```
---------------------------- jModeltest 0.1.1 ----------------------------
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--------------------------------------------------------------------------
Wed May 01 07:08:39 BST 2013  (Mac OS X 10.8.2, arch: x86_64)


****************************** NOTICE ***********************************
This program may contain errors. Please inspect the results carefully.
*************************************************************************

Reading data file "phosphoproteinCDSsLabelsEd.prank"... OK.
  number of sequences: 23
  number of sites: 1074


------------------------------------------------------------
*                                                          *
*        COMPUTATION OF LIKELIHOOD SCORES WITH PHYML       *
*                                                          *
------------------------------------------------------------

Settings:
 Phyml version = 3.0
 Candidate models = 12
  number of substitution schemes = 3
  including models with equal/unequal base frequencies (+F)
  including only models without a proportion of invariable sites
  including models with/without rate variation among sites (+G) (nCat = 4)
 Optimized free parameters (K) = substitution parameters + 43 branch lengths
 Base tree for likelihood calculations = fixed BIONJ-JC tree topology

Estimating a BIONJ-JC tree ... OK
BIONJ-JC  tree:
(((((((((08097MAR_2:0.004820,08098MAR_2:0.001775):0.000385,((08323MAR_2:0.008855,08077MAR_2:0.
008335):0.001288,08317MAR_2:0.007919):0.000287):0.001151,(08002MAR_2:0.003826,08048MAR_2:0.00
2769):0.003162):0.002977,08081MAR_2:0.009982):0.001834,(08064MAR_2:0.009565,(08191ALG_2:0.011
179,(((08140ALG_2:0.000899,08260ALG_2:0.000034):0.000117,(08130ALG_2:0.001643,08195ALG_2:0.00
0224):0.002487):0.006740,(08231ALG_2:0.003772,(08134ALG_2:0.002563,(08219ALG_2:0.002775,(0825
7ALG_2:0.002123,08142ALG_2:0.001619):0.001011):0.003436):0.002485):0.002012):0.000808):0.0040
84):0.003990):0.018100,86127TUN_1:0.007998):0.003696,86075TUN_1:0.003854):0.001774,8727TUN_19
:0.001185,86131TUN_1:0.001619);

Maximum likelihod estimation for the JC model.
  BIONJ-JC tree topology
   Model = JC
   partition = 000000
   -lnL = 2746.7194
   K = 43
  Computation time = 00h:00:00:01  (00h:00:00:01)

Maximum likelihod estimation for the JC+G model.
  BIONJ-JC tree topology
   Model = JC+G
   partition = 000000
   -lnL = 2727.2815
   K = 44
```

```
   gamma shape = 0.2110
  Computation time = 00h:00:00:02  (00h:00:00:03)

Maximum likelihod estimation for the F81 model.
  BIONJ-JC tree topology
   Model = F81
   partition = 000000
   -lnL = 2733.3029
   K = 46
    freqA = 0.3155
    freqC = 0.2312
    freqG = 0.2251
    freqT = 0.2282
  Computation time = 00h:00:00:01  (00h:00:00:04)

Maximum likelihod estimation for the F81+G model.
  BIONJ-JC tree topology
   Model = F81+G
   partition = 000000
   -lnL = 2714.1958
   K = 47
    freqA = 0.3147
    freqC = 0.2319
    freqG = 0.2247
    freqT = 0.2287
    gamma shape = 0.2170
  Computation time = 00h:00:00:03  (00h:00:00:07)

Maximum likelihod estimation for the K80 model.
  BIONJ-JC tree topology
   Model = K80
   partition = 010010
   -lnL = 2620.5998
   K = 44
   kappa = 19.8465 (ti/tv = 9.9233)
  Computation time = 00h:00:00:01  (00h:00:00:08)

Maximum likelihod estimation for the K80+G model.
  BIONJ-JC tree topology
   Model = K80+G
   partition = 010010
   -lnL = 2600.1642
   K = 45
   kappa = 20.3541 (ti/tv = 10.1771)
   gamma shape = 0.1960
  Computation time = 00h:00:00:02  (00h:00:01:00)

Maximum likelihod estimation for the HKY model.
  BIONJ-JC tree topology
   Model = HKY
   partition = 010010
   -lnL = 2606.9185
   K = 47
    freqA = 0.3149
    freqC = 0.2349
    freqG = 0.2185
    freqT = 0.2317
```

```
   kappa = 19.9426 (ti/tv = 9.8742)
  Computation time = 00h:00:00:02  (00h:00:01:02)

Maximum likelihod estimation for the HKY+G model.
  BIONJ-JC tree topology
   Model = HKY+G
   partition = 010010
   -lnL = 2585.9380
   K = 48
    freqA = 0.3180
    freqC = 0.2331
    freqG = 0.2195
    freqT = 0.2294
   kappa = 20.6975 (ti/tv = 10.2636)
   gamma shape = 0.1860
  Computation time = 00h:00:00:04  (00h:00:01:06)

Maximum likelihod estimation for the SYM model.
  BIONJ-JC tree topology
   Model = SYM
   partition = 012345
   -lnL = 2614.1699
   K = 48
   R(a) [AC] =  2.7624
   R(b) [AG] =  20.8033
   R(c) [AT] =  0.5504
   R(d) [CG] =  0.3160
   R(e) [CT] =  27.6671
   R(f) [GT] =  1.0000
  Computation time = 00h:00:00:02  (00h:00:01:08)

Maximum likelihod estimation for the SYM+G model.
  BIONJ-JC tree topology
   Model = SYM+G
   partition = 012345
   -lnL = 2594.4435
   K = 49
   R(a) [AC] =  2.8775
   R(b) [AG] =  22.0983
   R(c) [AT] =  0.5568
   R(d) [CG] =  0.2767
   R(e) [CT] =  27.7946
   R(f) [GT] =  1.0000
   gamma shape = 0.2090
  Computation time = 00h:00:00:03  (00h:00:02:01)

Maximum likelihod estimation for the GTR model.
  BIONJ-JC tree topology
   Model = GTR
   partition = 012345
   -lnL = 2599.2069
   K = 51
    freqA = 0.3211
    freqC = 0.2269
    freqG = 0.2262
    freqT = 0.2258
   R(a) [AC] =  2.3472
```

```
   R(b) [AG] =  17.6864
   R(c) [AT] =  0.4690
   R(d) [CG] =  0.3148
   R(e) [CT] =  27.6117
   R(f) [GT] =  1.0000
  Computation time = 00h:00:00:02  (00h:00:02:03)

Maximum likelihod estimation for the GTR+G model.
  BIONJ-JC tree topology
   Model = GTR+G
   partition = 012345
   -lnL = 2579.6503
   K = 52
    freqA = 0.3212
    freqC = 0.2270
    freqG = 0.2258
    freqT = 0.2260
   R(a) [AC] =  2.3285
   R(b) [AG] =  18.3248
   R(c) [AT] =  0.4515
   R(d) [CG] =  0.2772
   R(e) [CT] =  27.2227
   R(f) [GT] =  1.0000
   gamma shape = 0.2120
  Computation time = 00h:00:00:04  (00h:00:02:07)

Computation of likelihood scores completed. It took 00h:00:02:07.




------------------------------------------------------------------
*                                                                *
*             AKAIKE INFORMATION CRITERION (AIC)                 *
*                                                                *
------------------------------------------------------------------

 Model  selected:
   Model = GTR+G
   partition = 012345
   -lnL = 2579.6503
   K = 52
    freqA = 0.3212
    freqC = 0.2270
    freqG = 0.2258
    freqT = 0.2260
   R(a) [AC] =  2.3285
   R(b) [AG] =  18.3248
   R(c) [AT] =  0.4515
   R(d) [CG] =  0.2772
   R(e) [CT] =  27.2227
   R(f) [GT] =  1.0000
   gamma shape = 0.2120


* AIC MODEL SELECTION : Selection uncertainty
```

Model	-lnL	K	AIC	delta	weight	cumWeight
GTR+G	2579.6503	52	5263.3006	0.0000	0.9078	0.9078
HKY+G	2585.9380	48	5267.8759	4.5753	0.0921	1.0000
SYM+G	2594.4435	49	5286.8870	23.5864	6.86e-006	1.0000
K80+G	2600.1642	45	5290.3284	27.0278	1.23e-006	1.0000
GTR	2599.2069	51	5300.4137	37.1131	7.92e-009	1.0000
HKY	2606.9185	47	5307.8369	44.5363	1.94e-010	1.0000
SYM	2614.1699	48	5324.3398	61.0392	5.05e-014	1.0000
K80	2620.5998	44	5329.1996	65.8990	4.45e-015	1.0000
F81+G	2714.1958	47	5522.3916	259.0910	4.98e-057	1.0000
JC+G	2727.2815	44	5542.5629	279.2624	2.07e-061	1.0000
F81	2733.3029	46	5558.6059	295.3053	6.81e-065	1.0000
JC	2746.7194	43	5579.4387	316.1382	2.04e-069	1.0000

-lnL: negative log likelihod
K: number of estimated parameters
AIC: Akaike Information Criterion
delta: AIC difference
weight: AIC weight
cumWeight: cumulative AIC weight

Model selection results also available at the "Model > Show model table" menu

* AIC MODEL SELECTION : Confidence interval

There are 12 models in the 100% confidence interval: [GTR+G HKY+G SYM+G K80+G GTR HKY SYM K80 F81+G JC+G F81 JC]

* AIC MODEL SELECTION : Parameter importance

Parameter	Importance
fA	1.0000
fC	1.0000
fG	1.0000
fT	1.0000
kappa	0.0921
titv	0.0921
rAC	0.9079
rAG	0.9079
rAT	0.9079
rCG	0.9079
rCT	0.9079
rGT	0.9079
alpha(G)	1.0000

Values have been rounded.
(I): considers only +I models.
(G): considers only +G models.
(IG): considers only +I+G models.

* AIC MODEL SELECTION : Model averaged estimates

Parameter	Model-averaged estimates
fA	0.3209
fC	0.2275
fG	0.2253
fT	0.2263
kappa	20.6975
titv	10.2636
rAC	2.3285
rAG	18.3249
rAT	0.4515
rCG	0.2772
rCT	27.2227
rGT	1.0000
alpha(G)	0.2096

Numbers have been rounded.
(I): considers only +I models.
(G): considers only +G models.
(IG): considers only +I+G models.

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*

* BAYESIAN INFORMATION CRITERION (BIC) *

*

Settings:
sample size = 1074

Model selected:
Model = HKY+G
partition = 010010
-lnL = 2585.9380
K = 48
freqA = 0.3180
freqC = 0.2331
freqG = 0.2195
freqT = 0.2294
kappa = 20.6975 (ti/tv = 10.2636)
gamma shape = 0.1860

* BIC MODEL SELECTION : Selection uncertainty

Model	-lnL	K	BIC	delta	weight	cumWeight
HKY+G	2585.9380	48	5506.8749	0.0000	0.9767	0.9767
K80+G	2600.1642	45	5514.3899	7.5150	0.0228	0.9995
GTR+G	2579.6503	52	5522.2161	15.3412	0.0005	1.0000
SYM+G	2594.4435	49	5530.8651	23.9902	6.03e-006	1.0000
HKY	2606.9185	47	5541.8567	34.9819	2.47e-008	1.0000
K80	2620.5998	44	5548.2820	41.4071	9.96e-010	1.0000
GTR	2599.2069	51	5554.3501	47.4752	4.79e-011	1.0000
SYM	2614.1609	48	5563.2388	56.4639	5.36e-013	1.0000

```
SYM          2614.1699   48   5363.3388    36.4639   5.36e-013    1.0000
F81+G        2714.1958   47   5756.4114   249.5365   6.36e-055    1.0000
JC+G         2727.2815   44   5761.6453   254.7704   4.65e-056    1.0000
F81          2733.3029   46   5787.6466   280.7717   1.05e-061    1.0000
JC           2746.7194   43   5793.5420   286.6671   5.51e-063    1.0000
---------------------------------------------------------------------------
-lnL:       negative log likelihod
K:          number of estimated parameters
BIC:        Bayesian Information Criterion
delta:      BIC difference
weight:     BIC weight
cumWeight:  cumulative BIC weight


Model selection results also available at the "Model > Show model table" menu


* BIC MODEL SELECTION : Confidence interval

There are 12 models in the 100% confidence interval: [ HKY+G K80+G GTR+G SYM+G HKY K80 GTR
SYM F81+G JC+G F81 JC ]


* BIC MODEL SELECTION : Parameter importance

Parameter   Importance
----------------------
fA              0.9772
fC              0.9772
fG              0.9772
fT              0.9772
kappa           0.9995
titv            0.9995
rAC             0.0005
rAG             0.0005
rAT             0.0005
rCG             0.0005
rCT             0.0005
rGT             0.0005
alpha(G)        1.0000
----------------------
Values have been rounded.
 (I):  considers only +I models.
 (G):  considers only +G models.
 (IG): considers only +I+G models.


* BIC MODEL SELECTION : Model averaged estimates

           Model-averaged
Parameter       estimates
-------------------------
fA                 0.3180
fC                 0.2331
fG                 0.2195
fT                 0.2294
kappa             20.6897
titv              10.2616
```

```
titv              10.2636
rAC                2.3357
rAG               18.3741
rAT                0.4529
rCG                0.2772
rCT               27.2302
rGT                1.0000
alpha(G)           0.1862
-------------------------
Numbers have been rounded.
 (I):  considers only +I models.
 (G):  considers only +G models.
 (IG): considers only +I+G models.



-----------------------------------------------------------------
*                                                               *
*      DECISION THEORY PERFORMANCE-BASED SELECTION (DT)         *
*                                                               *
-----------------------------------------------------------------

Settings:
 Branch lenghts counted as parameters
 sample size = 1074

 Model  selected:
   Model = HKY+G
   partition = 010010
   -lnL = 2585.9380
   K = 48
    freqA = 0.3180
    freqC = 0.2331
    freqG = 0.2195
    freqT = 0.2294
   kappa = 20.6975 (ti/tv = 10.2636)
   gamma shape = 0.1860


* DT MODEL SELECTION : Selection uncertainty

Model             -lnL    K          DT      delta      weight cumWeight
-------------------------------------------------------------------------
HKY+G        2585.9380   48      0.0000     0.0000      0.9047    0.9047
K80+G        2600.1642   45      0.0003     0.0003      0.0215    0.9263
GTR+G        2579.6503   52      0.0003     0.0003      0.0210    0.9472
SYM+G        2594.4435   49      0.0003     0.0003      0.0195    0.9667
F81+G        2714.1958   47      0.0011     0.0011      0.0059    0.9726
JC+G         2727.2815   44      0.0011     0.0011      0.0058    0.9784
SYM          2614.1699   48      0.0016     0.0016      0.0043    0.9827
GTR          2599.2069   51      0.0018     0.0018      0.0037    0.9864
K80          2620.5998   44      0.0018     0.0018      0.0036    0.9900
HKY          2606.9185   47      0.0019     0.0019      0.0035    0.9936
F81          2733.3029   46      0.0020     0.0020      0.0033    0.9968
JC           2746.7194   43      0.0021     0.0021      0.0032    1.0000
-------------------------------------------------------------------------
-lnL:t      negative log likelihod
K:          number of estimated parameters
```

k: number of estimated parameters
DT: decision theory performance-based score
delta: DT difference
weight: DT weight* (calculated using 1/DT)
cumWeight: cumulative DT weight

Warning: The DT weights reported here are very gross and should be used with caution. See the program documentation.

Model selection results also available at the "Model > Show model table" menu

* DT MODEL SELECTION : Confidence interval

There are 12 models in the 100% confidence interval: [HKY+G K80+G GTR+G SYM+G F81+G JC+G SYM GTR K80 HKY F81 JC]

* DT MODEL SELECTION : Parameter importance

Parameter	Importance
fA	0.9421
fC	0.9421
fG	0.9421
fT	0.9421
kappa	0.9334
titv	0.9334
rAC	0.0485
rAG	0.0485
rAT	0.0485
rCG	0.0485
rCT	0.0485
rGT	0.0485
alpha(G)	0.9784

Values have been rounded.
 (I): considers only +I models.
 (G): considers only +G models.
 (IG): considers only +I+G models.

* DT MODEL SELECTION : Model averaged estimates

Parameter	Model-averaged estimates
fA	0.3181
fC	0.2329
fG	0.2197
fT	0.2293
kappa	20.6834
titv	10.2588
rAC	2.5891
rAG	20.0123
rAT	0.5039
rCG	0.2833

```
rCT               27.5218
rGT                1.0000
alpha(G)           0.1876
------------------------
Numbers have been rounded.
 (I):  considers only +I models.
 (G):  considers only +G models.
 (IG): considers only +I+G models.



-----------------------------------------------------------------
*                                                               *
*          HIERARCHICAL LIKELIHOO RATIO TESTS (hLRT)            *
*                                                               *
-----------------------------------------------------------------

Settings:
  Forward selection (adding parameters)
    starting model = JC
    hypotheses order = freq-titv-2ti4tv-gamma
  Confidence alpha level = 0.0100

* Tested hypothesis = freq
Null  model             =  JC        -lnL = 2746.7194
Alternative   model   =   F81        -lnL = 2733.3029
2(lnL1-lnL0)      = 26.8328         P-value = 0.0000

* Tested hypothesis = titv
Null  model             =  F81       -lnL = 2733.3029
Alternative   model   =   HKY        -lnL = 2606.9185
2(lnL1-lnL0)      = 252.7690        P-value < 1.0E-6

* Tested hypothesis = 2ti4tv
Null  model             =  HKY       -lnL = 2606.9185
Alternative   model   =   GTR        -lnL = 2599.2069
2(lnL1-lnL0)      = 15.4232         P-value = 0.0039

* Tested hypothesis = gamma
Null  model             =  GTR       -lnL = 2599.2069
Alternative  model  =  GTR+G         -lnL = 2579.6503
2(lnL1-lnL0)      = 39.1131         P-value < 1.0E-6

 Model  selected:
   Model = GTR+G
   partition = 012345
   -lnL = 2579.6503
   K = 52
    freqA = 0.3212
    freqC = 0.2270
    freqG = 0.2258
    freqT = 0.2260
   R(a) [AC] =  2.3285
   R(b) [AG] =  18.3248
   R(c) [AT] =  0.4515
   R(d) [CG] =  0.2772
   R(e) [CT] =  27.2227
```

```
R(f) [GT] =  1.0000
gamma shape = 0.2120
```