



Aquavalens Project

"Protecting the health of Europeans by improving methods for the detection of pathogens in drinking water and water used in food preparation."

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MST predictive models validated at European level.

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Abbreviations:

- Mitochondrial DNA markers: Human-specific (HMMit), Porcine (PGMit)
- *Bacteroidetes* DNA: Human-specific (HF183Taqman), Ruminant (BacR), Porcine (Pig2Bac)
- *Bifidobacterium* DNA: Human-specific (HMBif), Bovine (CWBif), Poultry (PLBif), Total (TLBif)
- Norovirus RNA (NoV)

1. Validation of the developed MST predictive models

Eight different scenarios for MST were considered, on the basis of the following issues:

1. Predictive models for determining a binary outcome (human vs. non-human source of contamination) against a multi-class outcome (four different animal classes: bovine, porcine, poultry, human).
2. Predictive models using all studied markers (culture-dependent and molecular targets) against molecular targets only, the latter being aimed at an eventual implementation on technological platforms.
3. Predictive models designed to work at point source (heavy pollution) against those designed to work under environmental conditions (diluted and aged samples).

From the statistical point of view, there was also an interest in studying simple models (linear, low complexity, interpretable) against more sophisticated ones (non-linear, high complexity, non-interpretable).

This experimental procedure yields 16 modelling scenarios; since the results achieved with the use of simple models were considered very satisfactory for all the scenarios involving heavy pollution (close to 100% accuracy), in the end this number could be reduced to 12 modelling scenarios. A list of the obtained models (based on non-linear methods) for the different scenarios considering the effects of dilution and aging of the faecal pollution is related on the annex section.

In all cases, the predictive models allowed the identification of the list of the best subsets of markers (D5.3), which were analysed for their feasibility during one-day working meeting in Barcelona, with the participation of all WP5 partners. The conditions for testing this feasibility at European level were defined, determining a second sampling campaign to be performed by the participant laboratories in WP5 (see 30th Month periodic report, WP5).

The models were selected using standard statistical resampling techniques, involving different forms of cross-validation. The generic goal of *cross-validation* (CV) is to estimate the expected error of a model in a data set that is independent of the data that were used to train the model. One round of k-fold CV (or k-CV) involves partitioning the sample into k complementary subsets, systematically performing the modelling on the union of k-1 such subsets and checking the obtained model on the remaining subset (acting as a validation set). To reduce variability, multiple rounds can be performed using different partitions, and the results averaged over the rounds. The advantage of this method over repeated random subsampling is that all observations are used for both training and validation, and each observation is used for validation exactly once. In *stratified* k-CV, each subset contains roughly the same proportions of class labels, which is particularly necessary in severely unbalanced class distributions. In our case, CV was used to assess the predictive ability of possible subsets of markers under the different scenarios using our Aquavalens WP5 data matrix, developed in the first sampling campaign (D5.2 Data set on the distribution of different chemical and microbial parameters in surface waters). It should be noted that in the heavy pollution scenario, leave-one-out cross-validation (LOOCV) was used, due to the small sample size condition (just 118 studied samples). In the aged and diluted data scenario, an extended large data matrix was created from the original Aquavalens WP5 data matrix under a realistic resampling condition; in this case, 10x10 CV was used to obtain reliable prediction figures.

2. Results and discussion

The selected predictive models were evaluated for prediction and their corresponding accuracy was estimated by repeated rounds of k-CV, as explained above. Furthermore, four validated MST predictive models at the five participant countries (Austria, Germany, Finland, Portugal and Spain) were selected based on molecular markers only, in order to be considered for future use on technological platforms.

These selected models determine a subset of nine molecular parameters (see below and in abbreviations) to be considered as preliminary candidates for the final list of molecular targets on MST due to the end of the WP5 (Month 32). However, the final list of selected MST markers to include in the technological platforms will be confirmed through the second sampling campaign.

The validated MST molecular-based models (linear or non-linear) and the corresponding scenarios providing solutions are:

Linear Discriminating Analysis

Human vs Non-human / point source

HMBif, PLBif, TLBif, Pig2Bac, HF183TaqMan (accuracy 100% by LOOCV)

Four sources / point source

HMBif, BacR, Pig2Bac (accuracy 100% by LOOCV)

Non-linear Analysis (Random Forest)

Human vs Non-human

NoV, PGMit (accuracy 88.5% by 10x10 CV)

Four sources

NoV, PGMit, CWBif, HMBif, TLBif/CWBif (accuracy by 79.1% by 10x10 CV)

Although adding some additional molecular markers to the subsets selected could increase accuracy, it could not be worthy when considering costs. If other combinations of molecular markers are requested with the purpose of implementation on technological platforms, it could be possible to select other predictive models out of the already performed calculations at close accuracy values.

3. Annex. List of developed models for the different scenarios developed by non-linear methods (Random Forest)

The models defined for the different studied scenarios considering effects of dilution and aging of faecal pollution. The obtained models are shorted attending to:

1. The used indicators. CASE A: using all the measured indicators and MST markers (culture dependent and molecular targets). CASE B: using only molecular markers.
2. The type of faecal source to be distinguished. HUMAN – NONHUMAN: distinguishing human source vs. Non-human (animal) source. MULTINOMIAL: distinguishing of four faecal pollution sources: human, bovine, porcine and poultry.

CASE A - HUMAN / NON HUMAN

2 variables

```
# Accuracy vars
[1,] "0.9418" "SomPhg | HMBactPhg"
[2,] "0.9418" "HMBactPhg | Ratio.SomPhg.PGBactPhg"
[3,] "0.9417" "HMBactPhg | Ratio.SomPhg.HMBactPhg"
[4,] "0.9417" "HMBactPhg | Ratio.SomPhg.CWBactPhg"
[5,] "0.938" "HMBactPhg | Ratio.SomPhg.PLBactPhg"
[6,] "0.9326" "Norav | Ratio.SomPhg.HMBactPhg"
[7,] "0.9318" "CP | HMBactPhg"
[8,] "0.9283" "CP | Ratio.SomPhg.HMBactPhg"
[9,] "0.9252" "HMBactPhg | Norav"
[10,] "0.9251" "HMBactPhg | Cyclamate"
```

3 variables

```
# Accuracy threevar.names
[1,] "0.9638" "HMBactPhg | Norav | Ratio.SomPhg.HMBactPhg"
[2,] "0.9636" "SomPhg | HMBactPhg | Norav"
[3,] "0.9604" "HMBactPhg | Norav | Ratio.SomPhg.CWBactPhg"
[4,] "0.9591" "CP | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg"
[5,] "0.9587" "HMBactPhg | Norav | Ratio.SomPhg.PLBactPhg"
[6,] "0.9578" "CP | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PLBactPhg"
[7,] "0.9547" "CP | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg"
[8,] "0.9546" "HMBactPhg | Norav | Ratio.SomPhg.PGBactPhg"
[9,] "0.9512" "Norav | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg"
[10,] "0.9507" "CP | SomPhg | Ratio.SomPhg.HMBactPhg"
```

4 variables

```
# Accuracy fourvar.names
[1,] "0.9798" "CP | Norav | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg"
[2,] "0.9789" "CP | HMBactPhg | Norav | Ratio.SomPhg.PGBactPhg"
[3,] "0.9776" "CP | HMBactPhg | Norav | Ratio.SomPhg.CWBactPhg"
[4,] "0.9773" "CP | SomPhg | HMBactPhg | Norav"
[5,] "0.9773" "CP | HMBactPhg | Norav | Ratio.SomPhg.HMBactPhg"
[6,] "0.977" "HMBactPhg | Norav | Ratio.SomPhg.PGBactPhg | Ratio.SomPhg.PLBactPhg"
[7,] "0.9767" "CP | HMBactPhg | Norav | Ratio.SomPhg.PLBactPhg"
[8,] "0.9766" "HMBactPhg | Norav | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PGBactPhg"
[9,] "0.9764" "HMBactPhg | Norav | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg"
[10,] "0.9763" "SomPhg | HMBactPhg | Norav | Ratio.SomPhg.PGBactPhg"
[11,] "0.9751" "SomPhg | HMBactPhg | Norav | Cyclamate"
[12,] "0.9748" "CP | Norav | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg"
```


[13,] "0.9747" "HMBactPhg | Norav | Cyclamate | Ratio.SomPhg.CWBactPhg"
 [14,] "0.9746" "CP | Norav | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PLBactPhg"
 [15,] "0.9745" "CP | SomPhg | Norav | Ratio.SomPhg.HMBactPhg"
 [16,] "0.9736" "HMBactPhg | Norav | Cyclamate | Ratio.SomPhg.HMBactPhg"
 [17,] "0.9733" "SomPhg | HMBactPhg | Norav | Ratio.SomPhg.PLBactPhg"
 [18,] "0.9732" "HMBactPhg | Norav | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PLBactPhg"
 [19,] "0.9727" "HMBactPhg | Norav | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg"
 [20,] "0.9727" "HMBactPhg | Norav | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PLBactPhg"
 [21,] "0.9719" "SomPhg | HMBactPhg | Norav | Ratio.SomPhg.HMBactPhg"
 [22,] "0.9717" "SomPhg | HMBactPhg | Norav | Ratio.SomPhg.CWBactPhg"
 [23,] "0.9704" "Norav | Cyclamate | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg"

5variables

Accuracy fivevar.names

[1,] "0.9828" "CP | HMBactPhg | Norav | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PGBactPhg"
 [2,] "0.9828" "CP | HMBactPhg | Norav | Ratio.SomPhg.PGBactPhg | Ratio.SomPhg.PLBactPhg"
 [3,] "0.9824" "CP | SomPhg | HMBactPhg | Norav | Ratio.SomPhg.PGBactPhg"
 [4,] "0.982" "CP | HMBactPhg | Norav | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg"
 [5,] "0.9806" "CP | HMBactPhg | Norav | Cyclamate | Ratio.SomPhg.PGBactPhg"
 [6,] "0.9805" "CP | Norav | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PGBactPhg"
 [7,] "0.9802" "CP | Norav | Cyclamate | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg"
 [8,] "0.9796" "CP | SomPhg | Norav | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg"
 [9,] "0.9796" "CP | Norav | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.SomPhg.PLBactPhg"
 [10,] "0.9791" "CP | HMBactPhg | Norav | Cyclamate | Ratio.SomPhg.HMBactPhg"

CASE A- MULTINOMIAL (HM / CW / PG / PL)

single variable

[1,] "0.7959" "Ratio.SomPhg.HMBactPhg"
 [2,] "0.78" "Ratio.SomPhg.PGBactPhg"
 [3,] "0.7763" "Ratio.SomPhg.CWBactPhg"
 [4,] "0.7752" "Ratio.SomPhg.PLBactPhg"
 [5,] "0.7351" "CP"
 [6,] "0.7017" "Ratio.TLBif.PLBif"
 [7,] "0.5471" "Norav"
 [8,] "0.4926" "HMBactPhg"
 [9,] "0.4518" "CWMit"

two variables

[1,] "0.8863" "CP | Ratio.SomPhg.HMBactPhg"
 [2,] "0.8718" "CP | Ratio.SomPhg.PGBactPhg"
 [3,] "0.8662" "CP | Ratio.SomPhg.CWBactPhg"
 [4,] "0.8649" "Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg"
 [5,] "0.8575" "CP | Ratio.SomPhg.PLBactPhg"
 [6,] "0.8432" "Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PLBactPhg"
 [7,] "0.841" "Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg"
 [8,] "0.837" "Ratio.SomPhg.HMBactPhg | Ratio.TLBif.PLBif"
 [9,] "0.8241" "Ratio.SomPhg.PGBactPhg | Ratio.SomPhg.PLBactPhg"
 [10,] "0.8169" "Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PGBactPhg"
 [11,] "0.8058" "Ratio.SomPhg.CWBactPhg | Ratio.TLBif.PLBif"
 [12,] "0.8057" "Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"
 [13,] "0.8044" "Ratio.SomPhg.PGBactPhg | Ratio.TLBif.PLBif"
 [14,] "0.8018" "Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PLBactPhg"
 [15,] "0.7706" "CP | Ratio.TLBif.PLBif"
 [16,] "0.6961" "Norav | Ratio.SomPhg.HMBactPhg"
 [17,] "0.678" "Norav | Ratio.SomPhg.CWBactPhg"
 [18,] "0.6564" "Norav | Ratio.SomPhg.PGBactPhg"
 [19,] "0.6528" "Norav | Ratio.SomPhg.PLBactPhg"
 [20,] "0.6511" "Norav | Ratio.TLBif.PLBif"
 [21,] "0.6275" "HMBactPhg | CWMit"
 [22,] "0.6271" "HMBactPhg | Ratio.SomPhg.PGBactPhg"
 [23,] "0.6126" "HMBactPhg | Ratio.SomPhg.CWBactPhg"
 [24,] "0.6125" "Norav | CWMit"
 [25,] "0.6067" "HMBactPhg | Ratio.TLBif.PLBif"
 [26,] "0.5971" "HMBactPhg | Ratio.SomPhg.HMBactPhg"
 [27,] "0.5966" "HMBactPhg | Norav"
 [28,] "0.5959" "CWMit | Ratio.SomPhg.HMBactPhg"
 [29,] "0.5868" "HMBactPhg | Ratio.SomPhg.PLBactPhg"

[30,] "0.5855" "CP | Norav"
 [31,] "0.5765" "CWMit | Ratio.SomPhg.CWBactPhg"
 [32,] "0.5708" "CWMit | Ratio.SomPhg.PLBactPhg"
 [33,] "0.5635" "CWMit | Ratio.SomPhg.PGBactPhg"
 [34,] "0.5634" "CP | HMBactPhg"
 [35,] "0.5368" "CP | CWMit"
 [36,] "0.5079" "CWMit | Ratio.TLBif.PLBif"

three variables

[1,] "0.9386" "CP | Ratio.SomPhg.HMBactPhg | Ratio.TLBif.PLBif"
 [2,] "0.9214" "CP | Ratio.SomPhg.CWBactPhg | Ratio.TLBif.PLBif"
 [3,] "0.92" "CP | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"
 [4,] "0.9184" "CP | Ratio.SomPhg.PGBactPhg | Ratio.TLBif.PLBif"
 [5,] "0.9153" "CP | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg"
 [6,] "0.9039" "CP | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg"
 [7,] "0.9016" "CP | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PLBactPhg"
 [8,] "0.8962" "Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.TLBif.PLBif"
 [9,] "0.8928" "CP | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PGBactPhg"
 [10,] "0.8917" "CP | Ratio.SomPhg.PGBactPhg | Ratio.SomPhg.PLBactPhg"
 [11,] "0.8815" "Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg | Ratio.TLBif.PLBif"
 [12,] "0.8803" "CP | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PLBactPhg"
 [13,] "0.8791" "Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"
 [14,] "0.875" "Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.SomPhg.PLBactPhg"
 [15,] "0.873" "Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PGBactPhg"
 [16,] "0.8557" "Ratio.SomPhg.PGBactPhg | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"
 [17,] "0.8527" "Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PLBactPhg"
 [18,] "0.8503" "Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.TLBif.PLBif"
 [19,] "0.8353" "Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"
 [20,] "0.8332" "Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.SomPhg.PLBactPhg"

four variables

[1,] "0.9617" "CP | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.TLBif.PLBif"
 [2,] "0.9599" "CP | Norav | Ratio.SomPhg.HMBactPhg | Ratio.TLBif.PLBif"
 [3,] "0.9579" "CP | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg | Ratio.TLBif.PLBif"
 [4,] "0.9569" "CP | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"
 [5,] "0.9567" "CP | HMBactPhg | Ratio.SomPhg.CWBactPhg | Ratio.TLBif.PLBif"
 [6,] "0.9566" "CP | HMBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.TLBif.PLBif"
 [7,] "0.9554" "CP | CWMit | Ratio.SomPhg.HMBactPhg | Ratio.TLBif.PLBif"
 [8,] "0.9527" "CP | HMBactPhg | Ratio.SomPhg.HMBactPhg | Ratio.TLBif.PLBif"
 [9,] "0.9523" "CP | HMBactPhg | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"
 [10,] "0.9505" "CP | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.TLBif.PLBif"
 [11,] "0.95" "CP | Norav | Ratio.SomPhg.CWBactPhg | Ratio.TLBif.PLBif"

[12,] "0.9498" "CP | Ratio.SomPhg.PGBactPhg | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"
 [13,] "0.9494" "CP | Norav | Ratio.SomPhg.PGBactPhg | Ratio.TLBif.PLBif"
 [14,] "0.9485" "CP | Norav | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"
 [15,] "0.9448" "CP | CWMit | Ratio.SomPhg.CWBactPhg | Ratio.TLBif.PLBif"
 [16,] "0.9447" "CP | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"
 [17,] "0.9426" "CP | CWMit | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg"
 [18,] "0.9422" "CP | CWMit | Ratio.SomPhg.PGBactPhg | Ratio.TLBif.PLBif"
 [19,] "0.9409" "CP | CWMit | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"
 [20,] "0.9379" "CP | Norav | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg"
 [21,] "0.9335" "CP | Norav | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg"
 [22,] "0.9331" "CP | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg |
 Ratio.SomPhg.PGBactPhg"
 [23,] "0.933" "CP | CWMit | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PLBactPhg"
 [24,] "0.9303" "CP | CWMit | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg"
 [25,] "0.9301" "CP | Norav | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PLBactPhg"
 [26,] "0.9296" "CP | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg |
 Ratio.SomPhg.PLBactPhg"
 [27,] "0.929" "CWMit | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.TLBif.PLBif"
 [28,] "0.9259" "CP | HMBactPhg | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PGBactPhg"
 [29,] "0.925" "CP | HMBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.SomPhg.PLBactPhg"
 [30,] "0.9237" "CP | CWMit | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PGBactPhg"
 [31,] "0.9237" "CP | CWMit | Ratio.SomPhg.PGBactPhg | Ratio.SomPhg.PLBactPhg"
 [32,] "0.9231" "Norav | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.TLBif.PLBif"
 [33,] "0.9225" "CP | Norav | Ratio.SomPhg.PGBactPhg | Ratio.SomPhg.PLBactPhg"
 [34,] "0.9218" "CP | Norav | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PGBactPhg"
 [35,] "0.9216" "CP | HMBactPhg | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg"
 [36,] "0.921" "CP | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg |
 Ratio.SomPhg.PLBactPhg"
 [37,] "0.9171" "Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PGBactPhg
 | Ratio.TLBif.PLBif"
 [38,] "0.9165" "Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.SomPhg.PLBactPhg
 | Ratio.TLBif.PLBif"
 [39,] "0.9158" "Norav | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"
 [40,] "0.9155" "Norav | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg | Ratio.TLBif.PLBif"
 [41,] "0.9143" "CWMit | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"
 [42,] "0.9142" "CP | Norav | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PLBactPhg"
 [43,] "0.9132" "CP | HMBactPhg | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PLBactPhg"
 [44,] "0.9132" "CP | CWMit | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PLBactPhg"
 [45,] "0.9131" "HMBactPhg | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PGBactPhg |
 Ratio.TLBif.PLBif"
 [46,] "0.9116" "CWMit | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg |
 Ratio.TLBif.PLBif"
 [47,] "0.9104" "HMBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.SomPhg.PLBactPhg |
 Ratio.TLBif.PLBif"
 [48,] "0.9103" "CP | HMBactPhg | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg"
 [49,] "0.9092" "CP | HMBactPhg | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PLBactPhg"

[50,] "0.908" "CP | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.SomPhg.PLBactPhg"

five variables

[1,] "0.9656" "CP | CWMit | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.TLBif.PLBif"

[2,] "0.9635" "CP | Norav | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.TLBif.PLBif"

[3,] "0.9612" "CP | CWMit | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg | Ratio.TLBif.PLBif"

[4,] "0.96" "CP | Norav | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg | Ratio.TLBif.PLBif"

[5,] "0.9599" "CP | CWMit | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"

[6,] "0.9595" "CP | Norav | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"

[7,] "0.9579" "CP | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"

[8,] "0.9576" "CP | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.TLBif.PLBif"

[9,] "0.9572" "CP | HMBactPhg | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.TLBif.PLBif"

[10,] "0.9571" "CP | HMBactPhg | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.TLBif.PLBif"

[11,] "0.957" "CP | HMBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"

[12,] "0.9555" "CP | CWMit | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.TLBif.PLBif"

[13,] "0.9545" "CP | CWMit | Ratio.SomPhg.PGBactPhg | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"

[14,] "0.9534" "CP | Norav | Ratio.SomPhg.PGBactPhg | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"

[15,] "0.9525" "CP | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"

[16,] "0.9524" "CP | Norav | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.TLBif.PLBif"

[17,] "0.9513" "CP | HMBactPhg | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"

[18,] "0.9508" "CP | HMBactPhg | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"

[19,] "0.9506" "CP | HMBactPhg | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg | Ratio.TLBif.PLBif"

[20,] "0.9489" "CP | CWMit | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"

[21,] "0.9482" "CP | Norav | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"

[22,] "0.9473" "CP | CWMit | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.SomPhg.PLBactPhg"
 [23,] "0.9463" "CP | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"
 [24,] "0.9462" "CP | CWMit | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PGBactPhg"
 [25,] "0.9417" "CP | Norav | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PGBactPhg"
 [26,] "0.9381" "CP | Norav | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.SomPhg.PLBactPhg"
 [27,] "0.9369" "CP | CWMit | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PLBactPhg"
 [28,] "0.9369" "CWMit | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.TLBif.PLBif"
 [29,] "0.935" "CWMit | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.PGBactPhg | Ratio.SomPhg.PLBactPhg | Ratio.TLBif.PLBif"
 [30,] "0.934" "CP | Norav | Ratio.SomPhg.HMBactPhg | Ratio.SomPhg.CWBactPhg | Ratio.SomPhg.PLBactPhg"

CASE B - HUMAN / NONHUMAN

single variable

0.8675 "Norav",
 0.8237 "Ratio.TLBif.CWBif",
 0.8236 "Ratio.TLBif.HMBif",
 0.8232 "Ratio.TLBif.PGNeo",
 0.8199 "TLBif",
 0.8196 "Ratio.TLBif.PLBif",
 0.8111 "Ratio.AllBac.HF183Taqman"
 0.8085 "AllBac",
 0.8071 "Ratio.AllBac.BacR",
 0.8060 "Ratio.AllBac.Pig2Bac",
 0.6912 "PGMit",

two variables

```
# accuracy | twovar.names
[1,] "0.8849" "Norav | PGMit"
[2,] "0.8812" "Norav | Ratio.TLBif.CWBif"
[3,] "0.8782" "Norav | Ratio.TLBif.PGNeo"
[4,] "0.8764" "Norav | Ratio.TLBif.HMBif"
[5,] "0.8738" "Norav | Ratio.TLBif.PLBif"
[6,] "0.8723" "TLBif | Norav"
```

[7,] "0.8642" "Norav | Ratio.AllBac.HF183Taqman"
 [8,] "0.8603" "Norav | Ratio.AllBac.BacR"
 [9,] "0.8599" "Norav | AllBac"
 [10,] "0.8567" "Norav | Ratio.AllBac.Pig2Bac"

three variables

[1,] "0.8921" "Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
 [2,] "0.8919" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif"
 [3,] "0.8898" "Norav | PGMit | Ratio.TLBif.CWBif"
 [4,] "0.8888" "Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
 [5,] "0.8885" "TLBif | Norav | Ratio.TLBif.CWBif"
 [6,] "0.8872" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo"
 [7,] "0.8869" "Norav | PGMit | Ratio.AllBac.HF183Taqman"
 [8,] "0.886" "Norav | PGMit | Ratio.AllBac.Pig2Bac"
 [9,] "0.8858" "Norav | PGMit | Ratio.TLBif.PGNeo"
 [10,] "0.8857" "Norav | PGMit | Ratio.AllBac.BacR"
 [11,] "0.8856" "TLBif | Norav | PGMit"
 [12,] "0.8856" "Norav | PGMit | Ratio.TLBif.HMBif"
 [13,] "0.8855" "Norav | PGMit | Ratio.TLBif.PLBif"
 [14,] "0.8854" "Norav | AllBac | PGMit"
 [15,] "0.8831" "Norav | Ratio.TLBif.CWBif | Ratio.AllBac.HF183Taqman"
 [16,] "0.8828" "Norav | AllBac | Ratio.TLBif.CWBif"
 [17,] "0.8824" "Norav | Ratio.TLBif.CWBif | Ratio.AllBac.BacR"
 [18,] "0.8819" "Norav | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
 [19,] "0.8814" "TLBif | Norav | Ratio.TLBif.PGNeo"

four variables

#	accuracy	fourvar.names
[1,]	"0.9178"	"Norav Ratio.TLBif.HMBif Ratio.TLBif.CWBif Ratio.AllBac.HF183Taqman"
[2,]	"0.9174"	"Norav Ratio.TLBif.CWBif Ratio.TLBif.PGNeo Ratio.AllBac.BacR"
[3,]	"0.9171"	"Norav Ratio.TLBif.CWBif Ratio.TLBif.PGNeo Ratio.AllBac.HF183Taqman"
[4,]	"0.917"	"Norav AllBac Ratio.TLBif.HMBif Ratio.TLBif.CWBif"
[5,]	"0.917"	"Norav Ratio.TLBif.CWBif Ratio.TLBif.PGNeo Ratio.AllBac.Pig2Bac"
[6,]	"0.9165"	"Norav Ratio.TLBif.HMBif Ratio.TLBif.CWBif Ratio.AllBac.Pig2Bac"
[7,]	"0.9163"	"Norav Ratio.TLBif.HMBif Ratio.TLBif.CWBif Ratio.AllBac.BacR"
[8,]	"0.9157"	"Norav AllBac Ratio.TLBif.CWBif Ratio.TLBif.PGNeo"
[9,]	"0.9154"	"Norav Ratio.TLBif.CWBif Ratio.TLBif.PLBif Ratio.AllBac.BacR"
[10,]	"0.915"	"Norav Ratio.TLBif.HMBif Ratio.TLBif.PGNeo Ratio.AllBac.HF183Taqman"
[11,]	"0.9145"	"Norav Ratio.TLBif.HMBif Ratio.TLBif.CWBif Ratio.TLBif.PGNeo"
[12,]	"0.9142"	"TLBif Norav Ratio.TLBif.CWBif Ratio.AllBac.BacR"
[13,]	"0.9141"	"Norav Ratio.TLBif.CWBif Ratio.TLBif.PLBif Ratio.AllBac.HF183Taqman"
[14,]	"0.914"	"TLBif Norav AllBac Ratio.TLBif.CWBif"
[15,]	"0.9138"	"TLBif Norav Ratio.TLBif.CWBif Ratio.AllBac.HF183Taqman"
[16,]	"0.9135"	"TLBif Norav Ratio.TLBif.CWBif Ratio.AllBac.Pig2Bac"

[17,] "0.9135" "Norav | AllBac | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
 [18,] "0.9132" "Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif | Ratio.AllBac.Pig2Bac"
 [19,] "0.9122" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
 [20,] "0.9121" "Norav | AllBac | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo"
 [21,] "0.9113" "Norav | Ratio.TLBif.CWBif | Ratio.AllBac.Pig2Bac | Ratio.AllBac.HF183Taqman"
 [22,] "0.9111" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.AllBac.BacR"
 [23,] "0.911" "TLBif | Norav | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif"
 [24,] "0.9109" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.AllBac.Pig2Bac"
 [25,] "0.9107" "Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
 [26,] "0.9103" "Norav | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif"
 [27,] "0.9094" "Norav | AllBac | Ratio.TLBif.CWBif | Ratio.AllBac.HF183Taqman"
 [28,] "0.9094" "Norav | Ratio.TLBif.CWBif | Ratio.AllBac.BacR | Ratio.AllBac.Pig2Bac"
 [29,] "0.9092" "Norav | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif | Ratio.AllBac.HF183Taqman"
 [30,] "0.9089" "Norav | AllBac | Ratio.TLBif.CWBif | Ratio.AllBac.Pig2Bac"
 [31,] "0.9087" "TLBif | Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
 [32,] "0.9087" "Norav | Ratio.TLBif.CWBif | Ratio.AllBac.BacR | Ratio.AllBac.HF183Taqman"
 [33,] "0.9084" "Norav | Ratio.TLBif.PGNeo | Ratio.AllBac.Pig2Bac | Ratio.AllBac.HF183Taqman"
 [34,] "0.9079" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif | Ratio.AllBac.BacR"
 [35,] "0.9078" "TLBif | Norav | Ratio.TLBif.HMBif | Ratio.AllBac.HF183Taqman"
 [36,] "0.9078" "TLBif | Norav | Ratio.TLBif.PGNeo | Ratio.AllBac.HF183Taqman"
 [37,] "0.9078" "Norav | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo"
 [38,] "0.9075" "TLBif | Norav | AllBac | Ratio.TLBif.PGNeo"
 [39,] "0.9075" "TLBif | Norav | Ratio.TLBif.HMBif | Ratio.AllBac.BacR"
 [40,] "0.9074" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif | Ratio.AllBac.HF183Taqman"
 [41,] "0.9072" "TLBif | Norav | AllBac | Ratio.TLBif.HMBif"
 [42,] "0.9072" "TLBif | Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
 [43,] "0.907" "TLBif | Norav | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo"
 [44,] "0.9069" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
 [45,] "0.9068" "TLBif | Norav | Ratio.TLBif.PGNeo | Ratio.AllBac.BacR"
 [46,] "0.9066" "TLBif | Norav | PGMit | Ratio.TLBif.HMBif"
 [47,] "0.9066" "Norav | AllBac | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif"
 [48,] "0.9066" "Norav | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif"
 [49,] "0.9063" "Norav | AllBac | Ratio.TLBif.CWBif | Ratio.AllBac.BacR"
 [50,] "0.9063" "Norav | AllBac | Ratio.TLBif.PGNeo | Ratio.AllBac.HF183Taqman"
 [51,] "0.9061" "Norav | AllBac | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
 [52,] "0.9061" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif | Ratio.AllBac.Pig2Bac"
 [53,] "0.9059" "Norav | Ratio.TLBif.PGNeo | Ratio.AllBac.BacR | Ratio.AllBac.Pig2Bac"
 [54,] "0.9059" "Norav | Ratio.TLBif.PGNeo | Ratio.AllBac.BacR | Ratio.AllBac.HF183Taqman"
 [55,] "0.9058" "Norav | PGMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
 [56,] "0.9057" "Norav | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif | Ratio.AllBac.BacR"
 [57,] "0.9056" "Norav | AllBac | Ratio.TLBif.PGNeo | Ratio.AllBac.Pig2Bac"
 [58,] "0.9055" "Norav | PGMit | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
 [59,] "0.9055" "Norav | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif | Ratio.AllBac.Pig2Bac"
 [60,] "0.9054" "TLBif | Norav | PGMit | Ratio.TLBif.CWBif"
 [61,] "0.9048" "TLBif | Norav | Ratio.TLBif.HMBif | Ratio.AllBac.Pig2Bac"
 [62,] "0.9032" "Norav | PGMit | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
 [63,] "0.9031" "TLBif | Norav | PGMit | Ratio.TLBif.PGNeo"

[64,] "0.9031" "TLBif | Norav | Ratio.TLBif.PGNeo | Ratio.AllBac.Pig2Bac"
 [65,] "0.9028" "TLBif | Norav | PGMit | Ratio.TLBif.PLBif"
 [66,] "0.9027" "Norav | AllBac | Ratio.TLBif.PGNeo | Ratio.AllBac.BacR"
 [67,] "0.9022" "Norav | AllBac | Ratio.TLBif.HMBif | Ratio.AllBac.HF183Taqman"
 [68,] "0.9018" "Norav | Ratio.TLBif.HMBif | Ratio.AllBac.Pig2Bac | Ratio.AllBac.HF183Taqman"
 [69,] "0.9015" "Norav | AllBac | Ratio.TLBif.HMBif | Ratio.AllBac.Pig2Bac"
 [70,] "0.9012" "Norav | PGMit | Ratio.TLBif.HMBif | Ratio.AllBac.HF183Taqman"
 [71,] "0.9012" "Norav | PGMit | Ratio.TLBif.CWBif | Ratio.AllBac.Pig2Bac"
 [72,] "0.9011" "Norav | PGMit | Ratio.TLBif.PLBif | Ratio.AllBac.HF183Taqman"
 [73,] "0.901" "TLBif | Norav | PGMit | Ratio.AllBac.HF183Taqman"
 [74,] "0.9009" "TLBif | Norav | Ratio.TLBif.PLBif | Ratio.AllBac.HF183Taqman"
 [75,] "0.9009" "Norav | PGMit | Ratio.TLBif.HMBif | Ratio.AllBac.BacR"
 [76,] "0.9009" "Norav | PGMit | Ratio.TLBif.PGNeo | Ratio.AllBac.HF183Taqman"
 [77,] "0.9008" "Norav | PGMit | Ratio.TLBif.PLBif | Ratio.AllBac.Pig2Bac"
 [78,] "0.9008" "Norav | Ratio.TLBif.HMBif | Ratio.AllBac.BacR | Ratio.AllBac.Pig2Bac"
 [79,] "0.9007" "TLBif | Norav | AllBac | PGMit"
 [80,] "0.9007" "TLBif | Norav | AllBac | Ratio.TLBif.PLBif"
 [81,] "0.9007" "Norav | AllBac | PGMit | Ratio.TLBif.CWBif"
 [82,] "0.9007" "Norav | AllBac | PGMit | Ratio.TLBif.PGNeo"
 [83,] "0.9007" "Norav | AllBac | PGMit | Ratio.TLBif.PLBif"
 [84,] "0.9007" "Norav | PGMit | Ratio.TLBif.CWBif | Ratio.AllBac.HF183Taqman"
 [85,] "0.9006" "Norav | PGMit | Ratio.TLBif.CWBif | Ratio.AllBac.BacR"
 [86,] "0.9006" "Norav | PGMit | Ratio.TLBif.PLBif | Ratio.AllBac.BacR"
 [87,] "0.9005" "Norav | PGMit | Ratio.TLBif.PGNeo | Ratio.AllBac.Pig2Bac"
 [88,] "0.9004" "Norav | AllBac | PGMit | Ratio.TLBif.HMBif"
 [89,] "0.9004" "Norav | PGMit | Ratio.TLBif.HMBif | Ratio.AllBac.Pig2Bac"
 [90,] "0.9002" "Norav | Ratio.TLBif.HMBif | Ratio.AllBac.BacR | Ratio.AllBac.HF183Taqman"
 [91,] "0.9001" "TLBif | Norav | PGMit | Ratio.AllBac.BacR"
 [92,] "0.9001" "TLBif | Norav | PGMit | Ratio.AllBac.Pig2Bac"
 [93,] "0.9001" "Norav | PGMit | Ratio.TLBif.PGNeo | Ratio.AllBac.BacR"

5 variable results

[1,] "0.9213" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo |
 Ratio.AllBac.HF183Taqman"
 [2,] "0.9202" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo |
 Ratio.AllBac.Pig2Bac"
 [3,] "0.92" "Norav | AllBac | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
 [4,] "0.9189" "Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif |
 Ratio.AllBac.HF183Taqman"
 [5,] "0.9188" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo |
 Ratio.AllBac.BacR"
 [6,] "0.9187" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.AllBac.Pig2Bac |
 Ratio.AllBac.HF183Taqman"
 [7,] "0.9187" "Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.AllBac.Pig2Bac |
 Ratio.AllBac.HF183Taqman"

[8,] "0.9186" "Norav | AllBac | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.AllBac.Pig2Bac"
 [9,] "0.9185" "Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.AllBac.BacR |
 Ratio.AllBac.HF183Taqman"
 [10,] "0.9184" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.AllBac.BacR |
 Ratio.AllBac.Pig2Bac"
 [11,] "0.9184" "Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.AllBac.BacR |
 Ratio.AllBac.Pig2Bac"
 [12,] "0.9182" "TLBif | Norav | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.AllBac.HF183Taqman"
 [13,] "0.9181" "Norav | AllBac | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif |
 Ratio.AllBac.HF183Taqman"
 [14,] "0.9181" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.AllBac.BacR |
 Ratio.AllBac.HF183Taqman"
 [15,] "0.918" "Norav | AllBac | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.AllBac.Pig2Bac"
 [16,] "0.9179" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif |
 Ratio.AllBac.BacR"
 [17,] "0.9179" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif |
 Ratio.AllBac.HF183Taqman"
 [18,] "0.9177" "TLBif | Norav | AllBac | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif"
 [19,] "0.9176" "Norav | AllBac | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.AllBac.BacR"
 [20,] "0.9174" "Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif | Ratio.AllBac.BacR |
 Ratio.AllBac.Pig2Bac"
 [21,] "0.9173" "Norav | AllBac | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
 [22,] "0.9172" "Norav | AllBac | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
 [23,] "0.9171" "TLBif | Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.AllBac.BacR"
 [24,] "0.917" "Norav | AllBac | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.AllBac.BacR"
 [25,] "0.9168" "TLBif | Norav | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.AllBac.BacR"
 [26,] "0.9167" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif |
 Ratio.AllBac.Pig2Bac"
 [27,] "0.9167" "Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif |
 Ratio.AllBac.BacR"
 [28,] "0.9167" "Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif | Ratio.AllBac.Pig2Bac |
 Ratio.AllBac.HF183Taqman"
 [29,] "0.9166" "Norav | AllBac | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo |
 Ratio.AllBac.HF183Taqman"
 [30,] "0.9165" "Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif |
 Ratio.AllBac.Pig2Bac"
 [31,] "0.9163" "TLBif | Norav | AllBac | Ratio.TLBif.CWBif | Ratio.AllBac.Pig2Bac"
 [32,] "0.9163" "TLBif | Norav | Ratio.TLBif.CWBif | Ratio.AllBac.Pig2Bac |
 Ratio.AllBac.HF183Taqman"
 [33,] "0.9162" "TLBif | Norav | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.AllBac.Pig2Bac"
 [34,] "0.9162" "Norav | AllBac | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif | Ratio.AllBac.Pig2Bac"
 [35,] "0.9161" "Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif | Ratio.AllBac.BacR |
 Ratio.AllBac.HF183Taqman"
 [36,] "0.916" "TLBif | Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.AllBac.Pig2Bac"
 [37,] "0.916" "TLBif | Norav | Ratio.TLBif.CWBif | Ratio.AllBac.BacR | Ratio.AllBac.Pig2Bac"
 [38,] "0.9159" "TLBif | Norav | AllBac | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
 [39,] "0.9157" "TLBif | Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.AllBac.HF183Taqman"

[40,] "0.9156" "TLBif | Norav | AllBac | Ratio.TLBif.CWBif | Ratio.AllBac.HF183Taqman"
 [41,] "0.9155" "Norav | AllBac | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif | Ratio.AllBac.HF183Taqman"
 [42,] "0.9154" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo |
 Ratio.TLBif.PLBif"
 [43,] "0.9153" "TLBif | Norav | Ratio.TLBif.CWBif | Ratio.AllBac.BacR | Ratio.AllBac.HF183Taqman"
 [44,] "0.915" "Norav | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.AllBac.Pig2Bac"
 [45,] "0.9149" "TLBif | Norav | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
 [46,] "0.9148" "Norav | AllBac | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif | Ratio.AllBac.BacR"
 [47,] "0.9145" "TLBif | Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif | Ratio.AllBac.Pig2Bac"
 [48,] "0.9144" "TLBif | Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif | Ratio.AllBac.HF183Taqman"
 [49,] "0.9143" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif |
 Ratio.AllBac.HF183Taqman"
 [50,] "0.9142" "TLBif | Norav | AllBac | Ratio.TLBif.CWBif | Ratio.AllBac.BacR"
 [51,] "0.9142" "Norav | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.AllBac.BacR"
 [52,] "0.914" "Norav | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif |
 Ratio.AllBac.HF183Taqman"
 [53,] "0.9137" "TLBif | Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif | Ratio.AllBac.BacR"
 [54,] "0.9136" "TLBif | Norav | AllBac | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
 [55,] "0.9134" "Norav | AllBac | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif"
 [56,] "0.9133" "TLBif | Norav | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif"
 [57,] "0.9133" "TLBif | Norav | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo |
 Ratio.AllBac.HF183Taqman"
 [58,] "0.9132" "Norav | AllBac | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
 [59,] "0.9131" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.AllBac.Pig2Bac |
 Ratio.AllBac.HF183Taqman"
 [60,] "0.9128" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.AllBac.BacR |
 Ratio.AllBac.Pig2Bac"
 [61,] "0.9125" "TLBif | Norav | PGMit | Ratio.TLBif.HMBif | Ratio.AllBac.BacR"
 [62,] "0.9125" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.AllBac.BacR |
 Ratio.AllBac.HF183Taqman"
 [63,] "0.9123" "Norav | AllBac | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.AllBac.Pig2Bac"
 [64,] "0.9123" "Norav | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
 [65,] "0.9122" "Norav | AllBac | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.AllBac.BacR"
 [66,] "0.9122" "Norav | AllBac | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo |
 Ratio.AllBac.HF183Taqman"
 [67,] "0.9121" "Norav | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif | Ratio.AllBac.HF183Taqman"
 [68,] "0.9119" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif |
 Ratio.AllBac.Pig2Bac"
 [69,] "0.9118" "TLBif | Norav | AllBac | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo"
 [70,] "0.9118" "Norav | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo |
 Ratio.AllBac.HF183Taqman"
 [71,] "0.9118" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif |
 Ratio.AllBac.BacR"
 [72,] "0.9116" "TLBif | Norav | PGMit | Ratio.TLBif.HMBif | Ratio.AllBac.HF183Taqman"
 [73,] "0.9115" "TLBif | Norav | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
 [74,] "0.9114" "Norav | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
 [75,] "0.9112" "TLBif | Norav | PGMit | Ratio.TLBif.CWBif | Ratio.AllBac.HF183Taqman"

[76,] "0.9112" "Norav | AllBac | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo"
 [77,] "0.9112" "Norav | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.AllBac.Pig2Bac"
 [78,] "0.9111" "TLBif | Norav | PGMit | Ratio.TLBif.HMBif | Ratio.AllBac.Pig2Bac"
 [79,] "0.911" "TLBif | Norav | AllBac | PGMit | Ratio.TLBif.HMBif"
 [80,] "0.9109" "Norav | AllBac | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif"
 [81,] "0.9108" "Norav | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif | Ratio.AllBac.BacR"
 [82,] "0.9105" "Norav | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif | Ratio.AllBac.Pig2Bac"
 [83,] "0.9104" "TLBif | Norav | AllBac | PGMit | Ratio.TLBif.CWBif"
 [84,] "0.9104" "TLBif | Norav | PGMit | Ratio.TLBif.CWBif | Ratio.AllBac.BacR"
 [85,] "0.9104" "Norav | PGMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo |
 Ratio.AllBac.HF183Taqman"
 [86,] "0.9103" "TLBif | Norav | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.AllBac.BacR"
 [87,] "0.9103" "Norav | PGMit | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif | Ratio.AllBac.HF183Taqman"
 [88,] "0.9101" "TLBif | Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
 [89,] "0.91" "TLBif | Norav | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.AllBac.Pig2Bac"
 [90,] "0.91" "Norav | PGMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.AllBac.BacR"
 [91,] "0.91" "Norav | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif | Ratio.AllBac.Pig2Bac |
 Ratio.AllBac.HF183Taqman"
 [92,] "0.9098" "Norav | AllBac | PGMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
 [93,] "0.9098" "Norav | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.AllBac.BacR"
 [94,] "0.9097" "TLBif | Norav | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo"
 [95,] "0.9097" "TLBif | Norav | PGMit | Ratio.TLBif.CWBif | Ratio.AllBac.Pig2Bac"
 [96,] "0.9096" "Norav | AllBac | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif |
 Ratio.AllBac.HF183Taqman"
 [97,] "0.9096" "Norav | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
 [98,] "0.9094" "TLBif | Norav | Ratio.TLBif.PGNeo | Ratio.AllBac.Pig2Bac |
 Ratio.AllBac.HF183Taqman"
 [99,] "0.9092" "Norav | PGMit | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif |
 Ratio.AllBac.HF183Taqman"
 [100,] "0.9091" "TLBif | Norav | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif |
 Ratio.AllBac.HF183Taqman"
 [101,] "0.909" "TLBif | Norav | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif"
 # ...
 [461,] "0.8255" "AllBac | Ratio.TLBif.PLBif | Ratio.AllBac.BacR | Ratio.AllBac.Pig2Bac |
 Ratio.AllBac.HF183Taqman"
 [462,] "0.8227" "TLBif | AllBac | Ratio.AllBac.BacR | Ratio.AllBac.Pig2Bac |
 Ratio.AllBac.HF183Taqman"

CASE B – MULTINOMIAL (HM / CW / PG / PL)

single variable

```
# accuracy single.res.b.t
[1,] "0.7013" "Ratio.TLBif.CWBif"
[2,] "0.6985" "Ratio.TLBif.PLBif"
[3,] "0.693" "Ratio.TLBif.PGNeo"
```

[4,]	"0.6902"	"Ratio.TLBif.HMBif"
[5,]	"0.6861"	"TLBif"
[6,]	"0.5467"	"Norav"
[7,]	"0.4457"	"CWMit"
[8,]	"0.443"	"PGMit"
[9,]	"0.4336"	"PLMit"

two variables

```
# Accuracy twovar.names.tB
[1,] "0.7662" "Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
[2,] "0.7495" "Ratio.TLBif.HMBif | Ratio.TLBif.PLBif"
[3,] "0.7477" "Ratio.TLBif.HMBif | Ratio.TLBif.CWBif"
[4,] "0.7474" "Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[5,] "0.7452" "Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
[6,] "0.7319" "TLBif | Ratio.TLBif.CWBif"
[7,] "0.7281" "TLBif | Ratio.TLBif.PLBif"
[8,] "0.7248" "Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo"
[9,] "0.7082" "TLBif | Ratio.TLBif.HMBif"
[10,] "0.7071" "TLBif | Ratio.TLBif.PGNeo"
[11,] "0.6539" "Norav | Ratio.TLBif.PLBif"
[12,] "0.6039" "Norav | CWMit"
[13,] "0.6003" "Norav | Ratio.TLBif.CWBif"
[14,] "0.5962" "Norav | PGMit"
[15,] "0.5904" "Norav | PLMit"
[16,] "0.5816" "Norav | Ratio.TLBif.HMBif"
[17,] "0.5805" "CWMit | PGMit"
[18,] "0.5736" "Norav | Ratio.TLBif.PGNeo"
[19,] "0.5703" "TLBif | Norav"
[20,] "0.5666" "PGMit | PLMit"
[21,] "0.5663" "CWMit | PLMit"
[22,] "0.5297" "PGMit | Ratio.TLBif.PLBif"
[23,] "0.5123" "CWMit | Ratio.TLBif.PLBif"
[24,] "0.5122" "PGMit | Ratio.TLBif.CWBif"
[25,] "0.5097" "PLMit | Ratio.TLBif.PGNeo"
[26,] "0.4957" "PLMit | Ratio.TLBif.CWBif"
[27,] "0.4924" "PGMit | Ratio.TLBif.HMBif"
[28,] "0.4878" "PLMit | Ratio.TLBif.PLBif"
[29,] "0.4867" "CWMit | Ratio.TLBif.PGNeo"
[30,] "0.4824" "PGMit | Ratio.TLBif.PGNeo"
[31,] "0.4822" "CWMit | Ratio.TLBif.HMBif"
[32,] "0.4804" "TLBif | PGMit"
[33,] "0.4753" "PLMit | Ratio.TLBif.HMBif"
[34,] "0.4736" "CWMit | Ratio.TLBif.CWBif"
[35,] "0.4722" "TLBif | PLMit"
[36,] "0.4613" "TLBif | CWMit"
```

three variables

```
# Accuracy threevar.names.tB
[1,] "0.7772" "Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
[2,] "0.7744" "Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[3,] "0.764" "TLBif | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
[4,] "0.7631" "Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[5,] "0.7564" "Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
[6,] "0.749" "TLBif | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif"
[7,] "0.7474" "TLBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[8,] "0.7458" "TLBif | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif"
[9,] "0.7435" "TLBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
[10,] "0.7349" "Norav | CWMit | PGMit"
[11,] "0.7241" "TLBif | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo"
[12,] "0.7107" "Norav | PGMit | PLMit"
[13,] "0.7045" "CWMit | PGMit | PLMit"
[14,] "0.6968" "Norav | PGMit | Ratio.TLBif.PLBif"
[15,] "0.6895" "Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
[16,] "0.685" "Norav | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[17,] "0.6788" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif"
[18,] "0.665" "TLBif | Norav | Ratio.TLBif.PLBif"
[19,] "0.6411" "Norav | PGMit | Ratio.TLBif.CWBif"
[20,] "0.6406" "Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
```

four variables

```
# Accuracy fourvar.names.tB
[1,] "0.8278" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
[2,] "0.827" "Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[3,] "0.8198" "TLBif | Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
[4,] "0.8151" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
[5,] "0.8127" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[6,] "0.8078" "TLBif | Norav | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif"
[7,] "0.8067" "TLBif | Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
[8,] "0.8039" "TLBif | Norav | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[9,] "0.8028" "CWMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
[10,] "0.8008" "TLBif | Norav | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif"
[11,] "0.7997" "CWMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[12,] "0.7987" "PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
[13,] "0.797" "PGMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[14,] "0.7969" "PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
[15,] "0.7945" "PLMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[16,] "0.7937" "TLBif | CWMit | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
[17,] "0.7913" "PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[18,] "0.7908" "CWMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
```

[19,] "0.7898" "TLBif | PGMit | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
 [20,] "0.7898" "PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
 [21,] "0.7868" "Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
 [22,] "0.7857" "TLBif | PLMit | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
 [23,] "0.7831" "TLBif | CWMit | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif"
 [24,] "0.7824" "TLBif | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif"
 [25,] "0.782" "TLBif | Norav | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo"
 [26,] "0.7811" "TLBif | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif"
 [27,] "0.7805" "PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
 [28,] "0.7797" "TLBif | PLMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
 [29,] "0.7793" "CWMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
 [30,] "0.7789" "TLBif | PGMit | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
 [31,] "0.7784" "TLBif | CWMit | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
 [32,] "0.778" "TLBif | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
 [33,] "0.7769" "PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
 [34,] "0.7762" "TLBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
 [35,] "0.7736" "TLBif | CWMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif"

five variables

```
# Accuracy      fivevar.names.tB
[1,] "0.8319" "Norav | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[2,] "0.8269" "TLBif | Norav | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
[ 3,] "0.8267" "TLBif | Norav | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[ 4,] "0.8139" "TLBif | Norav | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
[ 5,] "0.8122" "TLBif | Norav | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[6,] "0.8056" "CWMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[ 7,] "0.8045" "PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[ 8,] "0.8037" "PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[ 9,] "0.801" "TLBif | CWMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
[10,] "0.7983" "TLBif | CWMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[11,] "0.798" "TLBif | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
[12,] "0.7972" "TLBif | PGMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[13,] "0.795" "TLBif | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
[14,] "0.7932" "TLBif | PLMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[15,] "0.7923" "Norav | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
[16,] "0.7921" "Norav | PGMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[17,] "0.7905" "TLBif | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[18,] "0.7899" "TLBif | CWMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[19,] "0.7891" "Norav | CWMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[20,] "0.7882" "TLBif | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
[21,] "0.7865" "Norav | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
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[22,] "0.7852" "TLBif | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
 [23,] "0.7849" "Norav | CWMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
 [24,] "0.7847" "TLBif | Norav | PGMit | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
 [25,] "0.7844" "TLBif | Norav | PGMit | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
 [26,] "0.7795" "TLBif | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
 [27,] "0.7794" "Norav | PLMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
 [28,] "0.7785" "TLBif | Norav | CWMit | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
 [29,] "0.7781" "TLBif | CWMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
 [30,] "0.7781" "Norav | CWMit | PGMit | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
 [31,] "0.7781" "Norav | PGMit | PLMit | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
 [32,] "0.7778" "TLBif | Norav | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif"
 [33,] "0.7777" "TLBif | Norav | PLMit | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
 [34,] "0.7766" "TLBif | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
 [35,] "0.7763" "Norav | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
 [36,] "0.7715" "Norav | CWMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
 [37,] "0.7693" "Norav | PGMit | PLMit | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
 [38,] "0.7688" "Norav | CWMit | PGMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
 [39,] "0.7688" "Norav | CWMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
 [40,] "0.7687" "TLBif | Norav | CWMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif"
 [41,] "0.7679" "TLBif | Norav | PGMit | PLMit | Ratio.TLBif.PLBif"
 [42,] "0.7663" "Norav | CWMit | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif"
 [43,] "0.7663" "Norav | PGMit | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif"
 [44,] "0.7654" "TLBif | Norav | CWMit | PGMit | Ratio.TLBif.CWBif"
 [45,] "0.7632" "TLBif | Norav | CWMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
 [46,] "0.763" "TLBif | Norav | CWMit | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif"
 [47,] "0.7615" "Norav | CWMit | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif"
 [48,] "0.7614" "Norav | CWMit | PGMit | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
 [49,] "0.7614" "CWMit | PGMit | PLMit | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
 [50,] "0.7613" "TLBif | Norav | CWMit | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
 [51,] "0.7568" "TLBif | Norav | CWMit | PGMit | Ratio.TLBif.PLBif"
 [52,] "0.7567" "Norav | CWMit | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo"
 [53,] "0.7554" "Norav | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
 [54,] "0.7549" "Norav | CWMit | PGMit | PLMit | Ratio.TLBif.CWBif"
 [55,] "0.754" "Norav | CWMit | PLMit | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
 [56,] "0.753" "Norav | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
 [57,] "0.7523" "CWMit | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
 [58,] "0.7521" "Norav | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
 [59,] "0.7518" "CWMit | PGMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
 [60,] "0.7517" "TLBif | Norav | PLMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
 [61,] "0.7507" "TLBif | Norav | CWMit | PGMit | Ratio.TLBif.HMBif"
 [62,] "0.7504" "TLBif | Norav | CWMit | PGMit | Ratio.TLBif.PGNeo"
 [63,] "0.7494" "TLBif | Norav | PGMit | PLMit | Ratio.TLBif.CWBif"
 [64,] "0.749" "TLBif | Norav | PGMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
 [65,] "0.749" "Norav | CWMit | PGMit | PLMit | Ratio.TLBif.PLBif"
 [66,] "0.749" "Norav | PGMit | PLMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
 [67,] "0.7488" "TLBif | CWMit | PGMit | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"

[68,] "0.7487" "TLBif | Norav | PLMit | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[69,] "0.7487" "Norav | PGMit | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif"
[70,] "0.7481" "TLBif | Norav | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif"
[71,] "0.7465" "TLBif | Norav | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif"
[72,] "0.744" "Norav | CWMit | PLMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
[73,] "0.7422" "TLBif | Norav | PGMit | PLMit | Ratio.TLBif.PGNeo"
[74,] "0.7418" "Norav | PGMit | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo"
[75,] "0.7412" "CWMit | PGMit | PLMit | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[76,] "0.7411" "TLBif | CWMit | PGMit | PLMit | Ratio.TLBif.PLBif"
[77,] "0.741" "Norav | CWMit | PGMit | PLMit | Ratio.TLBif.HMBif"
[78,] "0.7408" "TLBif | Norav | CWMit | PGMit | PLMit"
[79,] "0.7408" "CWMit | PGMit | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif"
[80,] "0.7401" "Norav | CWMit | PGMit | PLMit | Ratio.TLBif.PGNeo"
[81,] "0.7397" "Norav | CWMit | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif"
[82,] "0.7389" "TLBif | Norav | PGMit | PLMit | Ratio.TLBif.HMBif"
[83,] "0.7378" "CWMit | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
[84,] "0.7374" "TLBif | Norav | CWMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo"
[85,] "0.7366" "TLBif | Norav | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif"
[86,] "0.7352" "TLBif | Norav | CWMit | PLMit | Ratio.TLBif.CWBif"
[87,] "0.7348" "CWMit | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[88,] "0.7313" "CWMit | PLMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[89,] "0.7308" "CWMit | PGMit | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif"
[90,] "0.7306" "TLBif | CWMit | PGMit | PLMit | Ratio.TLBif.CWBif"
[91,] "0.7302" "CWMit | PGMit | PLMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
[92,] "0.7299" "TLBif | CWMit | PGMit | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[93,] "0.7288" "CWMit | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[94,] "0.7282" "Norav | CWMit | PLMit | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[95,] "0.7261" "TLBif | CWMit | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif"
[96,] "0.7257" "CWMit | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
[97,] "0.7256" "Norav | CWMit | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif"
[98,] "0.7254" "TLBif | Norav | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo"
[99,] "0.7251" "TLBif | CWMit | PLMit | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
[100,] "0.7233" "TLBif | Norav | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo"
[101,] "0.7224" "PGMit | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
[102,] "0.7221" "Norav | CWMit | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo"
[103,] "0.7202" "PGMit | PLMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[104,] "0.7175" "TLBif | Norav | CWMit | PLMit | Ratio.TLBif.PLBif"
[105,] "0.714" "TLBif | PGMit | PLMit | Ratio.TLBif.CWBif | Ratio.TLBif.PLBif"
[106,] "0.7109" "TLBif | CWMit | PGMit | PLMit | Ratio.TLBif.HMBif"
[107,] "0.7109" "CWMit | PGMit | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo"
[108,] "0.7105" "TLBif | CWMit | PGMit | PLMit | Ratio.TLBif.PGNeo"
[109,] "0.7104" "TLBif | CWMit | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif"
[110,] "0.7083" "TLBif | Norav | CWMit | PLMit | Ratio.TLBif.HMBif"
[111,] "0.7059" "TLBif | CWMit | PLMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
[112,] "0.7058" "TLBif | Norav | CWMit | PLMit | Ratio.TLBif.PGNeo"
[113,] "0.7015" "PGMit | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[114,] "0.6988" "PGMit | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"

[115,] "0.6966" "TLBif | CWMit | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo"
[116,] "0.6945" "CWMit | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
[117,] "0.693" "TLBif | CWMit | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif"
[118,] "0.6925" "TLBif | CWMit | PLMit | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"
[119,] "0.6917" "TLBif | CWMit | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif"
[120,] "0.6912" "TLBif | PGMit | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.PLBif"
[121,] "0.6895" "TLBif | PGMit | PLMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
[122,] "0.6886" "TLBif | PGMit | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.CWBif"
[123,] "0.6829" "TLBif | CWMit | PGMit | Ratio.TLBif.CWBif | Ratio.TLBif.PGNeo"
[124,] "0.6697" "TLBif | CWMit | PGMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo"
[125,] "0.667" "TLBif | PGMit | PLMit | Ratio.TLBif.HMBif | Ratio.TLBif.PGNeo"
[126,] "0.6663" "TLBif | PGMit | PLMit | Ratio.TLBif.PGNeo | Ratio.TLBif.PLBif"