Instability of âCLL under OFE,
even in the presence of pseudo-counts

Constants

```
beta = (Pi^2 - 18) / 24;
alpha = (Pi^2 + 6) / 24;
lambda = (Pi^2) / 6;
```

Case I dataset with 500 elements

- **Dataset values**

```
Nijck = 400;

Nijc = 410;

(*Nij(1-c)*)
Nijcc  = 20;

(*Nij(1-c)*)
Nijcck = 0 ;
```

- **PseudoCounts 0.5**

```
PC = 0.5;
NijckPC = Nijck + PC;
NijcPC = Nijc + 2 * PC;
NijccPC  = Nijcc + 2 * PC;
NijcckPC = Nijcck + PC;
```

- **âCLL left summand**

```
N[alpha NijckPC Log[2, NijckPC / NijcPC]]
```

```
-9.88751
```

- **âCLL right summand (bad behaviour)**

```
N[beta NijckPC Log[2, NijcckPC / NijccPC]]
```

```
731.608
```

- **fCLL left summand**

```
N[(alpha + beta) NijckPC Log[2, NijckPC / NijcPC]]
```

```
-4.82189
```

- **fCLL right summand**

```
N[-beta * lambda * NijckPC
   (Log[2, NijckPC / (NijcckPC + NijckPC)] - Log[2, NijcPC / (NijcPC + NijccPC)])]
```

```
15.6432
```

PseudoCounts 5

```
PC = 5;
NijckPC = Nijck + PC;
NijcPC = Nijc + 2 * PC;
NijccPC  = Nijcc + 2 * PC;
NijcckPC = Nijcck + PC;
```

- âCLL left summand

```
N[alpha NijckPC Log[2, NijckPC / NijcPC]]
```

```
-14.0508
```

- âCLL right summand (bad behaviour)

```
N[beta NijckPC Log[2, NijcckPC / NijccPC]]
```

```
354.658
```

- fCLL left summand

```
N[(alpha + beta) NijckPC Log[2, NijckPC / NijcPC]]
```

```
-6.8522
```

- fCLL right summand

```
N[-beta * lambda * NijckPC
   (Log[2, NijckPC / (NijcckPC + NijckPC)] - Log[2, NijcPC / (NijcPC + NijccPC)])]
```

```
18.4687
```

PseudoCounts 10

```
PC = 10;
NijckPC = Nijck + PC;
NijcPC = Nijc + 2 * PC;
NijccPC  = Nijcc + 2 * PC;
NijcckPC = Nijcck + PC;
```

- âCLL left summand

```
N[alpha NijckPC Log[2, NijckPC / NijcPC]]
```

```
-18.6284
```

- âCLL right summand (bad behaviour)

```
N[beta NijckPC Log[2, NijcckPC / NijccPC]]
```

```
277.789
```

- fCLL left summand

```
N[(alpha + beta) NijckPC Log[2, NijckPC / NijcPC]]
```

```
-9.08461
```

fCLL right summand

```
N[-beta * lambda * NijckPC
   (Log[2, NijckPC / (NijcckPC + NijckPC)] - Log[2, NijcPC / (NijcPC + NijccPC)])]
```

```
21.3755
```

Case II dataset with 1000 elements

- **Dataset values that make âCLL diverge**

```
Nijck = 800;

Nijc = 810;

(*Nij(1-c)*)
Nijcc = 30;

(*Nij(1-c)*)
Nijcck = 0 ;
```

- **PseudoCounts 0.5**

```
PC = 0.5;
NijckPC = Nijck + PC;
NijcPC = Nijc + 2 * PC;
NijccPC = Nijcc + 2 * PC;
NijcckPC = Nijcck + PC;
```

- âCLL left summand

```
N[alpha NijckPC Log[2, NijckPC / NijcPC]]
```

```
-9.95144
```

- **âCLL right summand (bad behaviour)**

```
N[beta NijckPC Log[2, NijcckPC / NijccPC]]
```

```
1614.67
```

- fCLL left summand

```
N[(alpha + beta) NijckPC Log[2, NijckPC / NijcPC]]
```

```
-4.85307
```

- fCLL right summand

```
N[-beta * lambda * NijckPC
   (Log[2, NijckPC / (NijcckPC + NijckPC)] - Log[2, NijcPC / (NijcPC + NijccPC)])]
```

```
23.7391
```

PseudoCounts 5

```
PC = 5;
NijckPC = Nijck + PC;
NijcPC = Nijc + 2 * PC;
NijccPC  = Nijcc + 2 * PC;
NijcckPC = Nijcck + PC;
```

âCLL left summand

```
N[alpha NijckPC Log[2, NijckPC / NijcPC]]
```

```
-14.1777
```

âCLL right summand (bad behaviour)

```
N[beta NijckPC Log[2, NijcckPC / NijccPC]]
```

```
818.121
```

fCLL left summand

```
N[(alpha + beta) NijckPC Log[2, NijckPC / NijcPC]]
```

```
-6.9141
```

fCLL right summand

```
N[-beta * lambda * NijckPC
   (Log[2, NijckPC / (NijcckPC + NijckPC)] - Log[2, NijcPC / (NijcPC + NijccPC)])]
```

```
26.8162
```

PseudoCounts 10

```
PC = 10;
NijckPC = Nijck + PC;
NijcPC = Nijc + 2 * PC;
NijccPC  = Nijcc + 2 * PC;
NijcckPC = Nijcck + PC;
```

âCLL left summand

```
N[alpha NijckPC Log[2, NijckPC / NijcPC]]
```

```
-18.8474
```

âCLL right summand (bad behaviour)

```
N[beta NijckPC Log[2, NijcckPC / NijccPC]]
```

```
637.139
```

fCLL left summand

```
N[(alpha + beta) NijckPC Log[2, NijckPC / NijcPC]]
```

```
-9.19142
```

fCLL right summand

```
N[-beta * lambda * NijckPC
   (Log[2, NijckPC / (NijcckPC + NijckPC)] - Log[2, NijcPC / (NijcPC + NijccPC)])]
```

```
30.102
```

Case III for Large dataset with 10000 elements the problems are more acute

- **Dataset values that make âCLL diverge**

```
Nijck = 9000;

Nijc = 9150;

(*Nij(1-c)*)
Nijcc  = 70;

(*Nij(1-c)*)
Nijcck = 0 ;
```

- **PseudoCounts 0.5**

```
PC = 0.5;
NijckPC = Nijck + PC;
NijcPC = Nijc + 2 * PC;
NijccPC  = Nijcc + 2 * PC;
NijcckPC = Nijcck + PC;
```

- **âCLL left summand**

```
N[alpha NijckPC Log[2, NijckPC / NijcPC]]
```

```
-48.0402
```

- **âCLL right summand (bad behaviour)**

```
N[beta NijckPC Log[2, NijcckPC / NijccPC]]
```

```
21800.1
```

- **fCLL left summand**

```
N[(alpha + beta) NijckPC Log[2, NijckPC / NijcPC]]
```

```
-23.428
```

- **fCLL right summand**

```
N[-beta * lambda * NijckPC
   (Log[2, NijckPC / (NijcckPC + NijckPC)] - Log[2, NijcPC / (NijcPC + NijccPC)])]
```

```
56.1378
```

PseudoCounts 5

```
PC = 5;
NijckPC = Nijck + PC;
NijcPC = Nijc + 2 * PC;
NijccPC  = Nijcc + 2 * PC;
NijcckPC = Nijcck + PC;
```

âCLL left summand

```
N[alpha NijckPC Log[2, NijckPC / NijcPC]]
```

```
-146.605
```

âCLL right summand (bad behaviour)

```
N[beta NijckPC Log[2, NijcckPC / NijccPC]]
```

```
12 202.4
```

fCLL left summand

```
N[(alpha + beta) NijckPC Log[2, NijckPC / NijcPC]]
```

```
-71.4958
```

fCLL right summand

```
N[-beta * lambda * NijckPC
   (Log[2, NijckPC / (NijcckPC + NijckPC)] - Log[2, NijcPC / (NijcPC + NijccPC)])]
```

```
58.9338
```

PseudoCounts 10

```
PC = 10;
NijckPC = Nijck + PC;
NijcPC = Nijc + 2 * PC;
NijccPC  = Nijcc + 2 * PC;
NijcckPC = Nijcck + PC;
```

âCLL left summand

```
N[alpha NijckPC Log[2, NijckPC / NijcPC]]
```

```
-151.294
```

âCLL right summand (bad behaviour)

```
N[beta NijckPC Log[2, NijcckPC / NijccPC]]
```

```
9675.52
```

fCLL left summand

```
N[(alpha + beta) NijckPC Log[2, NijckPC / NijcPC]]
```

```
-73.7823
```

fCLL right summand

```
N[-beta * lambda * NijckPC
   (Log[2, NijckPC / (NijcckPC + NijckPC)] - Log[2, NijcPC / (NijcPC + NijccPC)])]
```

```
62.7106
```