Tables and Figure Captions

# Tables

## Table 1

**Table 1**. Sensitivity to sample size. This table shows the standardized coefficient between the sample size and the value of each index, adjusted for error, and stratified by model type and presence of true effect. The stronger the coefficient is, the stronger the relationship with sample size.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Index | Linear Models / Presence of Effect | Linear Models / Absence of Effect | Logistic Models / Presence of Effect | Logistic Models / Absence of Effect |
| *p*-value | 0.166 | 0.008 | 0.157 | 0.020 |
| *p*-direction | 0.171 | 0.013 | 0.154 | 0.024 |
| *p*-MAP | 0.239 | 0.002 | 0.238 | 0.032 |
| ROPE (95%) | 0.033 | 0.359 | 0.008 | 0.310 |
| ROPE (full) | 0.025 | 0.363 | 0.016 | 0.315 |
| Bayes factor (vs. 0) | 0.198 | 0.116 | 0.116 | 0.141 |
| Bayes factor (vs. ROPE) | 0.152 | 0.136 | 0.078 | 0.180 |

## Table 2

**Table 2**. Sensitivity to noise. This table shows the standardized coefficient between noise and the value of each index when the true effect is present, adjusted for sample size and stratified by model type. The stronger the coefficient is, the stronger the relationship with noise.

|  |  |  |
| --- | --- | --- |
| Index | Linear Models / Presence of Effect | Logistic Models / Presence of Effect |
| *p*-value | 0.35 | 0.40 |
| *p*-direction | 0.36 | 0.40 |
| *p*-MAP | 0.55 | 0.60 |
| ROPE (95%) | 0.45 | 0.45 |
| ROPE (full) | 0.46 | 0.45 |
| Bayes factor (vs. 0) | 0.79 | 0.65 |
| Bayes factor (vs. ROPE) | 0.81 | 0.67 |

## Table 3

**Table 3**. Summary of Bayesian Indices of Effect Existence and Significance.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Index | Interpretation | Definition | Strengths | Limitations |
| Probability of Direction (pd) | Probability that an effect is of the same sign as the median’s. | Proportion of the posterior distribution of the same sign than the median’s. | Straightforward computation and interpretation. Objective property of the posterior distribution. 1:1 correspondence with the frequentist p-value. | Limited information favoring the null hypothesis. |
| MAP-based p-value | Relative odds of the presence of an effect against 0. | Density value at 0 divided by the density value at the mode of the posterior distribution. | Straightforward computation. Objective property of the posterior distribution | Limited information favoring the null hypothesis. Relates on density approximation. Indirect relationship between mathematical definition and interpretation. |
| ROPE (95%) | Probability that the credible effect values are not negligible. | Proportion of the 95% CI inside of a range of values defined as the ROPE. | Provides information related to the practical relevance of the effects. | A ROPE range needs to be arbitrarily defined. Sensitive to the scale (the unit) of the predictors. Not sensitive to highly significant effects. |
| ROPE (full) | Probability that the effect possible values are not negligible. | Proportion of the posterior distribution inside of a range of values defined as the ROPE. | Provides information related to the practical relevance of the effects. | A ROPE range needs to be arbitrarily defined. Sensitive to the scale (the unit) of the predictors. |
| Bayes factor (vs. 0) | The degree by which the probability mass has shifted away from or towards the null value, after observing the data. | Ratio of the density of the null value between the posterior and the prior distributions. | An unbounded continuous measure of relative evidence. Allows statistically supporting the null hypothesis. | Sensitive to selection of prior distribution shape, location and scale. |
| Bayes factor (vs. ROPE) | The degree by which the probability mass has into or outside of the null interval (ROPE), after observing the data. | Ratio of the odds of the posterior vs the prior distribution falling inside of the range of values defined as the ROPE. | An unbounded continuous measure of relative evidence. Allows statistically supporting the null hypothesis. Compared to the BF (vs. 0), evidence is accumulated faster for the null when the null is true. | Sensitive to selection of prior distribution shape, location and scale. Additionally, a ROPE range needs to be arbitrarily defined, which is sensitive to the scale (the unit) of the predictors. |

# Figure Captions

* **Figure 1**. Bayesian indices of effect existence and significance. (A) The *Probability of Direction (pd)* is defined as the proportion of the posterior distribution that is of the median’s sign (the yellow area). (B) The *MAP-based p-value* is defined as the density value at 0, - the height of the red segment, divided by the density at the Maximum A Posteriori (MAP), - the height of the blue segment. (C) The ROPE (95%) (ROPE) is defined as the proportion of the 95% CI (the yellow area) that lies within the ROPE (the red area). For the ROPE (full), the full posterior distrubtion (including the tails) is used. (D) Bayes factors indicate the degree by which the posterior distribution has shifted from the null value (0) or the ROPE (the red area), relative to the prior distribution (represented by the dotted line).
* **Figure 2**. Impact of Sample Size on the different indices, for linear and logistic models, and when the null hypothesis is true or false. Grey vertical lines for *p*-values and Bayes factors represent commonly used thresholds.
* **Figure 3**. Impact of Noise. The noise corresponds to the standard deviation of the Gaussian noise that was added to the generated data. It is related to the magnitude the parameter (the more noise there is, the smaller the coefficient). Grey vertical lines for *p*-values and Bayes factors represent commonly used thresholds. The scale is capped for the Bayes factors as these extend to infinity.
* **Figure 4**. Relationship with the frequentist *p*-value. In each plot, the *p*-value densities are visualized by the marginal top (absence of true effect) and bottom (presence of true effect) markers, whereas on the left (presence of true effect) and right (absence of true effect), the markers represent the density of the index of interest. Different point shapes, representing different sample sizes, specifically illustrate its impact on the percentages in ROPE, for which each “curve line” is associated with one sample size (the bigger the sample size, the higher the percentage in ROPE).
* **Figure 5**. The probability of reaching different *p*-value based significance thresholds (.1, .05, .01, .001 for solid, long-dashed, short-dashed and dotted lines, respectively) for different values of the corresponding Bayesian indices.
* **Figure 6**. Relationship between three Bayesian indices: The Probability of Direction (*pd*), the percentage of the full posterior distribution in the ROPE, and the Bayes factor (*vs.* ROPE).