```
<< PrSAT`
```

Nickerson‘s RBH model:

```
MODEL1 = PrSAT[{Pr[H] == 1 / 2,
   Pr[R && B | H] == 50 / 1000, Pr[R && B | ! H] == 25 / 1000,
   Pr[R && ! B | H] == 0, Pr[R && ! B | ! H] == 25 / 1000,
   Pr[! R && B | H] == 50 / 1000, Pr[! R && B | ! H] == 75 / 1000,
   Pr[! R && ! B | H] == 900 / 1000, Pr[! R && ! B | ! H] == 875 / 1000}]
```

$$\{\{B \to \{a_2, a_5, a_6, a_8\}, H \to \{a_3, a_5, a_7, a_8\}, R \to \{a_4, a_6, a_7, a_8\}, \Omega \to \{a_1, a_2, a_3, a_4, a_5, a_6, a_7, a_8\}\}, \left\{a_1 \to \frac{7}{16}, a_2 \to \frac{3}{80}, a_3 \to \frac{9}{20}, a_4 \to \frac{1}{80}, a_5 \to \frac{1}{40}, a_6 \to \frac{1}{80}, a_7 \to 0, a_8 \to \frac{1}{40}\right\}\}$$

These constraints give a unique model:

```
Solve[AlgebraicForm[{Pr[H] == 1 / 2,
    Pr[R && B | H] == 50 / 1000, Pr[R && B | ! H] == 25 / 1000,
    Pr[R && ! B | H] == 0, Pr[R && ! B | ! H] == 25 / 1000,
    Pr[! R && B | H] == 50 / 1000, Pr[! R && B | ! H] == 75 / 1000,
    Pr[! R && ! B | H] == 900 / 1000, Pr[! R && ! B | ! H] == 875 / 1000}, {R, B, H}]][[1]] // Sort
```

$$\left\{a_2 \to \frac{3}{80}, a_3 \to \frac{9}{20}, a_4 \to \frac{1}{80}, a_5 \to \frac{1}{40}, a_6 \to \frac{1}{80}, a_7 \to 0, a_8 \to \frac{1}{40}\right\}$$

```
EvaluateProbability[{Pr[B], Pr[! B], Pr[R]}, MODEL1]
```

$$\left\{\frac{1}{10}, \frac{9}{10}, \frac{1}{20}\right\}$$

```
EvaluateProbability[{Pr[H | R && B], Pr[H | ! R && B], Pr[H | ! R && ! B]}, MODEL1]
```

$$\left\{\frac{2}{3}, \frac{2}{5}, \frac{36}{71}\right\}$$

Nickerson‘s rBH model:

```
MODEL2 = PrSAT[{Pr[H] == 1 / 2,
   Pr[B | r && H] == 1, Pr[B | r && ! H] == 500 / 1000,
   Pr[! B | r && H] == 0, Pr[! B | r && ! H] == 500 / 1000,
   Pr[B | ! r && H] == 53 / 1000, Pr[B | ! r && ! H] == 79 / 1000,
   Pr[! B | ! r && H] == 947 / 1000 , Pr[! B | ! r && ! H] == 921 / 1000,
   Pr[H | r && B] == 2 / 3, Pr[r && B && H] == 1 / 40}]
```

$$\{\{B \to \{a_2, a_5, a_6, a_8\}, H \to \{a_3, a_5, a_7, a_8\}, r \to \{a_4, a_6, a_7, a_8\}, \Omega \to \{a_1, a_2, a_3, a_4, a_5, a_6, a_7, a_8\}\}, \left\{a_1 \to \frac{17499}{40000}, a_2 \to \frac{1501}{40000}, a_3 \to \frac{17993}{40000}, a_4 \to \frac{1}{80}, a_5 \to \frac{1007}{40000}, a_6 \to \frac{1}{80}, a_7 \to 0, a_8 \to \frac{1}{40}\right\}\}$$

These don‘t give a unique model!

```
Solve[AlgebraicForm[{Pr[H] == 1 / 2,
    Pr[B | r && H] == 1, Pr[B | r && ! H] == 500 / 1000,
    Pr[! B | r && H] == 0, Pr[! B | r && ! H] == 500 / 1000,
    Pr[B | ! r && H] == 53 / 1000, Pr[B | ! r && ! H] == 79 / 1000,
    Pr[! B | ! r && H] == 947 / 1000 , Pr[! B | ! r && ! H] == 921 / 1000,
    Pr[H | r && B] == 2 / 3, Pr[r && B && H] == 1 / 40}, {B, r, H}]][[1]] // Sort
```

$$\left\{a_2 \to \frac{1501}{40\,000},\ a_3 \to \frac{17\,993}{40\,000},\ a_4 \to \frac{1}{80},\ a_5 \to \frac{1007}{40\,000},\ a_6 \to \frac{1}{80},\ a_7 \to 0,\ a_8 \to \frac{1}{40}\right\}$$

Nickerson‘s expectations - “under H“

```
EvaluateProbability[
  {Pr[B | r && H] Abs[Pr[H | r && B] - Pr[H | r]] + Pr[! B | r && H] Abs[Pr[H | r && ! B] - Pr[H | r]]},
  MODEL2] // N
```

{0.166667}

```
EvaluateProbability[
  {Pr[B | ! r && H] Abs[Pr[H | ! r && B] - Pr[H | r]] + Pr[! B | ! r && H] Abs[Pr[H | ! r && ! B] - Pr[H | r]]},
  MODEL2] // N
```

{0.0118102}

Nickerson‘s expectations - “under ~H“

```
EvaluateProbability[{Pr[B | r && ! H] Abs[Pr[! H | r && B] - Pr[! H | r]] +
    Pr[! B | r && ! H] Abs[Pr[! H | r && ! B] - Pr[! H | r]]}, MODEL2] // N
```

{0.333333}

```
EvaluateProbability[{Pr[B | ! r && ! H] Abs[Pr[! H | ! r && B] - Pr[! H | ! r]] +
    Pr[! B | ! r && ! H] Abs[Pr[! H | ! r && ! B] - Pr[! H | ! r]]}, MODEL2] // N
```

{0.0141898}

Why not calculate them this way instead -- “unconditionally“ -- not “under either hypothesis“?

```
EvaluateProbability[
  {Pr[B | r] Abs[Pr[H | r && B] - Pr[H | r]] + Pr[! B | r] Abs[Pr[H | r && ! B] - Pr[H | r]]}, MODEL2] // N
```

{0.25}

```
EvaluateProbability[
  {Pr[B | ! r] Abs[Pr[H | ! r && B] - Pr[H | ! r]] + Pr[! B | ! r] Abs[Pr[H | ! r && ! B] - Pr[H | ! r]]},
  MODEL2] // N
```

{0.013}

Nickerson‘s bRH model:

```
MODEL3 = PrSAT[{Pr[H] == 1 / 2,
   Pr[R | b && H] == 500 / 1000, Pr[R | b && ! H] == 250 / 1000,
   Pr[R | ! b && H] == 0, Pr[R | ! b && ! H] == 28 / 1000,
   Pr[! R | b && H] == 500 / 1000, Pr[! R | b && ! H] == 750 / 1000,
   Pr[! R | ! b && H] == 1, Pr[! R | ! b && ! H] == 972 / 1000,
   Pr[H | R && b] == 2 / 3, Pr[R && b && H] == 1 / 40}]
```

$$\Big\{\{b \to \{a_2, a_5, a_6, a_8\},\ H \to \{a_3, a_5, a_7, a_8\},\ R \to \{a_4, a_6, a_7, a_8\},\ \Omega \to \{a_1, a_2, a_3, a_4, a_5, a_6, a_7, a_8\}\},$$
$$\left\{a_1 \to \frac{2187}{5000},\ a_2 \to \frac{3}{80},\ a_3 \to \frac{9}{20},\ a_4 \to \frac{63}{5000},\ a_5 \to \frac{1}{40},\ a_6 \to \frac{1}{80},\ a_7 \to 0,\ a_8 \to \frac{1}{40}\right\}\Big\}$$

```
Solve[AlgebraicForm[{Pr[H] == 1 / 2,
    Pr[R | b && H] == 500 / 1000, Pr[R | b && ! H] == 250 / 1000,
    Pr[R | ! b && H] == 0, Pr[R | ! b && ! H] == 28 / 1000,
    Pr[! R | b && H] == 500 / 1000, Pr[! R | b && ! H] == 750 / 1000,
    Pr[! R | ! b && H] == 1, Pr[! R | ! b && ! H] == 972 / 1000,
    Pr[H | R && b] == 2 / 3, Pr[R && b && H] == 1 / 40}, {b, R, H}]][[1]] // Sort
```

$\left\{a_2 \to \frac{3}{80}, a_3 \to \frac{9}{20}, a_4 \to \frac{63}{5000}, a_5 \to \frac{1}{40}, a_6 \to \frac{1}{80}, a_7 \to 0, a_8 \to \frac{1}{40}\right\}$

Nickerson‘s expectations - “under H“: he calculates this first one wrong, but this correction only makes his case stronger...

```
EvaluateProbability[
  {Pr[R | b && H] Abs[Pr[H | R && b] - Pr[H | b]] + Pr[! R | b && H] Abs[Pr[H | b && ! R] - Pr[H | b]]},
  MODEL3] // N
```

```
{0.133333}
```

```
EvaluateProbability[{Pr[R | ! b && H] Abs[Pr[H | R && ! b] - Pr[H | ! b]] +
    Pr[! R | ! b && H] Abs[Pr[H | ! b && ! R] - Pr[H | ! b]]}, MODEL3] // N
```

```
{0.00709939}
```

Why not calculate them this way instead -- “unconditionally“ -- not “under either hypothesis“?

```
EvaluateProbability[
  {Pr[R | b] Abs[Pr[H | R && b] - Pr[H | b]] + Pr[! R | b] Abs[Pr[H | b && ! R] - Pr[H | b]]}, MODEL3] // N
```

```
{0.125}
```

```
EvaluateProbability[
  {Pr[R | b] Abs[Pr[H | R && b] - Pr[H | b]] + Pr[! R | b] Abs[Pr[H | b && ! R] - Pr[H | b]]}, MODEL2] // N
```

```
{0.013}
```

Postscript: No Carnapian models can exhibit the Nickerson-ordering. Here‘s a quick proof, using Maher‘s parameterization of Carnap‘s later systems:

■ Computing the Measure on the State Descriptions

■ Finding Models in Maher's System

■ Proof that no Carnapian-Nickerson Models Exist

```
In[257]:= FindMaherModel[Pr[Ga | Fa] Abs[Pr[(Fa ⊃ Ga) ⋀ (Fb ⊃ Gb) | Fa ⋀ Ga] - Pr[(Fa ⊃ Ga) ⋀ (Fb ⊃ Gb) | Fa]] +
      Pr[¬ Ga | Fa] Abs[Pr[(Fa ⊃ Ga) ⋀ (Fb ⊃ Gb) | Fa ⋀ ¬ Ga] - Pr[(Fa ⊃ Ga) ⋀ (Fb ⊃ Gb) | Fa]] >
    Pr[Fa | Ga] Abs[Pr[(Fa ⊃ Ga) ⋀ (Fb ⊃ Gb) | Fa ⋀ Ga] - Pr[(Fa ⊃ Ga) ⋀ (Fb ⊃ Gb) | Ga]] +
      Pr[¬ Fa | Ga] Abs[Pr[(Fa ⊃ Ga) ⋀ (Fb ⊃ Gb) | ¬ Fa ⋀ Ga] - Pr[(Fa ⊃ Ga) ⋀ (Fb ⊃ Gb) | Ga]] >
    Pr[Fa | ¬ Ga] Abs[Pr[(Fa ⊃ Ga) ⋀ (Fb ⊃ Gb) | Fa ⋀ ¬ Ga] - Pr[(Fa ⊃ Ga) ⋀ (Fb ⊃ Gb) | ¬ Ga]] +
      Pr[¬ Fa | ¬ Ga] Abs[Pr[(Fa ⊃ Ga) ⋀ (Fb ⊃ Gb) | ¬ Fa ⋀ ¬ Ga] - Pr[(Fa ⊃ Ga) ⋀ (Fb ⊃ Gb) | ¬ Ga]] >
    Pr[Ga | ¬ Fa] Abs[Pr[(Fa ⊃ Ga) ⋀ (Fb ⊃ Gb) | ¬ Fa ⋀ Ga] - Pr[(Fa ⊃ Ga) ⋀ (Fb ⊃ Gb) | ¬ Fa]] +
      Pr[¬ Ga | ¬ Fa] Abs[Pr[(Fa ⊃ Ga) ⋀ (Fb ⊃ Gb) | ¬ Fa ⋀ ¬ Ga] - Pr[(Fa ⊃ Ga) ⋀ (Fb ⊃ Gb) | ¬ Fa]]]

Out[257]= {}
```

This can be shown also for the full 4-parameter case, as well as for other measures of confirmation.