplementary material

## Derivation of .

1. Sensitivity ().

|  |  |
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|  | (1) |
|  |  |

1. Specificity ().

|  |  |
| --- | --- |
|  | (2) |
|  |  |

1. Precision ().

|  |  |
| --- | --- |
|  | (3) |

|  |  |
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|  | (4) |
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1. Negative Predictive Value ().

|  |  |
| --- | --- |
|  | (5) |

|  |  |
| --- | --- |
|  | (6) |
|  |  |

1. Accuracy ().

|  |  |
| --- | --- |
|  | (7) |

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| --- | --- |
|  | (8) |

1. score.

|  |  |
| --- | --- |
|  | (9) |

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|  | (10) |

|  |  |
| --- | --- |
|  | (11) |

1. Geometric Mean ().

|  |  |
| --- | --- |
|  | (12) |

1. Matthews Correlation Coefficient ().

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|  | (13) |

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|  | (14) |

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|  | (21) |

1. Bookmaker Informedness ().

|  |  |
| --- | --- |
|  | (22) |

1. Markedness ().

|  |  |
| --- | --- |
|  | (23) |

|  |  |
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|  | (24) |

## Derivation of when the classes are balanced.

1. Sensitivity ().

|  |  |
| --- | --- |
|  | (25) |

1. Specificity ().

|  |  |
| --- | --- |
|  | (26) |

1. Precision ().

|  |  |
| --- | --- |
|  | (27) |

1. Negative Predictive Value ().

|  |  |
| --- | --- |
|  | (28) |

1. Accuracy ().

|  |  |
| --- | --- |
|  | (29) |

1. score.

|  |  |
| --- | --- |
|  | (30) |

1. Geometric Mean ().

|  |  |
| --- | --- |
|  | (31) |

1. Matthews Correlation Coefficient ().

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|  | (32) |

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|  | (33) |

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|  | (34) |

1. Bookmaker Informedness ().

|  |  |
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|  | (35) |

1. Markedness ().

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|  | (36) |

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|  | (37) |

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| --- | --- |
|  | (38) |

## Derivation of .

1. Sensitivity ().

|  |  |
| --- | --- |
|  | (39) |

1. Specificity ().

|  |  |
| --- | --- |
|  | (40) |

1. Precision ().

|  |  |
| --- | --- |
|  | (41) |

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| --- | --- |
|  | (42) |

1. Negative Predictive Value ().

|  |  |
| --- | --- |
|  | (43) |

|  |  |
| --- | --- |
|  | (44) |

1. Accuracy ().

|  |  |
| --- | --- |
|  | (45) |

1. score.

|  |  |
| --- | --- |
|  | (46) |

1. Geometric Mean ().

|  |  |
| --- | --- |
|  | (47) |

1. Matthews Correlation Coefficient ().

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1. Bookmaker Informedness ().

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|  | (51) |

1. Markedness ().

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## Derivation of .

1. Sensitivity ().

|  |  |
| --- | --- |
|  | (55) |

1. Specificity ().

|  |  |
| --- | --- |
|  | (56) |

1. Precision ().

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|  | (57) |

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|  | (58) |

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| --- | --- |
|  | (59) |

1. Negative Predictive Value ().

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|  | (60) |

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| --- | --- |
|  | (61) |

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| --- | --- |
|  | (62) |

1. Accuracy ().

|  |  |
| --- | --- |
|  | (63) |

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| --- | --- |
|  | (64) |

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| --- | --- |
|  | (65) |

|  |  |
| --- | --- |
|  | (66) |

1. score.

|  |  |
| --- | --- |
|  | (67) |

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| --- | --- |
|  | (68) |

1. Geometric Mean ().

|  |  |
| --- | --- |
|  | (69) |

1. Matthews Correlation Coefficient ().

|  |  |
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|  | (70) |

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|  | (76) |

1. Bookmaker Informedness ().

|  |  |
| --- | --- |
|  | (77) |

|  |  |
| --- | --- |
|  | (78) |

1. Markedness ().

|  |  |
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|  | (79) |

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|  | (87) |

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|  | (88) |