

## Supplementary Materials:

### GPS 2.1: enhanced prediction of kinase-specific phosphorylation sites with an algorithm of motif length selection

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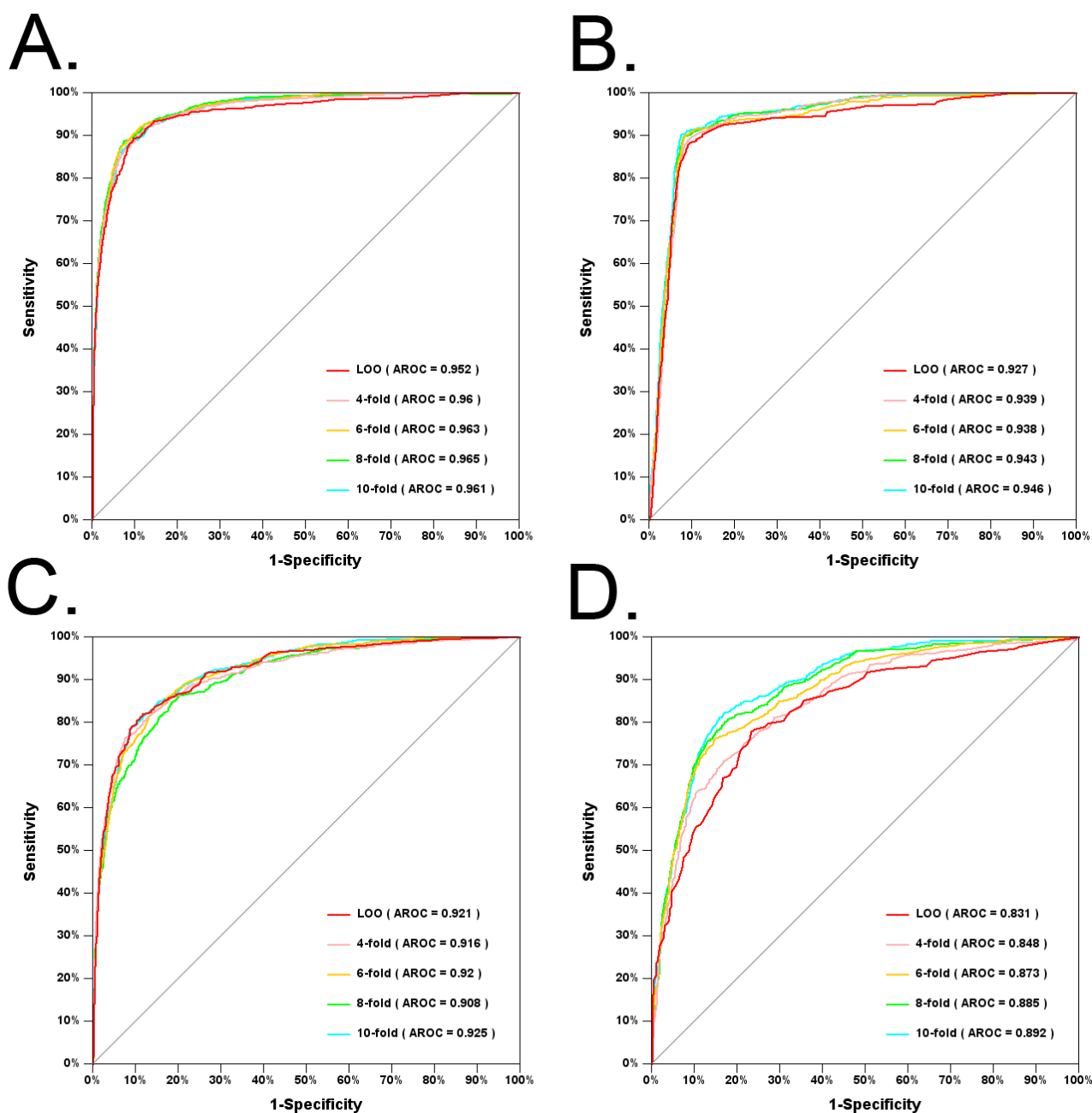
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**Running title:** *Phosphorylation Sites Prediction*

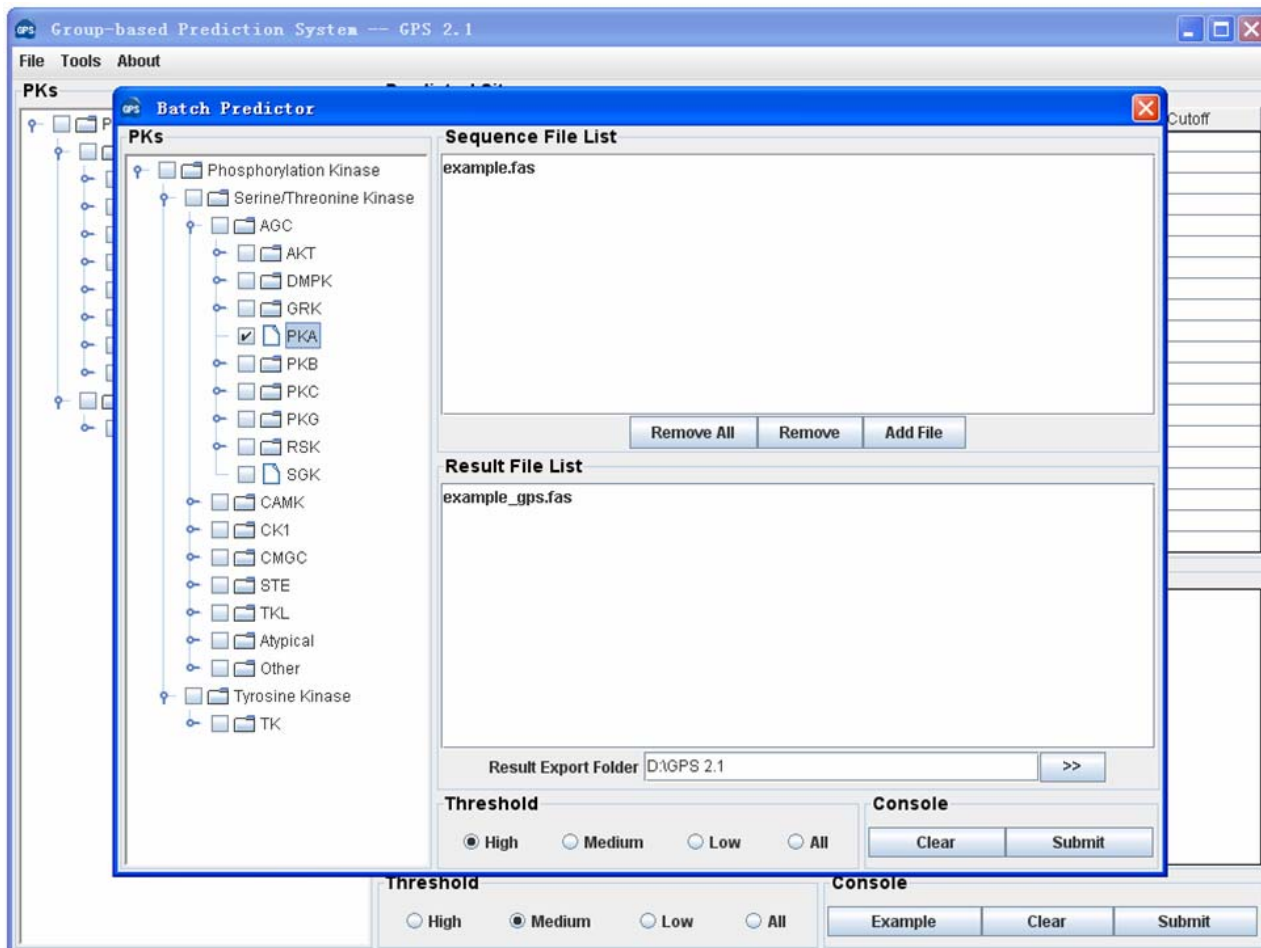
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## Supplementary Figures

**Supplementary Figure S1** – Several examples of sequence-similarity-group-based 4-, 6-, 8-, 10-fold cross-validation results. Although similar, we observed that the cross-validation values are slightly higher than LOO results with high frequency. The GPS algorithm relies on the sequence similarity measurement, while such a validation will reduce the scores of both positive and negative sites. Because the number of negative sites is much greater than positive data, the validation generates greater impact for negative sites to increase the performance. (A) AGC/PKA; (B) CMGC/CDK/CDC2; (C) Other/CK2; (D) TK/Src/Src.



**Supplementary Figure S2** – The “Batch Predictor” program allows users to predict kinase-specific phosphorylation sites for a large number of proteins (>1,500 proteins).



**Supplementary Figure S3** – In the “Performance” program, the self-consistency performances of GPS 2.1 could be viewed.

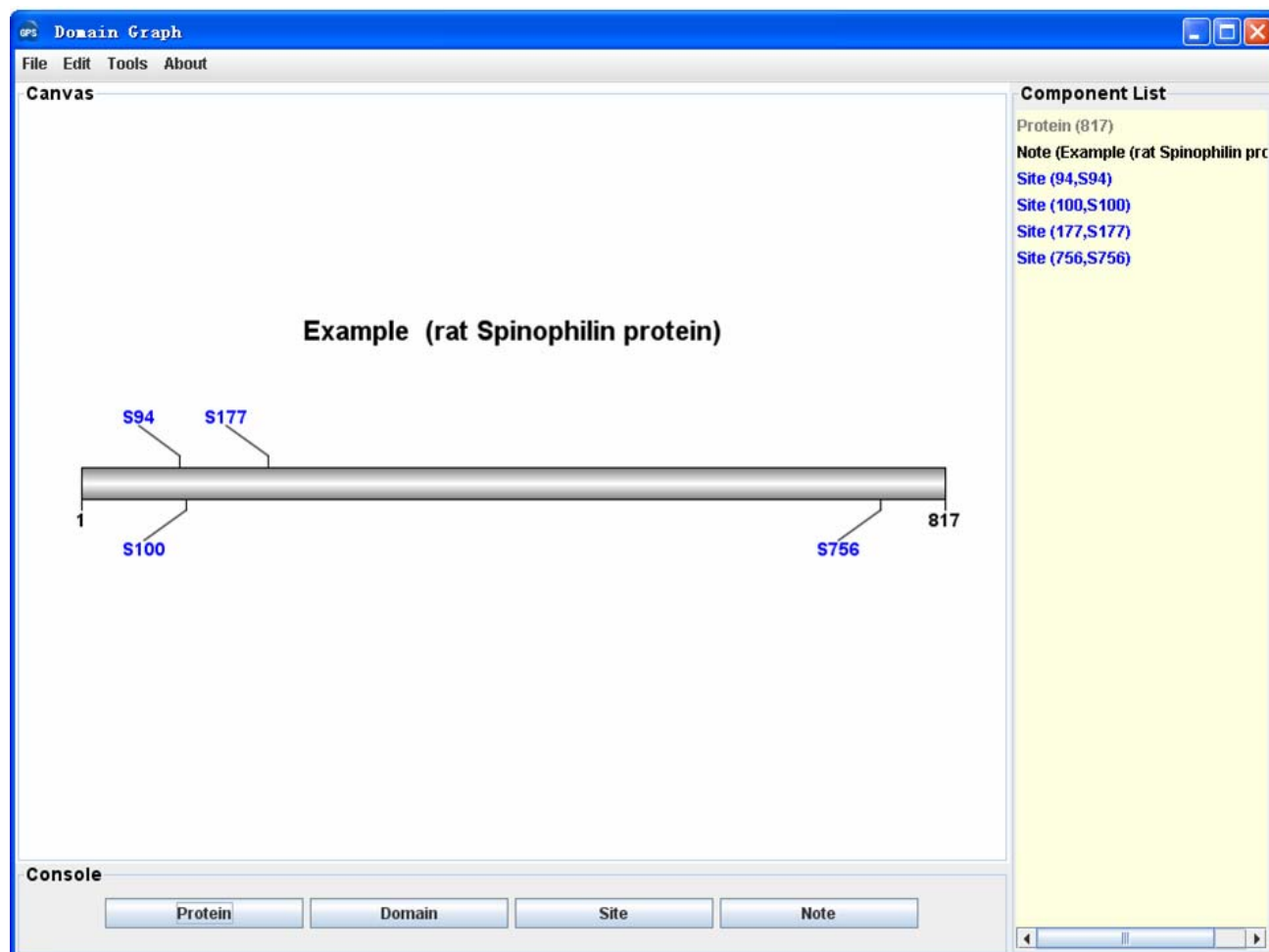
The screenshot displays the 'Performance' window of the Group-based Prediction System (GPS 2.1). The window is divided into several sections:

- PKs (Left Panel):** A hierarchical tree view showing the classification of kinases. The 'Phosphorylation Kinase' category is expanded to show 'Serine/Threonine Kinase', which includes subgroups like AGC, CAMK, CK1, CMGC, STE, TKL, Atypical, and Other. The 'AGC' subgroup is further expanded to show PKA, PKB, PKC, PKG, RSK, and SGK. The 'Tyrosine Kinase' category includes TK.
- Kinase Information (Table):** A table listing specific kinases with their UniProt IDs.
 

Name	Group	Family	Subfamily	UniProt
PKACa	AGC	PKA		<a href="#">Q32P54_HUMAN</a>
PKACb	AGC	PKA		<a href="#">KAPCB_HUMAN</a>
PKACg	AGC	PKA		<a href="#">Q5VZ02_HUMAN</a>
PRIX	AGC	PKA		<a href="#">PRIX_HUMAN</a>
PRKY	AGC	PKA		<a href="#">PRKY_HUMAN</a>
- Prediction Performance (Table):** A table showing performance metrics for different thresholds.
 

	Cutoff	Ac	Sn	Sp	Mcc
High	2.77	97.19%	68.38%	97.69%	0.4713
Medium	1.943	93.96%	82.97%	94.15%	0.3887
Low	1.422	90.32%	90.27%	90.32%	0.3342
- Threshold (Bottom):** Radio buttons for selecting a performance threshold: High (selected), Medium, Low, and All.
- Console (Bottom Right):** Buttons for 'Example', 'Clear', and 'Submit'.

**Supplementary Figure S4** – Users could visualize predicted phosphorylation sites with “Domain Graph” tool.



## Supplementary Tables

**Table S1** - The detailed results of Figure 1 in main text. We observed that the self-consistency results will be always increased with longer  $PSP(m, n)$ , while the LOO results will firstly reach a peak value then decrease. The optimal  $PSP(m, n)$  with the highest LOO results were marked in red.

**Table S2** - The performances of self-consistency and leave-one-out validation for 72 PK groups without less than 30 positive phosphorylation sites. Only performances of conventional 4-fold cross-validation were shown. The results of LOO are quite similar with the  $n$ -fold cross-validation for these PK groups.

**Table S3** - The performances of self-consistency and leave-one-out validation for other PK groups with less than 30 sites.

**Table S4** - We compared GPS 2.1 and GPS 2.0. In GPS 2.0, the average  $S_n$  values of LOO and self-consistency were calculated as 55.11% and 96.46%, while the two  $S_n$  values were 70.73% and 94.18% in GPS 2.1. In this regard, with the MLS method, the average  $S_n$  of the LOO was significantly increased 15.62%, while the average  $S_n$  value of the self-consistency was reduced 2.28%.

**Table S5** - The comparison for 72 PK groups with  $\geq 30$  sites. For the 72 PK groups, the results of leave-one-out validation are quite similar with  $n$ -fold cross-validation. In GPS 2.0, the average  $S_n$  values of LOO and self-consistency were calculated as 62.89% and 90.19%, while the two  $S_n$  values were 69.46% and 89.09% in GPS 2.1. In this regard, with the PS method, the average  $S_n$  of the LOO was significantly increased 6.57%, while the average  $S_n$  value of the self-consistency was reduced 1.10%.

**Table S1** - The detailed results of Figure 1 in main text. We observed that the self-consistency results will be always increased with longer PSP( $m, n$ ), while the LOO results will firstly reach a peak value then decrease. The optimal PSP( $m, n$ ) with the highest LOO results were marked in red.

Upstream	Downstream														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<b>AGC/AKT: the self-consistency validation</b>															
1	25.47%	29.21%	29.21%	34.83%	35.58%	44.57%	49.06%	52.81%	60.67%	64.79%	68.91%	76.03%	82.02%	86.52%	89.51%
2	32.58%	34.83%	38.95%	37.83%	43.45%	47.19%	51.31%	59.93%	64.42%	68.91%	74.16%	79.78%	85.77%	86.89%	91.76%
3	86.89%	87.27%	86.52%	86.89%	84.64%	83.52%	85.02%	85.39%	86.52%	87.27%	89.51%	91.39%	93.26%	94.38%	95.51%
4	89.51%	87.64%	87.27%	88.01%	86.52%	85.02%	85.39%	85.77%	88.76%	89.14%	90.26%	92.88%	94.76%	95.88%	96.63%
5	90.64%	89.89%	91.01%	89.89%	89.89%	89.51%	90.26%	91.39%	92.51%	93.26%	94.38%	94.76%	95.88%	96.63%	97.38%
6	90.64%	90.64%	91.01%	90.26%	90.26%	89.89%	91.39%	93.63%	94.01%	94.38%	95.88%	96.25%	97.00%	97.38%	97.38%
7	91.39%	91.01%	91.39%	91.76%	92.13%	91.76%	94.01%	94.38%	94.76%	95.51%	96.25%	97.38%	97.38%	97.75%	98.13%
8	91.39%	90.64%	91.01%	92.51%	91.76%	92.13%	93.63%	95.51%	95.51%	95.51%	97.38%	97.38%	98.13%	98.88%	99.25%
9	91.39%	91.39%	91.76%	92.88%	92.88%	92.88%	95.13%	95.88%	96.25%	97.75%	97.38%	98.50%	98.88%	99.25%	99.63%
10	91.76%	92.51%	92.88%	92.51%	94.01%	94.01%	95.88%	96.63%	97.38%	98.13%	98.50%	99.25%	99.25%	99.63%	99.63%
11	92.88%	92.51%	92.88%	93.26%	94.76%	95.88%	96.63%	97.38%	98.50%	98.50%	99.25%	99.25%	99.63%	100%	100%
12	93.63%	92.51%	93.63%	95.13%	95.88%	96.25%	97.00%	98.13%	98.88%	99.25%	99.25%	99.63%	100%	100%	100%
13	93.63%	94.38%	95.51%	95.51%	97.38%	97.38%	98.88%	99.25%	99.25%	99.25%	99.63%	100%	100%	100%	100%
14	94.76%	95.51%	95.88%	97.75%	98.13%	98.50%	99.25%	99.25%	99.63%	99.63%	100%	100%	100%	100%	100%
15	96.63%	97.00%	97.38%	98.50%	99.25%	99.25%	99.63%	99.63%	100%	100%	100%	100%	100%	100%	100%
<b>AGC/AKT: the leave-one-out validation</b>															
1	19.48%	23.60%	23.22%	22.85%	17.98%	25.47%	24.72%	23.97%	26.59%	25.47%	27.34%	26.22%	27.34%	27.72%	27.34%
2	25.84%	25.47%	25.47%	24.72%	23.60%	27.34%	25.09%	25.09%	30.71%	28.46%	28.09%	28.09%	29.96%	29.59%	31.46%
3	84.27%	85.02%	84.64%	83.90%	80.15%	77.53%	76.03%	75.66%	74.91%	73.03%	73.03%	71.54%	68.54%	66.29%	64.42%
4	86.89%	86.14%	84.27%	82.02%	78.65%	77.15%	75.28%	75.28%	73.78%	73.41%	70.41%	71.54%	67.79%	65.17%	62.55%
5	<b>89.89%</b>	89.51%	88.76%	87.64%	86.14%	85.02%	84.27%	82.40%	81.27%	81.65%	80.15%	80.52%	79.40%	78.65%	77.15%
6	89.89%	89.14%	88.39%	87.27%	85.02%	84.27%	83.15%	80.90%	81.27%	80.52%	78.28%	78.65%	78.28%	77.53%	76.03%
7	89.51%	89.14%	88.01%	87.64%	84.64%	83.52%	82.40%	80.90%	79.78%	79.78%	78.65%	78.65%	78.28%	77.15%	75.28%
8	89.14%	88.01%	87.27%	86.52%	83.15%	82.77%	82.40%	80.15%	80.52%	79.40%	79.03%	78.65%	78.28%	77.15%	76.03%
9	88.39%	88.01%	86.52%	85.02%	82.40%	82.02%	81.65%	79.78%	79.78%	79.78%	78.28%	78.28%	77.15%	76.03%	76.03%

10	87.64%	86.89%	85.77%	83.52%	80.52%	80.90%	79.78%	78.28%	78.65%	77.90%	77.90%	76.40%	76.40%	74.16%	74.53%
11	87.27%	86.89%	85.39%	82.40%	80.15%	80.52%	78.65%	77.53%	77.53%	76.78%	76.40%	76.03%	76.03%	74.53%	73.78%
12	86.14%	85.39%	83.90%	81.65%	78.28%	79.03%	77.15%	76.40%	76.78%	75.28%	74.91%	74.91%	74.91%	73.78%	73.78%
13	86.52%	85.39%	84.64%	80.90%	79.40%	78.28%	77.53%	77.15%	76.03%	74.91%	75.28%	74.53%	75.28%	73.03%	71.91%
14	85.02%	84.64%	83.15%	79.40%	77.15%	76.40%	75.66%	74.91%	75.66%	74.53%	73.41%	73.41%	74.16%	71.91%	70.41%
15	82.77%	83.15%	79.78%	78.28%	76.03%	75.28%	74.53%	73.78%	73.41%	72.28%	72.66%	72.66%	71.54%	70.04%	66.67%

Optimal PSP(m, n): PSP(5, 1)

**CMGC/CDK/CDC2/CDC2: the self-consistency validation**

1	77.46%	79.86%	78.66%	79.14%	80.10%	79.62%	80.58%	80.10%	81.77%	82.73%	83.21%	83.69%	84.89%	85.37%	86.57%
2	76.50%	78.42%	78.90%	80.34%	80.82%	80.82%	80.58%	80.10%	82.25%	82.73%	82.73%	84.17%	85.85%	86.09%	86.81%
3	78.66%	79.86%	79.38%	80.34%	81.06%	81.29%	80.82%	80.58%	82.73%	83.21%	83.69%	85.13%	86.81%	87.29%	88.25%
4	78.42%	77.70%	78.90%	79.62%	79.86%	80.82%	81.06%	80.82%	81.53%	82.49%	84.41%	84.65%	87.53%	88.49%	88.97%
5	77.46%	76.98%	79.38%	80.34%	79.62%	80.82%	81.29%	79.86%	82.25%	83.69%	85.37%	86.33%	89.21%	89.45%	89.93%
6	75.54%	76.02%	78.66%	79.86%	80.58%	80.82%	81.29%	81.53%	82.01%	84.17%	86.57%	87.53%	89.45%	90.17%	92.09%
7	77.22%	77.94%	79.86%	80.82%	80.82%	80.82%	81.53%	82.49%	83.21%	85.13%	87.05%	88.01%	89.45%	90.89%	93.05%
8	76.26%	78.42%	80.58%	81.06%	81.06%	80.82%	82.01%	83.21%	85.13%	86.09%	87.77%	89.69%	91.85%	92.81%	94.24%
9	76.26%	78.18%	81.06%	81.53%	82.25%	82.25%	83.45%	84.41%	86.09%	88.49%	90.17%	91.37%	93.29%	95.20%	95.92%
10	79.14%	80.34%	82.73%	82.01%	83.69%	83.93%	85.37%	85.85%	87.53%	88.73%	91.85%	93.29%	95.44%	95.68%	96.88%
11	78.66%	81.06%	82.97%	83.69%	84.17%	85.61%	85.85%	87.53%	88.97%	91.37%	93.76%	95.44%	96.88%	97.36%	98.08%
12	79.62%	82.49%	82.73%	84.17%	85.61%	86.57%	87.53%	88.73%	89.93%	91.85%	94.48%	96.16%	97.36%	97.84%	98.08%
13	81.77%	82.73%	83.45%	85.37%	87.05%	87.77%	88.49%	88.97%	90.89%	93.29%	96.40%	97.12%	97.84%	98.56%	98.80%
14	81.77%	83.45%	85.37%	88.25%	88.49%	89.93%	90.41%	91.61%	91.85%	95.20%	97.36%	97.84%	98.80%	99.28%	99.28%
15	83.93%	84.65%	85.85%	88.25%	89.45%	90.41%	90.89%	92.33%	94.72%	96.64%	97.60%	97.84%	99.04%	99.52%	99.76%

**CMGC/CDK/CDC2/CDC2: the leave-one-out validation**

1	76.98%	<b>78.18%</b>	78.18%	76.50%	77.46%	76.26%	76.74%	76.26%	76.26%	75.54%	76.26%	74.34%	73.62%	72.66%	70.74%
2	75.30%	76.74%	77.46%	78.18%	76.50%	76.26%	76.50%	75.06%	75.78%	76.02%	74.58%	72.66%	72.18%	71.46%	69.30%
3	76.98%	76.98%	77.70%	75.78%	77.46%	76.02%	75.78%	75.06%	75.54%	74.82%	73.62%	71.46%	71.46%	70.98%	68.59%
4	74.82%	74.82%	76.74%	76.26%	76.26%	74.82%	75.30%	73.62%	73.14%	73.62%	71.94%	70.02%	68.82%	67.87%	65.71%
5	73.86%	74.82%	75.54%	75.06%	74.34%	73.38%	72.66%	72.18%	71.46%	70.26%	69.78%	67.63%	67.63%	65.95%	64.27%
6	72.66%	71.94%	75.78%	74.58%	73.38%	71.94%	71.46%	71.22%	68.82%	69.54%	69.30%	66.91%	66.19%	64.99%	62.83%
7	74.34%	74.10%	76.02%	75.06%	72.66%	72.18%	71.46%	70.50%	68.59%	68.35%	66.67%	63.79%	63.79%	62.11%	59.95%
8	73.62%	73.62%	75.78%	74.10%	72.66%	71.46%	70.98%	68.11%	66.67%	66.19%	65.47%	62.83%	63.79%	61.87%	59.71%



9	72.18%	72.66%	73.86%	73.86%	72.18%	70.74%	69.06%	66.91%	64.03%	64.51%	64.51%	61.15%	61.39%	59.71%	56.59%
10	70.74%	70.98%	73.62%	73.14%	70.02%	69.78%	67.15%	66.19%	63.79%	64.03%	62.59%	59.71%	59.71%	59.23%	57.07%
11	71.22%	70.50%	70.26%	70.26%	69.06%	67.15%	66.19%	64.51%	62.11%	61.63%	60.43%	59.95%	61.15%	58.27%	57.31%
12	70.98%	69.30%	71.22%	71.46%	68.11%	65.95%	65.23%	64.27%	61.39%	60.67%	60.19%	56.83%	59.95%	56.12%	54.44%
13	68.35%	68.59%	68.82%	69.54%	65.95%	64.27%	62.35%	60.43%	60.19%	58.99%	58.27%	56.35%	57.31%	55.40%	52.76%
14	66.67%	65.71%	68.59%	68.11%	64.75%	63.55%	61.63%	60.91%	59.71%	58.51%	57.79%	56.83%	57.07%	55.64%	53.24%
15	65.71%	65.23%	65.23%	67.15%	62.59%	61.39%	58.75%	58.51%	58.03%	57.07%	57.55%	53.72%	55.16%	53.48%	53.24%

Opimal PSP(m, n): PSP(1, 2)

**Other/AUR: the self-consistency validation**

1	25.68%	31.08%	37.39%	38.29%	44.14%	49.55%	59.91%	65.77%	74.32%	81.98%	85.14%	87.84%	95.05%	96.40%	98.65%
2	62.16%	64.41%	63.51%	67.12%	68.92%	72.97%	76.58%	78.38%	83.78%	86.94%	90.99%	90.99%	96.40%	96.85%	98.20%
3	63.96%	65.77%	66.67%	68.02%	70.27%	75.68%	80.18%	84.23%	87.84%	90.09%	92.79%	94.14%	98.20%	98.20%	99.55%
4	63.51%	67.57%	69.37%	70.27%	73.87%	76.58%	81.98%	86.94%	89.19%	93.69%	95.05%	95.95%	98.65%	100%	99.55%
5	65.32%	68.92%	72.07%	72.97%	74.77%	78.83%	85.14%	90.54%	92.34%	95.50%	97.75%	98.20%	100%	100%	100%
6	67.57%	71.17%	74.77%	77.03%	79.73%	84.23%	88.29%	91.44%	95.05%	96.85%	98.20%	99.10%	100%	100%	100%
7	67.12%	72.97%	77.03%	77.93%	80.18%	86.94%	91.44%	94.14%	95.95%	97.75%	98.65%	99.55%	100%	100%	100%
8	69.37%	75.68%	77.03%	78.83%	83.78%	87.84%	94.14%	95.95%	97.30%	99.10%	99.55%	99.55%	100%	100%	100%
9	70.72%	76.58%	80.18%	81.98%	86.49%	91.44%	95.05%	96.40%	98.65%	99.55%	99.55%	100%	100%	100%	100%
10	71.62%	76.58%	81.98%	86.49%	88.74%	92.34%	95.95%	98.65%	99.10%	99.55%	100%	100%	100%	100%	100%
11	79.28%	83.78%	87.39%	90.54%	93.24%	95.95%	98.65%	98.65%	99.10%	99.55%	100%	100%	100%	100%	100%
12	86.49%	89.64%	91.89%	95.05%	96.85%	97.75%	99.10%	99.55%	100%	100%	100%	100%	100%	100%	100%
13	91.44%	93.24%	95.05%	96.85%	97.30%	98.65%	99.55%	100%	100%	100%	100%	100%	100%	100%	100%
14	92.79%	94.59%	96.85%	97.30%	98.65%	99.55%	99.55%	100%	100%	100%	100%	100%	100%	100%	100%
15	94.14%	95.95%	96.85%	98.20%	99.10%	99.55%	100%	100%	100%	100%	100%	100%	100%	100%	100%

**Other/AUR: the leave-one-out validation**

1	20.27%	21.62%	24.77%	23.42%	21.17%	22.07%	20.72%	24.77%	27.93%	31.98%	33.78%	33.78%	37.39%	35.14%	33.33%
2	59.46%	58.56%	59.46%	56.76%	54.95%	53.60%	50.90%	49.10%	49.10%	50.45%	51.80%	49.55%	51.35%	51.80%	48.20%
3	60.81%	60.81%	59.91%	56.76%	58.11%	58.56%	55.41%	54.05%	54.50%	52.25%	53.60%	52.70%	53.15%	52.70%	47.30%
4	59.46%	61.71%	60.36%	58.11%	57.66%	56.76%	57.66%	54.50%	54.05%	52.70%	54.05%	52.25%	53.15%	51.80%	47.75%
5	59.46%	58.56%	57.21%	55.86%	56.31%	54.95%	54.50%	53.15%	58.56%	54.95%	53.60%	54.05%	54.05%	56.76%	51.35%
6	57.66%	56.76%	56.76%	55.41%	56.76%	54.95%	54.05%	56.31%	59.01%	54.50%	56.31%	55.86%	56.31%	56.31%	51.80%
7	53.60%	55.86%	54.50%	50.45%	51.35%	51.35%	53.15%	53.60%	56.31%	52.70%	52.70%	54.95%	54.05%	55.41%	49.55%

8	53.15%	55.41%	52.70%	50.00%	51.35%	51.35%	50.90%	51.35%	53.15%	51.80%	52.70%	52.70%	54.50%	53.15%	49.10%
9	52.70%	52.70%	52.25%	50.00%	51.35%	50.45%	52.70%	52.70%	51.80%	50.90%	50.90%	50.00%	51.80%	51.35%	47.30%
10	49.55%	50.00%	50.00%	48.65%	47.75%	48.65%	50.45%	49.55%	50.00%	50.45%	50.90%	47.75%	47.30%	48.65%	45.95%
11	50.45%	50.00%	49.10%	49.55%	48.20%	49.55%	52.70%	50.90%	49.55%	50.00%	50.45%	46.85%	48.20%	46.85%	44.14%
12	50.00%	48.65%	47.75%	46.85%	48.65%	50.00%	50.90%	49.10%	50.00%	48.65%	49.55%	47.75%	48.65%	48.65%	45.05%
13	49.10%	45.95%	46.85%	45.50%	46.85%	48.20%	47.30%	46.85%	47.75%	47.75%	48.65%	46.85%	48.20%	48.65%	44.59%
14	45.50%	45.50%	45.05%	45.50%	48.65%	48.20%	48.20%	45.05%	46.85%	47.30%	45.95%	45.95%	45.50%	46.85%	42.79%
15	46.40%	45.50%	45.05%	45.50%	47.75%	46.40%	46.40%	44.59%	45.95%	45.95%	45.50%	45.05%	45.05%	45.05%	42.34%

Optimal PSP(m, n): PSP(4, 2)

**TK/InsR/IGF1R: the self-consistency validation**

1	45.16%	47.31%	61.29%	76.34%	77.42%	82.80%	92.47%	95.70%	96.77%	98.92%	100%	100%	100%	100%	100%
2	48.39%	67.74%	64.52%	76.34%	79.57%	86.02%	91.40%	93.55%	96.77%	96.77%	98.92%	100%	100%	100%	100%
3	47.31%	64.52%	75.27%	87.10%	88.17%	92.47%	95.70%	95.70%	97.85%	100%	100%	100%	100%	100%	100%
4	61.29%	69.89%	72.04%	86.02%	92.47%	93.55%	95.70%	96.77%	98.92%	100%	100%	100%	100%	100%	100%
5	65.59%	70.97%	78.49%	90.32%	95.70%	94.62%	96.77%	98.92%	98.92%	100%	100%	100%	100%	100%	100%
6	72.04%	84.95%	88.17%	95.70%	96.77%	97.85%	98.92%	98.92%	100%	100%	100%	100%	100%	100%	100%
7	81.72%	90.32%	93.55%	95.70%	96.77%	95.70%	96.77%	98.92%	100%	100%	100%	100%	100%	100%	100%
8	91.40%	92.47%	94.62%	96.77%	96.77%	96.77%	95.70%	100%	100%	100%	100%	100%	100%	100%	100%
9	93.55%	94.62%	97.85%	96.77%	96.77%	100%	98.92%	100%	100%	100%	100%	100%	100%	100%	100%
10	94.62%	96.77%	100%	98.92%	98.92%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
11	96.77%	97.85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
12	97.85%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
13	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
14	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
15	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

**TK/InsR/IGF1R: the leave-one-out validation**

1	26.88%	32.26%	41.94%	58.06%	48.39%	56.99%	64.52%	66.67%	63.44%	73.12%	77.42%	81.72%	80.65%	80.65%	82.80%
2	25.81%	41.94%	35.48%	56.99%	53.76%	62.37%	65.59%	68.82%	70.97%	73.12%	77.42%	83.87%	81.72%	82.80%	83.87%
3	27.96%	36.56%	46.24%	51.61%	53.76%	59.14%	65.59%	72.04%	72.04%	73.12%	78.49%	82.80%	81.72%	81.72%	83.87%
4	34.41%	39.78%	40.86%	49.46%	51.61%	66.67%	69.89%	72.04%	74.19%	75.27%	79.57%	81.72%	81.72%	81.72%	82.80%
5	33.33%	36.56%	38.71%	48.39%	58.06%	66.67%	74.19%	76.34%	74.19%	76.34%	80.65%	82.80%	81.72%	81.72%	83.87%
6	37.63%	38.71%	48.39%	59.14%	68.82%	77.42%	80.65%	78.49%	81.72%	81.72%	82.80%	82.80%	81.72%	82.80%	82.80%

7	37.63%	39.78%	47.31%	59.14%	69.89%	76.34%	75.27%	78.49%	82.80%	80.65%	81.72%	82.80%	82.80%	82.80%	82.80%
8	40.86%	46.24%	59.14%	67.74%	68.82%	78.49%	78.49%	83.87%	82.80%	80.65%	80.65%	82.80%	81.72%	83.87%	83.87%
9	52.69%	52.69%	73.12%	75.27%	74.19%	83.87%	78.49%	83.87%	83.87%	81.72%	80.65%	83.87%	83.87%	82.80%	81.72%
10	63.44%	68.82%	79.57%	81.72%	86.02%	86.02%	84.95%	84.95%	83.87%	81.72%	81.72%	81.72%	83.87%	82.80%	82.80%
11	67.74%	72.04%	81.72%	86.02%	84.95%	86.02%	86.02%	84.95%	83.87%	82.80%	81.72%	83.87%	83.87%	82.80%	86.02%
12	72.04%	76.34%	82.80%	86.02%	83.87%	86.02%	<b>87.10%</b>	84.95%	84.95%	83.87%	82.80%	84.95%	81.72%	83.87%	84.95%
13	78.49%	77.42%	81.72%	82.80%	84.95%	86.02%	84.95%	84.95%	84.95%	81.72%	82.80%	82.80%	81.72%	82.80%	82.80%
14	77.42%	78.49%	78.49%	81.72%	81.72%	82.80%	82.80%	82.80%	82.80%	79.57%	80.65%	80.65%	80.65%	79.57%	80.65%
15	77.42%	79.57%	80.65%	81.72%	82.80%	83.87%	82.80%	82.80%	82.80%	81.72%	82.80%	82.80%	80.65%	80.65%	81.72%

*Opimal PSP(m, n): PSP(12, 7)*

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**Table S2** - The performances of self-consistency and LOO validation for 72 PK groups without less than 30 positive phosphorylation sites. Due to the page limitation, only conventional 4-fold cross-validation performances were shown. The results of LOO are quite similar with the  $n$ -fold cross-validation for these PK groups.

Kinase Family	PSP( $m,n$ )		P.	N.	Threshold	Cutoff	Self Consistency				Leave-one-out Validation				4-Fold Cross Validation			
	$m$	$n$					$Ac$	$Sn$	$Sp$	$MCC$	$Ac$	$Sn$	$Sp$	$MCC$	$Ac$	$Sn$	$Sp$	$MCC$
AGC	7	15	1028	48168	High	1.355	95.67%	51.95%	96.61%	0.3384	95.58%	47.37%	96.61%	0.3097	95.58%	46.90%	96.62%	0.3077
					Medium	0.949	91.79%	71.50%	92.22%	0.3167	91.63%	64.20%	92.22%	0.2826	91.51%	62.38%	92.14%	0.2729
					Low	0.771	88.06%	78.89%	88.25%	0.2842	87.96%	74.12%	88.25%	0.2648	87.92%	72.87%	88.24%	0.2601
AGC/AKT	6	2	89	7648	High	3.831	97.48%	86.52%	97.61%	0.4978	97.44%	83.15%	97.61%	0.4805	97.36%	81.96%	97.55%	0.4756
					Medium	2.461	93.55%	91.01%	93.58%	0.3447	93.55%	91.01%	93.58%	0.3447	93.43%	91.96%	93.45%	0.3499
					Low	1.697	89.61%	92.13%	89.58%	0.2746	89.61%	92.13%	89.58%	0.2746	89.43%	92.83%	89.39%	0.2783
AGC/DMPK	14	1	39	2045	High	1.795	87.86%	100.00%	87.63%	0.3421	87.24%	66.67%	87.63%	0.2161	86.78%	61.50%	87.28%	0.1947
					Medium	1.256	76.01%	100.00%	75.55%	0.2338	75.53%	74.36%	75.55%	0.1554	75.53%	71.00%	75.62%	0.1470
					Low	1.000	67.85%	100.00%	67.24%	0.1923	67.51%	82.05%	67.24%	0.1413	67.57%	80.50%	67.31%	0.1388
AGC/DMPK/ROCK	14	1	38	1923	High	2.158	86.69%	97.37%	86.48%	0.3224	86.08%	65.79%	86.48%	0.2044	85.90%	64.00%	86.35%	0.2010
					Medium	1.526	75.42%	100.00%	74.93%	0.2340	74.91%	73.68%	74.93%	0.1528	74.31%	77.00%	74.25%	0.1635
					Low	1.237	67.41%	100.00%	66.77%	0.1936	67.01%	78.95%	66.77%	0.1329	65.91%	82.00%	65.57%	0.1405
AGC/GRK	10	12	84	1251	High	0.798	94.46%	100.00%	94.08%	0.7072	91.61%	54.76%	94.08%	0.4147	90.54%	52.05%	93.24%	0.3785
					Medium	0.583	89.74%	100.00%	89.05%	0.5818	87.57%	65.48%	89.05%	0.3773	86.79%	62.05%	88.53%	0.3529
					Low	0.476	86.44%	100.00%	85.53%	0.5207	84.34%	66.67%	85.53%	0.3317	83.73%	65.23%	85.03%	0.3222
AGC/GRK/BARK	5	15	33	692	High	1.788	96.55%	100.00%	96.39%	0.7405	93.79%	39.39%	96.39%	0.3347	92.30%	39.44%	95.03%	0.2989
					Medium	1.364	92.97%	100.00%	92.63%	0.6032	90.90%	54.55%	92.63%	0.3351	89.56%	52.78%	91.47%	0.3094
					Low	1.152	90.34%	100.00%	89.88%	0.5366	88.55%	60.61%	89.88%	0.3192	86.50%	59.44%	87.90%	0.2914
AGC/PKA	9	3	370	21108	High	2.770	97.19%	68.38%	97.69%	0.4713	97.14%	65.41%	97.69%	0.4534	97.06%	63.49%	97.65%	0.4399
					Medium	1.943	93.96%	82.97%	94.15%	0.3887	93.91%	80.54%	94.15%	0.3775	93.90%	79.41%	94.15%	0.3731
					Low	1.422	90.32%	90.27%	90.32%	0.3342	90.30%	89.46%	90.32%	0.3310	90.27%	88.44%	90.31%	0.3275
AGC/PKB	10	5	34	1723	High	1.882	96.19%	100.00%	96.11%	0.5688	95.73%	76.47%	96.11%	0.4466	95.43%	77.78%	95.80%	0.4491
					Medium	1.118	91.12%	100.00%	90.95%	0.4034	90.78%	82.35%	90.95%	0.3298	89.70%	85.56%	89.79%	0.3312
					Low	0.853	86.57%	100.00%	86.30%	0.3297	86.34%	88.24%	86.30%	0.2865	85.18%	86.67%	85.15%	0.2751
AGC/PKB/PDK1	8	7	34	1723	High	1.853	96.41%	100.00%	96.34%	0.5811	95.85%	70.59%	96.34%	0.4250	95.34%	65.56%	95.96%	0.3888
					Medium	1.059	91.12%	100.00%	90.95%	0.4034	90.78%	82.35%	90.95%	0.3298	90.25%	71.67%	90.64%	0.2861
					Low	0.794	86.00%	100.00%	85.72%	0.3226	85.71%	85.29%	85.72%	0.2692	84.70%	79.44%	84.81%	0.2451
AGC/PKC	10	8	413	18681	High	2.201	96.40%	54.72%	97.32%	0.3956	96.22%	46.73%	97.32%	0.3424	96.16%	46.97%	97.26%	0.3418
					Medium	1.608	92.95%	71.67%	93.42%	0.3493	92.80%	64.89%	93.42%	0.3156	92.74%	65.62%	93.35%	0.3185

					Low	1.332	89.65%	81.84%	89.82%	0.3240	89.44%	72.15%	89.82%	0.2824	89.49%	73.27%	89.85%	0.2885
					High	4.590	97.06%	34.72%	98.20%	0.2860	97.01%	31.94%	98.20%	0.2645	96.75%	29.46%	98.01%	0.2371
AGC/PKC/Alpha	4	5	144	7870	Medium	3.569	94.36%	60.42%	94.98%	0.3095	94.20%	51.39%	94.98%	0.2624	93.85%	49.05%	94.69%	0.2456
					Low	3.062	91.58%	68.75%	91.99%	0.2806	91.46%	62.50%	91.99%	0.2531	91.06%	60.14%	91.64%	0.2397
					High	3.806	97.47%	54.84%	98.00%	0.3648	97.10%	25.81%	98.00%	0.1765	96.86%	23.12%	97.82%	0.1526
AGC/PKC/Delta	3	2	31	2456	Medium	2.968	95.22%	67.74%	95.56%	0.3156	95.05%	54.84%	95.56%	0.2550	94.53%	48.12%	95.13%	0.2150
					Low	2.516	92.76%	70.97%	93.04%	0.2654	92.64%	61.29%	93.04%	0.2269	91.82%	56.25%	92.28%	0.1977
					High	3.970	96.94%	52.24%	97.76%	0.3818	96.57%	32.09%	97.76%	0.2419	96.27%	30.88%	97.49%	0.2223
AGC/PKC/Alpha/PKCa	11	5	134	7279	Medium	2.948	93.57%	72.39%	93.96%	0.3410	93.27%	55.97%	93.96%	0.2616	93.03%	57.06%	93.70%	0.2630
					Low	2.455	90.25%	79.10%	90.45%	0.2985	90.10%	70.90%	90.45%	0.2649	89.82%	68.38%	90.22%	0.2527
					High	5.095	97.88%	54.76%	98.66%	0.4724	97.83%	52.38%	98.66%	0.4554	97.88%	57.73%	98.64%	0.4975
AGC/PKG	3	1	42	2311	Medium	4.095	95.92%	69.05%	96.41%	0.4070	95.79%	61.90%	96.41%	0.3673	95.91%	65.91%	96.48%	0.3996
					Low	3.476	93.33%	78.57%	93.60%	0.3586	93.16%	69.05%	93.60%	0.3145	93.64%	70.91%	94.07%	0.3417
					High	1.897	96.67%	81.03%	96.93%	0.4821	96.34%	60.34%	96.93%	0.3680	95.79%	57.00%	96.44%	0.3314
AGC/RSK	7	3	58	3550	Medium	1.345	92.13%	94.83%	92.08%	0.3761	91.77%	72.41%	92.08%	0.2841	90.66%	69.33%	91.02%	0.2573
					Low	1.103	87.36%	100.00%	87.15%	0.3136	87.06%	81.03%	87.15%	0.2476	86.07%	74.67%	86.27%	0.2197
					High	1.289	95.48%	100.00%	95.42%	0.4821	94.87%	57.89%	95.42%	0.2834	94.57%	57.50%	95.15%	0.2796
AGC/RSK/RSK	7	13	38	2574	Medium	0.895	91.19%	100.00%	91.06%	0.3593	90.77%	71.05%	91.06%	0.2497	89.89%	69.50%	90.20%	0.2369
					Low	0.737	87.21%	100.00%	87.02%	0.2982	86.91%	78.95%	87.02%	0.2281	85.93%	75.50%	86.09%	0.2126
					High	1.953	96.35%	56.63%	96.97%	0.3430	96.18%	45.52%	96.97%	0.2779	96.14%	44.57%	96.95%	0.2716
CAMK	11	3	279	17849	Medium	1.430	92.40%	74.91%	92.68%	0.3006	92.23%	63.80%	92.68%	0.2535	92.18%	64.14%	92.62%	0.2544
					Low	1.208	88.61%	82.44%	88.71%	0.2658	88.47%	73.12%	88.71%	0.2322	88.12%	70.86%	88.39%	0.2207
					High	4.500	97.78%	53.19%	98.41%	0.4024	97.66%	44.68%	98.41%	0.3448	97.64%	44.38%	98.40%	0.3448
CAMK/CAMK2	6	3	94	6664	Medium	2.617	94.76%	68.09%	95.14%	0.3183	94.72%	64.89%	95.14%	0.3033	94.63%	63.54%	95.08%	0.2978
					Low	1.989	91.20%	89.36%	91.22%	0.3160	90.96%	72.34%	91.22%	0.2520	91.03%	73.33%	91.28%	0.2590
					High	2.917	98.50%	100.00%	98.48%	0.7117	97.49%	36.11%	98.48%	0.3035	97.50%	48.00%	98.39%	0.3962
CAMK/CAMK2/CAMK2a	10	7	36	2235	Medium	1.806	94.72%	100.00%	94.63%	0.4673	94.41%	80.56%	94.63%	0.3793	94.02%	78.50%	94.29%	0.3752
					Low	1.389	90.71%	100.00%	90.56%	0.3633	90.53%	88.89%	90.56%	0.3210	90.54%	85.00%	90.64%	0.3217
					High	2.461	96.80%	82.89%	96.96%	0.4347	96.55%	60.53%	96.96%	0.3231	96.52%	61.25%	96.95%	0.3329
CAMK/CAMKL	7	3	76	6613	Medium	1.868	92.00%	86.84%	92.06%	0.2947	91.91%	78.95%	92.06%	0.2664	91.97%	76.50%	92.16%	0.2653
					Low	1.605	88.25%	90.79%	88.22%	0.2517	88.17%	84.21%	88.22%	0.2313	88.03%	81.75%	88.11%	0.2278
					High	3.081	97.64%	94.59%	97.67%	0.5038	97.32%	59.46%	97.67%	0.3287	96.98%	51.50%	97.44%	0.2837
CAMK/CAMKL/AMPK	7	3	37	3951	Medium	2.324	93.36%	97.30%	93.32%	0.3294	93.20%	81.08%	93.32%	0.2730	93.13%	79.00%	93.27%	0.2740
					Low	1.946	90.27%	100.00%	90.18%	0.2802	90.22%	94.59%	90.18%	0.2639	89.11%	91.50%	89.08%	0.2495
					High	3.639	96.32%	66.67%	96.97%	0.4491	95.67%	36.11%	96.97%	0.2522	95.66%	37.50%	97.07%	0.2766
CAMK/MAPKAPK	7	2	36	1651	Medium	2.611	92.41%	88.89%	92.49%	0.4060	91.94%	66.67%	92.49%	0.3022	91.24%	62.50%	91.94%	0.2841

					Low	2.167	88.03%	91.67%	87.95%	0.3341	87.55%	69.44%	87.95%	0.2444	87.23%	68.00%	87.70%	0.2467
					High	6.030	96.27%	63.64%	96.99%	0.4335	95.68%	36.36%	96.99%	0.2559	95.74%	41.67%	97.04%	0.3037
CAMK/MAPKAPK/MAPKAPK	8	1	33	1496	Medium	4.333	92.09%	78.79%	92.38%	0.3586	91.69%	60.61%	92.38%	0.2723	90.83%	62.22%	91.52%	0.2742
					Low	3.606	87.64%	84.85%	87.70%	0.3051	87.31%	69.70%	87.70%	0.2438	86.89%	71.67%	87.25%	0.2559
					High	1.455	91.65%	98.70%	91.45%	0.4697	90.12%	42.86%	91.45%	0.1910	89.11%	42.50%	90.47%	0.1789
CK1	8	14	77	2738	Medium	1.091	84.19%	100.00%	83.75%	0.3515	82.98%	55.84%	83.75%	0.1706	81.43%	50.50%	82.33%	0.1401
					Low	0.922	77.37%	100.00%	76.73%	0.2877	76.23%	58.44%	76.73%	0.1339	75.50%	55.50%	76.08%	0.1214
					High	1.959	91.44%	90.41%	91.47%	0.4311	90.09%	41.10%	91.47%	0.1820	90.31%	45.00%	91.64%	0.2088
CK1/CK1	4	14	73	2590	Medium	1.521	85.09%	98.63%	84.71%	0.3575	83.93%	56.16%	84.71%	0.1802	83.74%	57.37%	84.51%	0.1869
					Low	1.301	79.01%	100.00%	78.42%	0.3010	77.92%	60.27%	78.42%	0.1509	78.13%	63.16%	78.57%	0.1659
					High	5.352	95.08%	55.21%	96.05%	0.3520	95.05%	53.85%	96.05%	0.3437	95.15%	54.18%	96.14%	0.3501
CMGC	2	4	585	24132	Medium	2.781	90.63%	84.96%	90.76%	0.3675	90.63%	84.96%	90.76%	0.3675	90.61%	86.46%	90.72%	0.3741
					Low	1.829	83.88%	87.86%	83.79%	0.2840	83.87%	87.35%	83.79%	0.2821	83.82%	88.57%	83.71%	0.2866
					High	2.856	95.09%	65.47%	95.76%	0.3909	94.93%	57.96%	95.76%	0.3479	94.86%	57.86%	95.70%	0.3462
CMGC/CDK	2	9	333	14801	Medium	1.342	90.14%	89.79%	90.15%	0.3661	90.13%	89.19%	90.15%	0.3635	89.97%	90.48%	89.96%	0.3670
					Low	0.934	83.94%	93.99%	83.71%	0.2967	83.88%	91.29%	83.71%	0.2868	83.50%	92.92%	83.28%	0.2896
					High	2.512	94.66%	77.78%	95.02%	0.4227	94.40%	65.22%	95.02%	0.3565	94.34%	63.75%	95.00%	0.3486
CMGC/CDK/CDC2	2	13	207	9682	Medium	1.261	87.11%	93.24%	86.98%	0.3243	87.05%	90.34%	86.98%	0.3131	86.69%	91.73%	86.58%	0.3141
					Low	0.932	78.56%	95.65%	78.20%	0.2499	78.50%	92.75%	78.20%	0.2403	78.49%	93.75%	78.16%	0.2439
					High	4.072	94.17%	74.82%	94.54%	0.3759	94.01%	66.19%	94.54%	0.3329	94.07%	65.86%	94.61%	0.3341
CMGC/CDK/CDC2/CDC2	1	13	139	7220	Medium	1.871	87.14%	87.77%	87.13%	0.2914	87.13%	87.05%	87.13%	0.2887	87.18%	86.14%	87.20%	0.2870
					Low	1.201	75.83%	93.53%	75.48%	0.2147	75.73%	88.49%	75.48%	0.1992	75.56%	88.00%	75.32%	0.1974
					High	3.095	95.22%	97.30%	95.17%	0.5792	94.70%	78.38%	95.17%	0.4766	94.84%	75.53%	95.40%	0.4735
CMGC/CDK/CDC2/CDK2	4	15	74	2606	Medium	1.500	87.54%	100.00%	87.18%	0.3977	87.50%	98.65%	87.18%	0.3919	87.20%	96.84%	86.92%	0.3844
					Low	1.027	78.06%	100.00%	77.44%	0.2942	78.02%	98.65%	77.44%	0.2892	77.91%	98.16%	77.32%	0.2898
					High	3.605	93.99%	58.02%	94.76%	0.3097	93.84%	50.62%	94.76%	0.2693	93.33%	47.14%	94.35%	0.2441
CMGC/GSK	2	5	81	3796	Medium	2.679	86.48%	79.01%	86.64%	0.2650	86.33%	71.60%	86.64%	0.2361	86.06%	69.76%	86.42%	0.2302
					Low	2.235	80.84%	87.65%	80.69%	0.2411	80.63%	77.78%	80.69%	0.2070	79.98%	75.48%	80.08%	0.1980
					High	4.102	95.00%	61.22%	95.70%	0.3544	94.58%	40.82%	95.70%	0.2360	94.43%	36.54%	95.71%	0.2156
CMGC/GSK/GSK3B	1	5	49	2351	Medium	3.000	91.54%	81.63%	91.75%	0.3498	91.29%	69.39%	91.75%	0.2949	91.26%	66.15%	91.82%	0.2885
					Low	2.347	86.42%	85.71%	86.43%	0.2854	86.29%	79.59%	86.43%	0.2621	85.12%	76.15%	85.32%	0.2439
					High	3.757	95.54%	61.00%	96.25%	0.3728	95.45%	56.33%	96.25%	0.3456	95.30%	54.80%	96.14%	0.3339
CMGC/MAPK	4	4	300	14574	Medium	2.037	90.59%	88.33%	90.64%	0.3555	90.58%	87.67%	90.64%	0.3527	90.45%	86.91%	90.53%	0.3494
					Low	1.227	85.34%	90.67%	85.23%	0.2889	85.34%	90.67%	85.23%	0.2889	84.95%	89.80%	84.85%	0.2833
					High	5.910	95.57%	70.66%	95.97%	0.3808	95.48%	65.27%	95.97%	0.3529	95.34%	63.57%	95.86%	0.3405
CMGC/MAPK/ERK	3	2	167	10234	Medium	3.485	90.24%	89.82%	90.25%	0.3212	90.24%	89.82%	90.25%	0.3212	90.06%	88.69%	90.09%	0.3150

					Low	2.096	85.45%	92.81%	85.33%	0.2685	85.43%	91.62%	85.33%	0.2645	85.35%	91.07%	85.26%	0.2626
					High	6.557	95.07%	77.39%	95.33%	0.3767	95.00%	73.04%	95.33%	0.3561	95.02%	70.86%	95.38%	0.3486
CMGC/MAPK/ERK/MAPK1	4	3	115	7691	Medium	3.904	89.93%	92.17%	89.90%	0.3122	89.92%	91.30%	89.90%	0.3090	89.95%	91.72%	89.92%	0.3121
					Low	2.330	84.84%	94.78%	84.70%	0.2581	84.82%	93.04%	84.70%	0.2526	84.97%	95.00%	84.82%	0.2610
					High	7.747	94.99%	68.97%	95.37%	0.3325	94.92%	64.37%	95.37%	0.3104	95.11%	65.91%	95.54%	0.3249
CMGC/MAPK/ERK/MAPK3	2	1	87	6041	Medium	4.483	89.44%	93.10%	89.39%	0.3027	89.44%	93.10%	89.39%	0.3027	89.36%	94.09%	89.29%	0.3062
					Low	3.034	84.64%	94.25%	84.51%	0.2503	84.64%	94.25%	84.51%	0.2503	84.86%	94.55%	84.72%	0.2544
					High	4.688	95.68%	75.00%	96.16%	0.4654	95.12%	50.00%	96.16%	0.3179	94.74%	49.23%	95.87%	0.3124
CMGC/MAPK/JNK	3	4	48	2082	Medium	1.979	90.28%	100.00%	90.06%	0.4117	90.19%	95.83%	90.06%	0.3940	89.76%	96.92%	89.58%	0.4027
					Low	1.312	83.71%	100.00%	83.33%	0.3182	83.71%	100.00%	83.33%	0.3182	82.17%	98.46%	81.77%	0.3080
					High	15.889	95.48%	52.78%	96.48%	0.3502	94.97%	30.56%	96.48%	0.2032	95.00%	34.50%	96.57%	0.2429
CMGC/MAPK/JNK/MAPK8	2	1	36	1536	Medium	3.444	91.35%	94.44%	91.28%	0.4150	91.35%	94.44%	91.28%	0.4150	91.03%	93.00%	90.97%	0.4191
					Low	2.444	85.94%	94.44%	85.74%	0.3264	85.94%	94.44%	85.74%	0.3264	86.47%	93.00%	86.30%	0.3423
					High	4.776	95.70%	68.97%	96.40%	0.4609	95.48%	60.34%	96.40%	0.4083	95.43%	60.00%	96.38%	0.4101
CMGC/MAPK/p38	3	4	58	2222	Medium	2.862	90.70%	77.59%	91.04%	0.3496	90.70%	77.59%	91.04%	0.3496	90.69%	78.67%	91.02%	0.3589
					Low	2.034	84.52%	82.76%	84.56%	0.2812	84.39%	77.59%	84.56%	0.2604	83.81%	80.00%	83.91%	0.2674
					High	5.720	95.75%	66.00%	96.54%	0.4525	95.64%	62.00%	96.54%	0.4277	95.72%	60.77%	96.69%	0.4327
CMGC/MAPK/p38/MAPK14	3	1	50	1878	Medium	3.320	90.51%	74.00%	90.95%	0.3334	90.51%	74.00%	90.95%	0.3334	90.65%	75.38%	91.07%	0.3477
					Low	2.180	86.00%	76.00%	86.26%	0.2745	86.00%	76.00%	86.26%	0.2745	85.70%	77.69%	85.93%	0.2824
					High	2.680	96.25%	54.00%	97.13%	0.3736	95.74%	29.00%	97.13%	0.2043	95.54%	32.12%	96.92%	0.2221
STE	6	5	100	4781	Medium	2.060	92.42%	73.00%	92.83%	0.3340	91.99%	52.00%	92.83%	0.2328	91.67%	51.54%	92.55%	0.2294
					Low	1.750	88.71%	84.00%	88.81%	0.3100	88.24%	61.00%	88.81%	0.2155	87.79%	62.12%	88.34%	0.2185
					High	2.088	96.72%	69.12%	97.29%	0.4745	95.89%	27.94%	97.29%	0.2014	95.40%	28.89%	96.86%	0.1978
STE/STE20	6	5	68	3286	Medium	1.632	93.44%	88.24%	93.55%	0.4222	92.61%	47.06%	93.55%	0.2204	91.89%	46.39%	92.88%	0.2101
					Low	1.397	89.27%	95.59%	89.14%	0.3600	88.49%	57.35%	89.14%	0.2030	87.84%	56.67%	88.52%	0.1982
					High	3.052	96.48%	53.45%	97.39%	0.3865	96.01%	31.03%	97.39%	0.2308	95.77%	29.67%	97.22%	0.2166
STE/STE20/PAKA	6	2	58	2724	Medium	2.345	93.13%	75.86%	93.50%	0.3665	92.63%	51.72%	93.50%	0.2462	92.19%	51.00%	93.09%	0.2378
					Low	2.000	89.86%	84.48%	89.98%	0.3325	89.43%	63.79%	89.98%	0.2442	89.10%	61.67%	89.70%	0.2345
					High	0.774	89.34%	72.57%	91.30%	0.5416	87.25%	52.54%	91.30%	0.3951	87.33%	54.28%	91.20%	0.4067
TK	15	13	689	5908	Medium	0.636	85.71%	84.91%	85.80%	0.5256	83.63%	65.02%	85.80%	0.3922	83.59%	64.48%	85.83%	0.3893
					Low	0.544	81.48%	91.44%	80.31%	0.4933	79.48%	72.28%	80.31%	0.3706	79.13%	71.85%	79.98%	0.3645
					High	1.720	92.59%	100.00%	91.85%	0.7104	87.52%	44.00%	91.85%	0.3236	86.62%	43.85%	91.03%	0.3100
TK/Abl	5	15	50	503	Medium	1.360	87.34%	100.00%	86.08%	0.5989	83.00%	52.00%	86.08%	0.2883	81.87%	52.69%	84.88%	0.2810
					Low	1.140	82.46%	100.00%	80.72%	0.5240	78.66%	58.00%	80.72%	0.2647	77.63%	63.85%	79.05%	0.2886
					High	1.333	92.44%	100.00%	91.70%	0.7033	87.45%	43.75%	91.70%	0.3164	85.91%	43.08%	90.40%	0.2939
TK/Abl/Abl	10	12	48	494	Medium	1.042	87.64%	100.00%	86.44%	0.6007	83.39%	52.08%	86.44%	0.2915	80.80%	51.54%	83.87%	0.2620

					Low	0.854	80.44%	100.00%	78.54%	0.4948	76.75%	58.33%	78.54%	0.2429	75.33%	59.23%	77.02%	0.2409
					High	2.000	94.22%	100.00%	93.44%	0.7933	89.17%	57.58%	93.44%	0.4974	86.96%	48.24%	92.32%	0.3990
TK/EGFR	15	4	66	488	Medium	1.591	89.17%	100.00%	87.70%	0.6778	85.74%	71.21%	87.70%	0.4835	83.04%	65.29%	85.49%	0.4095
					Low	1.333	82.49%	100.00%	80.12%	0.5696	80.87%	86.36%	80.12%	0.4808	78.68%	78.24%	78.74%	0.4137
					High	2.197	94.80%	100.00%	94.10%	0.8077	90.56%	63.93%	94.10%	0.5610	88.51%	55.62%	93.09%	0.4764
TK/EGFR/EGFR	15	5	61	458	Medium	1.770	88.82%	100.00%	87.34%	0.6691	85.74%	73.77%	87.34%	0.4934	84.20%	68.12%	86.43%	0.4447
					Low	1.475	82.47%	100.00%	80.13%	0.5671	79.77%	77.05%	80.13%	0.4168	79.24%	77.19%	79.52%	0.4163
					High	2.200	90.12%	100.00%	88.73%	0.7021	84.36%	53.33%	88.73%	0.3732	81.69%	43.75%	87.31%	0.2793
TK/FGFR	12	4	30	213	Medium	1.800	85.60%	100.00%	83.57%	0.6210	79.84%	53.33%	83.57%	0.2981	77.98%	46.88%	82.59%	0.2417
					Low	1.533	82.30%	100.00%	79.81%	0.5727	77.37%	60.00%	79.81%	0.3020	74.52%	51.25%	77.96%	0.2238
					High	1.606	94.56%	100.00%	93.56%	0.8329	89.83%	69.70%	93.56%	0.6213	88.13%	61.47%	93.17%	0.5517
TK/InsR	5	15	66	357	Medium	1.288	90.07%	100.00%	88.24%	0.7343	87.00%	80.30%	88.24%	0.5960	84.77%	69.12%	87.72%	0.5074
					Low	1.076	85.58%	100.00%	82.91%	0.6564	82.74%	81.82%	82.91%	0.5280	80.51%	75.88%	81.39%	0.4678
					High	1.839	93.75%	100.00%	92.66%	0.8080	91.83%	87.10%	92.66%	0.7207	90.28%	78.12%	92.44%	0.6547
TK/InsR/IGF1R	12	7	31	177	Medium	1.452	88.94%	100.00%	87.01%	0.7067	87.02%	87.10%	87.01%	0.6176	88.58%	80.62%	90.00%	0.6245
					Low	1.161	87.02%	100.00%	84.75%	0.6730	85.10%	87.10%	84.75%	0.5836	83.68%	80.62%	84.22%	0.5322
					High	2.489	92.02%	100.00%	90.37%	0.7849	82.89%	46.67%	90.37%	0.3807	82.76%	46.25%	90.73%	0.3878
TK/InsR/InsR	6	12	45	218	Medium	2.000	85.55%	100.00%	82.57%	0.6691	78.33%	57.78%	82.57%	0.3541	78.21%	53.75%	83.55%	0.3391
					Low	1.667	80.61%	100.00%	76.61%	0.5992	74.14%	62.22%	76.61%	0.3190	74.33%	60.42%	77.36%	0.3180
					High	3.195	95.79%	90.24%	96.31%	0.7721	91.79%	43.90%	96.31%	0.4381	90.75%	45.00%	95.37%	0.4214
TK/JakA	2	11	41	434	Medium	2.634	92.84%	100.00%	92.17%	0.7098	89.89%	65.85%	92.17%	0.4870	88.67%	59.09%	91.65%	0.4354
					Low	2.220	87.79%	100.00%	86.64%	0.5990	85.47%	73.17%	86.64%	0.4323	84.58%	71.82%	85.87%	0.4208
					High	2.067	96.91%	100.00%	96.21%	0.9081	96.91%	100.00%	96.21%	0.9081	93.45%	91.25%	93.97%	0.8044
TK/Met	15	8	30	132	Medium	1.500	88.89%	100.00%	86.36%	0.7347	88.89%	100.00%	86.36%	0.7347	88.93%	91.88%	88.24%	0.7084
					Low	1.133	82.72%	100.00%	78.79%	0.6384	82.72%	100.00%	78.79%	0.6384	82.14%	92.50%	79.71%	0.5983
					High	0.743	91.29%	94.44%	91.00%	0.6446	87.77%	52.78%	91.00%	0.3656	87.74%	53.70%	90.92%	0.3723
TK/Src	15	14	288	3122	Medium	0.583	87.62%	99.65%	86.52%	0.5907	84.63%	64.24%	86.52%	0.3692	84.54%	65.48%	86.32%	0.3761
					Low	0.483	83.14%	100.00%	81.58%	0.5218	80.94%	73.96%	81.58%	0.3664	79.54%	73.42%	80.11%	0.3482
					High	3.510	93.22%	75.51%	94.82%	0.6199	90.17%	38.78%	94.82%	0.3424	90.47%	41.54%	95.15%	0.3804
TK/Src/Fyn	6	8	49	541	Medium	2.857	89.83%	85.71%	90.20%	0.5700	87.29%	55.10%	90.20%	0.3652	86.11%	55.00%	89.08%	0.3507
					Low	2.408	83.56%	100.00%	82.07%	0.5248	80.85%	67.35%	82.07%	0.3290	81.14%	64.62%	82.72%	0.3257
					High	2.191	93.54%	100.00%	92.89%	0.7387	88.85%	48.94%	92.89%	0.3869	90.08%	50.83%	94.10%	0.4336
TK/Src/Lyn	15	4	47	464	Medium	1.745	90.02%	100.00%	89.01%	0.6534	86.69%	63.83%	89.01%	0.4181	86.32%	60.83%	88.93%	0.3974
					Low	1.447	84.93%	100.00%	83.41%	0.5623	82.19%	70.21%	83.41%	0.3770	81.20%	68.33%	82.52%	0.3554
					High	2.889	94.09%	92.59%	94.24%	0.7275	90.71%	55.56%	94.24%	0.4716	89.63%	56.07%	93.11%	0.4496
TK/Src/Lck	4	12	54	538	Medium	2.296	90.03%	96.30%	89.41%	0.6366	87.84%	72.22%	89.41%	0.4814	87.21%	73.21%	88.67%	0.4790



					Low	1.926	85.30%	100.00%	83.83%	0.5666	83.45%	79.63%	83.83%	0.4414	83.49%	80.36%	83.81%	0.4504
					High	0.832	91.36%	100.00%	90.68%	0.6438	87.95%	53.02%	90.68%	0.3432	87.35%	49.47%	90.38%	0.3146
TK/Src/Src	15	15	149	1900	Medium	0.651	86.14%	100.00%	85.05%	0.5410	83.46%	63.09%	85.05%	0.3223	82.96%	62.76%	84.57%	0.3161
					Low	0.537	80.82%	100.00%	79.32%	0.4670	78.87%	73.15%	79.32%	0.3168	78.39%	71.05%	78.98%	0.3035
					High	1.662	93.07%	98.46%	92.27%	0.7683	90.30%	76.92%	92.27%	0.6223	89.88%	71.18%	92.75%	0.5957
TK/Syk	11	9	65	440	Medium	1.262	88.12%	100.00%	86.36%	0.6701	85.94%	83.08%	86.36%	0.5562	85.62%	80.59%	86.40%	0.5444
					Low	1.015	82.18%	100.00%	79.55%	0.5776	80.79%	89.23%	79.55%	0.5060	79.80%	84.41%	79.10%	0.4734
					High	2.804	94.02%	98.04%	93.46%	0.7846	92.11%	82.35%	93.46%	0.6805	91.86%	81.92%	93.26%	0.6747
TK/Syk/Syk	15	3	51	367	Medium	2.137	90.43%	100.00%	89.10%	0.7067	89.00%	88.24%	89.10%	0.6289	88.71%	85.38%	89.18%	0.6135
					Low	1.706	84.69%	100.00%	82.56%	0.6051	83.49%	90.20%	82.56%	0.5408	83.10%	90.38%	82.07%	0.5381
					High	3.300	94.35%	100.00%	93.86%	0.7430	90.86%	56.67%	93.86%	0.4543	90.59%	57.50%	93.66%	0.4620
TK/Tec	4	13	30	342	Medium	2.600	89.52%	100.00%	88.60%	0.6206	86.83%	66.67%	88.60%	0.4119	86.65%	63.75%	88.78%	0.4030
					Low	2.167	84.68%	100.00%	83.33%	0.5361	83.06%	80.00%	83.33%	0.4178	81.60%	73.75%	82.33%	0.3750
					High	2.273	89.67%	100.00%	88.64%	0.6441	85.95%	59.09%	88.64%	0.3771	85.73%	58.33%	88.69%	0.3816
TK/PDGFR	11	6	44	440	Medium	1.818	82.23%	100.00%	80.45%	0.5218	79.34%	68.18%	80.45%	0.3275	80.16%	65.42%	81.76%	0.3334
					Low	1.500	75.62%	100.00%	73.18%	0.4458	73.14%	72.73%	73.18%	0.2854	75.08%	72.08%	75.41%	0.3098
					High	0.944	93.09%	100.00%	92.91%	0.5034	92.45%	75.00%	92.91%	0.3798	91.81%	65.00%	92.60%	0.3348
TKL	8	15	36	1354	Medium	0.667	87.19%	100.00%	86.85%	0.3822	86.62%	77.78%	86.85%	0.2889	85.17%	73.00%	85.53%	0.2654
					Low	0.528	81.15%	100.00%	80.65%	0.3121	80.65%	80.56%	80.65%	0.2389	79.13%	76.50%	79.20%	0.2229
					High	5.585	96.74%	61.70%	97.33%	0.4039	96.59%	53.19%	97.33%	0.3523	96.82%	56.46%	97.52%	0.3862
Atypical/PIKK	2	4	94	5515	Medium	1.926	92.35%	88.30%	92.42%	0.3633	92.28%	84.04%	92.42%	0.3454	92.26%	86.46%	92.36%	0.3573
					Low	1.511	86.54%	92.55%	86.44%	0.2849	86.50%	90.43%	86.44%	0.2775	86.28%	91.88%	86.18%	0.2822
					High	2.810	96.31%	98.25%	96.28%	0.5155	96.07%	82.46%	96.28%	0.4389	96.17%	81.33%	96.40%	0.4478
Atypical/PIKK/ATM	7	7	57	3841	Medium	1.550	94.82%	100.00%	94.74%	0.4566	94.77%	96.49%	94.74%	0.4413	94.94%	97.00%	94.91%	0.4584
					Low	1.200	94.51%	100.00%	94.43%	0.4457	94.48%	98.25%	94.43%	0.4381	94.59%	99.33%	94.52%	0.4547
					High	3.784	95.79%	48.65%	97.32%	0.4035	95.57%	41.89%	97.32%	0.3531	95.37%	40.53%	97.20%	0.3396
Other/AUR	3	2	74	2276	Medium	2.824	92.60%	62.16%	93.59%	0.3554	92.47%	58.11%	93.59%	0.3320	92.17%	57.89%	93.32%	0.3273
					Low	2.378	89.06%	67.57%	89.76%	0.3076	88.89%	62.16%	89.76%	0.2803	88.48%	63.95%	89.30%	0.2853
					High	4.472	93.26%	73.58%	93.82%	0.4062	93.23%	72.33%	93.82%	0.3994	93.23%	72.75%	93.82%	0.4025
Other/CK2	5	15	318	11195	Medium	3.094	88.49%	82.39%	88.66%	0.3429	88.47%	81.45%	88.66%	0.3387	88.39%	82.00%	88.57%	0.3406
					Low	2.475	84.23%	86.48%	84.16%	0.3027	84.17%	84.28%	84.16%	0.2937	84.10%	84.94%	84.07%	0.2962
					High	2.927	94.56%	77.24%	94.94%	0.4231	94.40%	69.92%	94.94%	0.3845	94.60%	71.29%	95.12%	0.3990
Other/CK2/CK2a	5	8	123	5537	Medium	2.049	90.60%	86.18%	90.70%	0.3587	90.46%	79.67%	90.70%	0.3302	90.49%	80.00%	90.72%	0.3331
					Low	1.642	86.38%	90.24%	86.29%	0.3094	86.24%	83.74%	86.29%	0.2842	86.44%	85.32%	86.46%	0.2933
					High	0.776	94.78%	100.00%	94.63%	0.5714	93.31%	46.94%	94.63%	0.2755	91.92%	45.00%	93.33%	0.2405
Other/IKK	15	7	49	1731	Medium	0.531	87.13%	100.00%	86.77%	0.3911	86.07%	61.22%	86.77%	0.2227	85.43%	53.85%	86.37%	0.1905

					Low	0.429	82.87%	100.00%	82.38%	0.3377	81.80%	61.22%	82.38%	0.1825	79.82%	62.69%	80.33%	0.1780
					High	1.812	95.73%	100.00%	95.64%	0.5551	94.00%	14.58%	95.64%	0.0691	93.52%	15.38%	95.28%	0.0719
Other/PLK	2	12	48	2319	Medium	1.438	91.42%	100.00%	91.25%	0.4177	89.99%	29.17%	91.25%	0.0997	88.62%	30.00%	89.93%	0.0952
					Low	1.229	85.34%	100.00%	85.04%	0.3215	84.20%	43.75%	85.04%	0.1120	83.80%	37.69%	84.84%	0.0908
					High	1.298	95.82%	100.00%	95.73%	0.5551	94.21%	19.15%	95.73%	0.0995	92.80%	18.33%	94.34%	0.0756
Other/PLK/PLK1	3	9	47	2320	Medium	1.021	88.68%	100.00%	88.45%	0.3633	87.41%	36.17%	88.45%	0.1055	85.89%	30.83%	87.02%	0.0739
					Low	0.872	81.96%	100.00%	81.59%	0.2844	80.69%	36.17%	81.59%	0.0635	79.79%	40.42%	80.60%	0.0742

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**Table S3** - The performances of self-consistency and leave-one-out validation for other PK groups with less than 30 sites.

Kinase Family	PSP( $m, n$ )		Positive	Negative	Threshold	Cutoff	Self Consistency				Leave-one-out Validation			
	$m$	$n$					Ac	Sn	Sp	MCC	Ac	Sn	Sp	MCC
AGC/AKT/AKT2	6	1	4	366	High	5.75	97.84%	100.00%	97.81%	0.5710	97.57%	75.00%	97.81%	0.4433
					Medium	3.75	95.68%	100.00%	95.63%	0.4373	95.68%	100.00%	95.63%	0.4373
					Low	3	89.73%	100.00%	89.62%	0.2921	89.73%	100.00%	89.62%	0.2921
AGC/DMPK/ROCK/ROCK1	8	1	15	889	High	3.4	93.36%	100.00%	93.25%	0.4319	92.59%	53.33%	93.25%	0.2256
					Medium	2.4	84.07%	100.00%	83.80%	0.2812	83.63%	73.33%	83.80%	0.1936
					Low	2	77.32%	100.00%	76.94%	0.2290	76.88%	73.33%	76.94%	0.1506
AGC/GRK/BARK/GRK-2	5	15	29	596	High	1.621	96.48%	100.00%	96.31%	0.7400	93.28%	31.03%	96.31%	0.2649
					Medium	1.207	93.60%	100.00%	93.29%	0.6262	91.84%	62.07%	93.29%	0.4013
					Low	1.034	90.56%	100.00%	90.10%	0.5449	89.28%	72.41%	90.10%	0.3936
AGC/GRK/BARK/GRK-3	8	1	4	96	High	5.75	99.00%	100.00%	98.96%	0.8898	95.00%	0.00%	98.96%	-0.0205
					Medium	4.25	99.00%	100.00%	98.96%	0.8898	95.00%	0.00%	98.96%	-0.0205
					Low	3.5	97.00%	100.00%	96.88%	0.7440	94.00%	25.00%	96.88%	0.2188
AGC/GRK/GRK	2	15	24	438	High	2	94.37%	100.00%	94.06%	0.6719	91.56%	45.83%	94.06%	0.3262
					Medium	1.583	88.96%	100.00%	88.36%	0.5317	86.80%	58.33%	88.36%	0.2980
					Low	1.333	84.63%	100.00%	83.79%	0.4601	82.47%	58.33%	83.79%	0.2413
AGC/GRK/GRK/GRK-1	1	15	8	123	High	3.75	94.66%	100.00%	94.31%	0.7092	91.60%	50.00%	94.31%	0.3826
					Medium	2.875	90.08%	100.00%	89.43%	0.5837	87.02%	50.00%	89.43%	0.2810
					Low	2.375	83.21%	100.00%	82.11%	0.4679	80.15%	50.00%	82.11%	0.1928
AGC/GRK/GRK/GRK-4	4	11	3	56	High	5	100.00%	100.00%	100.00%	1.0000	94.92%	0.00%	100.00%	N/A
					Medium	3.333	98.31%	100.00%	98.21%	0.8583	93.22%	0.00%	98.21%	-0.0304
					Low	2.333	94.92%	100.00%	94.64%	0.6879	93.22%	66.67%	94.64%	0.4836
AGC/GRK/GRK/GRK-5	12	2	11	170	High	2.273	98.90%	100.00%	98.82%	0.9144	95.03%	36.36%	98.82%	0.4696
					Medium	1.545	90.61%	100.00%	90.00%	0.5946	87.85%	54.55%	90.00%	0.3195
					Low	1.273	87.85%	100.00%	87.06%	0.5387	85.08%	54.55%	87.06%	0.2749
AGC/PKC/Eta	2	3	13	990	High	5.308	98.90%	53.85%	99.49%	0.5549	98.60%	30.77%	99.49%	0.3630
					Medium	4.308	96.61%	69.23%	96.97%	0.3873	96.11%	30.77%	96.97%	0.1734
					Low	3.769	93.52%	92.31%	93.54%	0.3669	93.02%	53.85%	93.54%	0.2090
AGC/PKC/Iota	4	5	13	859	High	3.692	98.39%	100.00%	98.37%	0.6882	97.71%	53.85%	98.37%	0.4128
					Medium	2.769	95.18%	100.00%	95.11%	0.4741	94.61%	61.54%	95.11%	0.2953
					Low	2.308	92.09%	100.00%	91.97%	0.3818	91.51%	61.54%	91.97%	0.2285
AGC/PKC/Alpha/PKCb	1	2	16	812	High	5.938	97.34%	31.25%	98.65%	0.2990	96.98%	12.50%	98.65%	0.1234
					Medium	3.688	94.20%	50.00%	95.07%	0.2655	94.08%	43.75%	95.07%	0.2310

					Low	3.062	89.98%	50.00%	90.76%	0.1868	89.86%	43.75%	90.76%	0.1591
					High	2.6	99.29%	100.00%	99.26%	0.9095	96.45%	20.00%	99.26%	0.3013
AGC/PKC/Alpha/PKCg	12	11	5	136	Medium	1.6	93.62%	100.00%	93.38%	0.5775	91.49%	40.00%	93.38%	0.2302
					Low	1	90.78%	100.00%	90.44%	0.5012	89.36%	60.00%	90.44%	0.2941
					High	3.478	97.57%	52.17%	98.08%	0.3399	97.23%	21.74%	98.08%	0.1441
AGC/PKC/Delta/PKCd	3	3	23	2035	Medium	2.696	95.68%	73.91%	95.92%	0.3414	95.34%	43.48%	95.92%	0.1994
					Low	2.304	92.71%	91.30%	92.73%	0.3218	92.18%	43.48%	92.73%	0.1430
					High	4.125	98.21%	87.50%	98.34%	0.5766	97.32%	12.50%	98.34%	0.0888
AGC/PKC/Delta/PKCt	1	3	8	663	Medium	3.125	95.38%	87.50%	95.48%	0.3946	94.93%	50.00%	95.48%	0.2250
					Low	2.625	93.29%	100.00%	93.21%	0.3751	92.70%	50.00%	93.21%	0.1803
					High	7.111	97.87%	88.89%	97.97%	0.5371	97.50%	55.56%	97.97%	0.3531
AGC/PKC/Eta/PKCe	7	2	9	790	Medium	5.333	94.62%	100.00%	94.56%	0.4045	94.37%	77.78%	94.56%	0.3152
					Low	4.556	92.62%	100.00%	92.53%	0.3500	92.37%	77.78%	92.53%	0.2695
					High	4.75	98.04%	100.00%	98.00%	0.7000	96.08%	0.00%	98.00%	-0.0200
AGC/PKC/Eta/PKCh	6	1	4	200	Medium	3.75	95.10%	100.00%	95.00%	0.5210	93.14%	0.00%	95.00%	-0.0321
					Low	3	93.14%	100.00%	93.00%	0.4546	91.18%	0.00%	93.00%	-0.0384
					High	3.615	98.51%	100.00%	98.49%	0.7017	97.82%	53.85%	98.49%	0.4236
AGC/PKC/Iota/PKCz	4	5	13	859	Medium	2.692	95.76%	100.00%	95.69%	0.4988	95.18%	61.54%	95.69%	0.3135
					Low	2.231	91.86%	100.00%	91.73%	0.3768	91.28%	61.54%	91.73%	0.2249
					High	4.062	97.40%	93.75%	97.47%	0.6156	97.04%	75.00%	97.47%	0.5098
AGC/PKG/PKG1	5	4	16	829	Medium	2.875	94.32%	100.00%	94.21%	0.4853	94.08%	87.50%	94.21%	0.4271
					Low	2.312	89.82%	100.00%	89.63%	0.3750	89.59%	87.50%	89.63%	0.3254
					High	3.5	99.23%	100.00%	99.20%	0.9092	96.17%	20.00%	99.20%	0.3001
AGC/PKG/PKG2	7	1	10	251	Medium	2.7	97.32%	100.00%	97.21%	0.7562	95.02%	40.00%	97.21%	0.3555
					Low	2.3	94.64%	100.00%	94.42%	0.6272	92.72%	50.00%	94.42%	0.3282
					High	6.083	97.58%	91.67%	97.66%	0.5713	96.97%	50.00%	97.66%	0.3329
AGC/RSK/p70	3	2	12	813	Medium	4.25	94.06%	91.67%	94.10%	0.3985	94.06%	91.67%	94.10%	0.3985
					Low	3.417	90.06%	91.67%	90.04%	0.3108	90.06%	91.67%	90.04%	0.3108
					High	5	98.03%	55.56%	99.59%	0.6713	96.06%	0.00%	99.59%	-0.0120
AGC/RSK/MSK/RSK5	2	1	9	245	Medium	4.111	96.85%	88.89%	97.14%	0.6747	94.88%	33.33%	97.14%	0.2897
					Low	3.778	94.88%	88.89%	95.10%	0.5765	93.31%	44.44%	95.10%	0.3009
					High	4.2	97.56%	80.00%	97.96%	0.6027	96.45%	30.00%	97.96%	0.2558
AGC/RSK/RSK/RSK1	3	1	10	441	Medium	3.4	96.23%	90.00%	96.37%	0.5558	95.12%	40.00%	96.37%	0.2602
					Low	3	94.46%	90.00%	94.56%	0.4781	93.35%	40.00%	94.56%	0.2109
					High	3.333	96.34%	100.00%	96.29%	0.4976	95.49%	33.33%	96.29%	0.1674
AGC/RSK/RSK/RSK2	9	4	9	701	Medium	2.444	90.56%	100.00%	90.44%	0.3273	90.14%	66.67%	90.44%	0.2104

					Low	1.889	87.46%	100.00%	87.30%	0.2832	87.32%	88.89%	87.30%	0.2482
					High	6.05	97.53%	80.00%	97.79%	0.5179	97.31%	65.00%	97.79%	0.4319
AGC/SGK	3	1	20	1355	Medium	4.3	95.05%	95.00%	95.06%	0.4453	95.05%	95.00%	95.06%	0.4453
					Low	3.35	91.78%	100.00%	91.66%	0.3713	91.71%	95.00%	91.66%	0.3522
					High	2.647	96.07%	100.00%	96.04%	0.3943	95.75%	58.82%	96.04%	0.2328
CAMK/CAMK1	11	5	17	2220	Medium	1.882	91.33%	100.00%	91.26%	0.2712	91.24%	88.24%	91.26%	0.2372
					Low	1.471	87.66%	100.00%	87.57%	0.2254	87.62%	94.12%	87.57%	0.2106
					High	5	97.85%	100.00%	97.82%	0.5964	96.92%	25.00%	97.82%	0.1624
CAMK/CAMK1/CAMK1a	4	2	4	321	Medium	3.75	94.15%	100.00%	94.08%	0.4045	93.85%	75.00%	94.08%	0.3032
					Low	3	89.23%	100.00%	89.10%	0.3023	88.92%	75.00%	89.10%	0.2199
					High	6.5	98.65%	80.00%	98.76%	0.4733	98.58%	70.00%	98.76%	0.4207
CAMK/CAMK1/CAMK4	5	1	10	1615	Medium	4.9	96.62%	80.00%	96.72%	0.3156	96.62%	80.00%	96.72%	0.3156
					Low	4.1	92.74%	90.00%	92.76%	0.2420	92.68%	80.00%	92.76%	0.2135
					High	4.571	98.34%	85.71%	98.72%	0.7478	97.52%	57.14%	98.72%	0.5586
CAMK/CAMKL/CHK1	6	1	14	469	Medium	3.357	95.65%	100.00%	95.52%	0.6181	95.03%	78.57%	95.52%	0.4998
					Low	2.786	91.93%	100.00%	91.68%	0.4921	91.30%	78.57%	91.68%	0.3869
					High	3.353	93.38%	88.24%	93.43%	0.3139	93.32%	82.35%	93.43%	0.2924
CAMK/CAMKL/LKB	5	1	17	1645	Medium	2.059	87.36%	94.12%	87.29%	0.2394	87.30%	88.24%	87.29%	0.2225
					Low	1.471	81.53%	100.00%	81.34%	0.2066	81.41%	88.24%	81.34%	0.1771
					High	2.917	91.05%	95.83%	90.96%	0.3939	90.63%	75.00%	90.96%	0.3046
CAMK/DAPK	11	1	24	1161	Medium	1.917	81.35%	100.00%	80.96%	0.2816	81.01%	83.33%	80.96%	0.2250
					Low	1.5	73.33%	100.00%	72.78%	0.2267	73.00%	83.33%	72.78%	0.1754
					High	4.222	91.74%	88.89%	91.82%	0.4326	91.13%	66.67%	91.82%	0.3221
CAMK/DAPK/DAPK3	5	1	18	636	Medium	2.889	81.96%	94.44%	81.60%	0.3082	81.80%	88.89%	81.60%	0.2865
					Low	2.278	74.01%	94.44%	73.43%	0.2461	73.85%	88.89%	73.43%	0.2264
					High	5.5	98.08%	100.00%	97.96%	0.8571	95.19%	50.00%	97.96%	0.5227
CAMK/MLCK	3	3	6	98	Medium	4.167	98.08%	100.00%	97.96%	0.8571	96.15%	66.67%	97.96%	0.6463
					Low	3.333	94.23%	100.00%	93.88%	0.6851	92.31%	66.67%	93.88%	0.4788
					High	2.667	97.98%	100.00%	97.91%	0.7776	96.11%	42.86%	97.91%	0.3986
CAMK/PHK	12	1	21	621	Medium	2.048	93.77%	100.00%	93.56%	0.5675	92.21%	52.38%	93.56%	0.3022
					Low	1.714	90.34%	100.00%	90.02%	0.4772	89.41%	71.43%	90.02%	0.3364
					High	6.7	98.44%	90.00%	98.61%	0.7047	97.66%	50.00%	98.61%	0.4446
CAMK/PKD	3	2	10	503	Medium	4.9	95.13%	90.00%	95.23%	0.4803	94.74%	70.00%	95.23%	0.3785
					Low	4	92.40%	90.00%	92.45%	0.3951	92.40%	90.00%	92.45%	0.3951
					High	3.333	98.21%	100.00%	98.17%	0.7431	97.19%	55.56%	98.17%	0.4671
CAMK/PKD/PKD1	7	2	9	383	Medium	2.222	93.88%	100.00%	93.73%	0.5056	93.62%	88.89%	93.73%	0.4520

					Low	1.667	89.80%	100.00%	89.56%	0.4056	89.54%	88.89%	89.56%	0.3584
					High	3.176	98.00%	100.00%	97.95%	0.6998	97.17%	58.82%	97.95%	0.4533
CAMK/RAD53	8	1	17	831	Medium	2.412	93.87%	100.00%	93.74%	0.4806	93.16%	64.71%	93.74%	0.3124
					Low	2	89.62%	100.00%	89.41%	0.3805	89.15%	76.47%	89.41%	0.2851
					High	1.588	96.27%	100.00%	96.15%	0.6646	94.96%	58.82%	96.15%	0.4191
CK1/CK1/CK1a	9	15	17	519	Medium	1.118	92.35%	100.00%	92.10%	0.5196	91.42%	70.59%	92.10%	0.3680
					Low	0.882	88.25%	100.00%	87.86%	0.4321	87.69%	82.35%	87.86%	0.3508
					High	5	98.11%	66.67%	99.22%	0.6974	96.21%	11.11%	99.22%	0.1768
CK1/CK1/CK1d	3	1	9	255	Medium	4	93.18%	77.78%	93.73%	0.4601	92.05%	44.44%	93.73%	0.2618
					Low	3.444	86.36%	88.89%	86.27%	0.3694	85.23%	55.56%	86.27%	0.2117
					High	1	93.51%	100.00%	93.42%	0.3900	92.70%	35.71%	93.42%	0.1280
CK1/CK1/CK1e	14	7	14	1095	Medium	0.643	88.19%	100.00%	88.04%	0.2915	87.74%	64.29%	88.04%	0.1759
					Low	0.429	81.88%	100.00%	81.64%	0.2306	81.42%	64.29%	81.64%	0.1309
					High	5.75	96.71%	100.00%	96.62%	0.6553	95.39%	50.00%	96.62%	0.3561
CK1/VRK	2	2	4	148	Medium	4.25	92.11%	100.00%	91.89%	0.4793	90.79%	50.00%	91.89%	0.2319
					Low	3.75	87.50%	100.00%	87.16%	0.3893	86.18%	50.00%	87.16%	0.1724
					High	5.077	95.02%	100.00%	94.88%	0.5774	95.02%	100.00%	94.88%	0.5774
CMGC/CDK/CDK4	3	4	13	469	Medium	3.308	88.80%	100.00%	88.49%	0.4144	88.80%	100.00%	88.49%	0.4144
					Low	2.308	84.44%	100.00%	84.01%	0.3523	84.44%	100.00%	84.01%	0.3523
					High	5	95.02%	100.00%	94.88%	0.5774	95.02%	100.00%	94.88%	0.5774
CMGC/CDK/CDK4/CDK4	3	4	13	469	Medium	3.308	88.80%	100.00%	88.49%	0.4144	88.80%	100.00%	88.49%	0.4144
					Low	2.231	84.44%	100.00%	84.01%	0.3523	84.44%	100.00%	84.01%	0.3523
					High	5.25	95.88%	100.00%	95.79%	0.5651	95.88%	100.00%	95.79%	0.5651
CMGC/CDK/CDK4/CDK6	3	6	4	190	Medium	3.5	89.18%	100.00%	88.95%	0.3772	89.18%	100.00%	88.95%	0.3772
					Low	2.75	84.02%	100.00%	83.68%	0.3093	84.02%	100.00%	83.68%	0.3093
					High	9.158	96.24%	94.74%	96.27%	0.5352	95.68%	63.16%	96.27%	0.3684
CMGC/CDK/CDK5	3	2	19	1045	Medium	3.895	92.20%	100.00%	92.06%	0.4141	92.20%	100.00%	92.06%	0.4141
					Low	2.474	86.75%	100.00%	86.51%	0.3205	86.75%	100.00%	86.51%	0.3205
					High	2.278	97.16%	100.00%	97.09%	0.6694	95.53%	33.33%	97.09%	0.2499
CMGC/CDK/CDK7	4	9	18	721	Medium	1.667	94.18%	100.00%	94.04%	0.5268	92.96%	50.00%	94.04%	0.2654
					Low	1.389	90.53%	100.00%	90.29%	0.4298	89.58%	61.11%	90.29%	0.2536
					High	5.083	96.79%	75.00%	97.15%	0.4620	95.99%	25.00%	97.15%	0.1579
CMGC/DYRK	4	1	12	736	Medium	3.583	92.25%	91.67%	92.26%	0.3668	91.71%	58.33%	92.26%	0.2272
					Low	2.917	87.57%	100.00%	87.36%	0.3160	87.03%	66.67%	87.36%	0.1986
					High	3	97.46%	100.00%	97.42%	0.6155	96.30%	28.57%	97.42%	0.1921
CMGC/DYRK/Dyrk1	3	12	7	426	Medium	2.143	91.92%	100.00%	91.78%	0.3911	90.99%	42.86%	91.78%	0.1544

					Low	1.714	86.14%	100.00%	85.92%	0.2996	85.22%	42.86%	85.92%	0.1029
					High	4	93.02%	100.00%	92.82%	0.5150	92.56%	83.33%	92.82%	0.4318
CMGC/GSK/GSK3A	5	2	6	209	Medium	2.667	87.91%	100.00%	87.56%	0.4052	87.44%	83.33%	87.56%	0.3324
					Low	2.167	82.79%	100.00%	82.30%	0.3389	82.33%	83.33%	82.30%	0.2726
					High	3.214	92.90%	100.00%	92.69%	0.5146	91.89%	64.29%	92.69%	0.3320
CMGC/MAPK/ERK/MAPK7	8	4	14	479	Medium	2.286	85.40%	100.00%	84.97%	0.3719	84.58%	71.43%	84.97%	0.2516
					Low	1.857	80.53%	100.00%	79.96%	0.3190	79.72%	71.43%	79.96%	0.2078
					High	4.947	94.56%	89.47%	94.68%	0.4744	93.32%	31.58%	94.68%	0.1618
CMGC/MAPK/JNK/MAPK9	5	2	19	864	Medium	2.737	88.00%	100.00%	87.73%	0.3652	87.66%	84.21%	87.73%	0.3025
					Low	2	83.24%	100.00%	82.87%	0.3071	83.24%	100.00%	82.87%	0.3071
					High	8.857	93.67%	100.00%	93.52%	0.5018	92.67%	57.14%	93.52%	0.2874
CMGC/MAPK/JNK/MAPK10	3	1	7	293	Medium	4.857	87.00%	100.00%	86.69%	0.3632	87.00%	100.00%	86.69%	0.3632
					Low	3.286	81.00%	100.00%	80.55%	0.2968	81.00%	100.00%	80.55%	0.2968
					High	8	97.96%	100.00%	97.93%	0.6478	96.94%	33.33%	97.93%	0.2434
CMGC/MAPK/p38/MAPK11	3	1	3	193	Medium	4.667	94.90%	100.00%	94.82%	0.4678	94.90%	100.00%	94.82%	0.4678
					Low	3.333	86.73%	100.00%	86.53%	0.2992	86.73%	100.00%	86.53%	0.2992
					High	10.667	99.10%	100.00%	99.07%	0.8620	99.10%	100.00%	99.07%	0.8620
CMGC/MAPK/p38/MAPK12	1	1	3	108	Medium	6	90.99%	100.00%	90.74%	0.4576	90.99%	100.00%	90.74%	0.4576
					Low	5	88.29%	100.00%	87.96%	0.4061	88.29%	100.00%	87.96%	0.4061
					High	8.333	94.79%	100.00%	94.62%	0.5957	94.79%	100.00%	94.62%	0.5957
CMGC/MAPK/p38/MAPK13	1	4	3	93	Medium	5.667	92.71%	100.00%	92.47%	0.5267	92.71%	100.00%	92.47%	0.5267
					Low	4.333	92.71%	100.00%	92.47%	0.5267	92.71%	100.00%	92.47%	0.5267
					High	1.65	97.08%	100.00%	96.98%	0.7240	95.88%	65.00%	96.98%	0.5106
STE/STE7	6	6	20	562	Medium	1.05	89.52%	100.00%	89.15%	0.4692	88.83%	80.00%	89.15%	0.3718
					Low	0.8	81.62%	100.00%	80.96%	0.3571	80.93%	80.00%	80.96%	0.2720
					High	7	99.03%	100.00%	99.00%	0.8617	99.03%	100.00%	99.00%	0.8617
STE/STE7/MAP2K1	1	1	3	100	Medium	5	94.17%	100.00%	94.00%	0.5598	94.17%	100.00%	94.00%	0.5598
					Low	4	82.52%	100.00%	82.00%	0.3423	82.52%	100.00%	82.00%	0.3423
					High	7	98.38%	90.91%	98.55%	0.7241	96.96%	27.27%	98.55%	0.2706
STE/STE7/MAP2K2	1	5	11	483	Medium	4	93.72%	100.00%	93.58%	0.4951	93.52%	90.91%	93.58%	0.4519
					Low	2	82.19%	100.00%	81.78%	0.3014	82.19%	100.00%	81.78%	0.3014
					High	3.25	97.50%	100.00%	97.41%	0.7461	96.67%	75.00%	97.41%	0.5964
STE/STE7/MAP2K3	1	11	4	116	Medium	1.75	91.67%	100.00%	91.38%	0.5110	90.83%	75.00%	91.38%	0.3834
					Low	1.25	89.17%	100.00%	88.79%	0.4571	88.33%	75.00%	88.79%	0.3369
					High	5.333	91.06%	100.00%	90.91%	0.3789	91.06%	100.00%	90.91%	0.3789
STE/STE7/MAP2K6	1	2	3	176	Medium	3.333	84.36%	100.00%	84.09%	0.2853	84.36%	100.00%	84.09%	0.2853

					Low	2.333	74.86%	100.00%	74.43%	0.2157	74.86%	100.00%	74.43%	0.2157
					High	3.2	92.55%	100.00%	92.31%	0.5211	91.30%	60.00%	92.31%	0.3122
STE/STE7/MAP2K7	13	5	5	156	Medium	1.8	85.71%	100.00%	85.26%	0.3902	85.71%	100.00%	85.26%	0.3902
					Low	1.2	76.40%	100.00%	75.64%	0.2966	76.40%	100.00%	75.64%	0.2966
					High	3	96.16%	100.00%	96.12%	0.4842	95.54%	50.00%	96.12%	0.2471
STE/STE11	6	4	10	798	Medium	2.1	92.08%	100.00%	91.98%	0.3526	91.71%	70.00%	91.98%	0.2420
					Low	1.7	88.74%	100.00%	88.60%	0.2962	88.37%	70.00%	88.60%	0.1984
					High	5.5	97.82%	53.57%	98.44%	0.4076	97.52%	32.14%	98.44%	0.2567
STE/STE20/PAKA/PAK1	3	1	28	1988	Medium	4.357	94.20%	67.86%	94.57%	0.3007	94.00%	53.57%	94.57%	0.2354
					Low	3.679	91.72%	78.57%	91.90%	0.2871	91.52%	64.29%	91.90%	0.2312
					High	3.118	98.17%	88.24%	98.71%	0.8251	93.88%	5.88%	98.71%	0.0831
STE/STE20/PAKA/PAK2	6	2	17	310	Medium	2.412	96.02%	100.00%	95.81%	0.7368	92.97%	41.18%	95.81%	0.3426
					Low	2.059	91.74%	100.00%	91.29%	0.5939	88.99%	47.06%	91.29%	0.2754
					High	2	96.04%	100.00%	95.95%	0.5854	94.27%	20.00%	95.95%	0.1140
STE/STE20/PAKA/PAK3	13	5	10	444	Medium	1.4	91.85%	100.00%	91.67%	0.4416	90.75%	50.00%	91.67%	0.2111
					Low	1	87.89%	100.00%	87.61%	0.3671	87.00%	60.00%	87.61%	0.2049
					High	2.857	96.84%	100.00%	96.76%	0.6312	95.89%	57.14%	96.76%	0.3856
STE/STE-Unique	8	15	7	309	Medium	1.571	92.72%	100.00%	92.56%	0.4647	92.09%	71.43%	92.56%	0.3314
					Low	1.143	90.51%	100.00%	90.29%	0.4133	89.87%	71.43%	90.29%	0.2894
					High	6.4	98.52%	80.00%	98.99%	0.7229	97.54%	40.00%	98.99%	0.4348
STE/STE-Unique/COT	1	1	5	198	Medium	5	96.06%	80.00%	96.46%	0.5235	96.06%	80.00%	96.46%	0.5235
					Low	4.6	95.07%	80.00%	95.45%	0.4777	95.07%	80.00%	95.45%	0.4777
					High	8	98.23%	100.00%	98.20%	0.7007	96.46%	0.00%	98.20%	-0.0180
STE/STE-Unique/NIK	1	8	2	111	Medium	5.5	95.58%	100.00%	95.50%	0.5223	95.58%	100.00%	95.50%	0.5223
					Low	4.5	92.92%	100.00%	92.79%	0.4308	92.92%	100.00%	92.79%	0.4308
					High	7.167	97.87%	83.33%	100.00%	0.9019	89.36%	16.67%	100.00%	0.3854
TK/Abl/Abl2	1	4	6	41	Medium	6.167	95.74%	100.00%	95.12%	0.8446	87.23%	33.33%	95.12%	0.3403
					Low	5.333	89.36%	100.00%	87.80%	0.6921	82.98%	50.00%	87.80%	0.3357
					High	2.667	100.00%	100.00%	100.00%	1.0000	90.00%	0.00%	100.00%	N/A
TK/Aik	3	13	6	54	Medium	2	95.00%	100.00%	94.44%	0.7935	85.00%	0.00%	94.44%	-0.0765
					Low	1.5	95.00%	100.00%	94.44%	0.7935	85.00%	0.00%	94.44%	-0.0765
					High	6.286	90.48%	42.86%	93.88%	0.3273	88.57%	14.29%	93.88%	0.0816
TK/Axl	2	1	7	98	Medium	5.571	90.48%	71.43%	91.84%	0.4791	86.67%	14.29%	91.84%	0.0546
					Low	5.143	86.67%	71.43%	87.76%	0.4008	82.86%	14.29%	87.76%	0.0155
					High	9	100.00%	100.00%	100.00%	1.0000	88.46%	0.00%	100.00%	N/A
TK/Axl/Axl	1	2	3	23	Medium	7.667	96.15%	100.00%	95.65%	0.8470	88.46%	33.33%	95.65%	0.3475



					Low	6.667	92.31%	100.00%	91.30%	0.7402	92.31%	100.00%	91.30%	0.7402
					High	4.34	100.00%	100.00%	100.00%	1.0000	89.29%	0.00%	100.00%	N/A
TK/Axl/Mer	7	7	3	25	Medium	3.34	96.43%	100.00%	96.00%	0.8485	85.71%	0.00%	96.00%	-0.0667
					Low	2.34	92.86%	100.00%	92.00%	0.7430	82.14%	0.00%	92.00%	-0.0961
					High	11	97.65%	100.00%	97.56%	0.7651	97.65%	100.00%	97.56%	0.7651
TK/Csk	1	1	6	164	Medium	10	97.06%	100.00%	96.95%	0.7272	97.06%	100.00%	96.95%	0.7272
					Low	9	95.29%	100.00%	95.12%	0.6385	95.29%	100.00%	95.12%	0.6385
					High	2.2	97.14%	100.00%	96.67%	0.8975	97.14%	100.00%	96.67%	0.8975
TK/EGFR/ErbB2	12	13	5	30	Medium	1.2	91.43%	100.00%	90.00%	0.7500	91.43%	100.00%	90.00%	0.7500
					Low	0.6	88.57%	100.00%	86.67%	0.6939	88.57%	100.00%	86.67%	0.6939
					High	3.773	91.78%	90.91%	91.84%	0.5827	89.86%	59.09%	91.84%	0.3838
TK/Eph	3	9	22	343	Medium	3	88.77%	100.00%	88.05%	0.5545	86.85%	68.18%	88.05%	0.3713
					Low	2.455	78.90%	100.00%	77.55%	0.4151	77.53%	77.27%	77.55%	0.2984
					High	6.571	93.15%	85.71%	93.94%	0.6821	84.93%	0.00%	93.94%	-0.0784
TK/Eph/EphB2	1	3	7	66	Medium	5.857	89.04%	85.71%	89.39%	0.5780	83.56%	28.57%	89.39%	0.1609
					Low	5.286	87.67%	100.00%	86.36%	0.6147	83.56%	57.14%	86.36%	0.3348
					High	9.333	100.00%	100.00%	100.00%	1.0000	97.14%	66.67%	100.00%	0.8040
TK/Eph/EphA3	1	2	3	32	Medium	8.333	100.00%	100.00%	100.00%	1.0000	97.14%	66.67%	100.00%	0.8040
					Low	7.333	88.57%	100.00%	87.50%	0.6124	85.71%	66.67%	87.50%	0.4023
					High	9.5	94.59%	100.00%	94.29%	0.6866	94.59%	100.00%	94.29%	0.6866
TK/Eph/EphB1	1	4	2	35	Medium	7	94.59%	100.00%	94.29%	0.6866	94.59%	100.00%	94.29%	0.6866
					Low	5.5	91.89%	100.00%	91.43%	0.6047	91.89%	100.00%	91.43%	0.6047
					High	4.923	94.02%	100.00%	93.67%	0.6716	91.45%	53.85%	93.67%	0.3808
TK/Fak	1	10	13	221	Medium	3.923	81.20%	100.00%	80.09%	0.4274	79.91%	76.92%	80.09%	0.3100
					Low	3.308	72.22%	100.00%	70.59%	0.3430	71.37%	84.62%	70.59%	0.2700
					High	7	95.10%	60.00%	97.74%	0.6064	95.10%	60.00%	97.74%	0.6064
TK/Fak/FAK	1	2	10	133	Medium	6.1	89.51%	60.00%	91.73%	0.4076	89.51%	60.00%	91.73%	0.4076
					Low	5.7	84.62%	80.00%	84.96%	0.4175	83.22%	60.00%	84.96%	0.2973
					High	9	97.80%	100.00%	97.73%	0.7657	97.80%	100.00%	97.73%	0.7657
TK/Fak/PYK2	1	10	3	88	Medium	6.333	89.01%	100.00%	88.64%	0.4523	89.01%	100.00%	88.64%	0.4523
					Low	4.667	85.71%	100.00%	85.23%	0.3998	85.71%	100.00%	85.23%	0.3998
					High	6.667	90.48%	75.00%	92.47%	0.5973	88.57%	58.33%	92.47%	0.4755
TK/Fer	4	4	12	93	Medium	5.5	90.48%	100.00%	89.25%	0.6977	86.67%	66.67%	89.25%	0.4720
					Low	4.667	83.81%	100.00%	81.72%	0.5815	80.95%	75.00%	81.72%	0.4181
					High	7.2	96.00%	100.00%	95.56%	0.8262	92.00%	60.00%	95.56%	0.5556
TK/Fer/Fer	5	5	5	45	Medium	5.6	92.00%	100.00%	91.11%	0.7115	92.00%	100.00%	91.11%	0.7115

					Low	4.4	88.00%	100.00%	86.67%	0.6276	88.00%	100.00%	86.67%	0.6276
					High	3.222	92.31%	100.00%	91.30%	0.7402	85.90%	44.44%	91.30%	0.3416
TK/Fer/Fes	13	3	9	69	Medium	2.444	82.05%	100.00%	79.71%	0.5585	75.64%	44.44%	79.71%	0.1832
					Low	1.889	78.21%	100.00%	75.36%	0.5108	71.79%	44.44%	75.36%	0.1427
					High	6.217	85.79%	39.13%	91.95%	0.3108	85.28%	34.78%	91.95%	0.2726
TK/FGFR/FGFR1	1	3	23	174	Medium	5.435	81.73%	52.17%	85.63%	0.3108	80.20%	39.13%	85.63%	0.2104
					Low	5	77.66%	52.17%	81.03%	0.2540	77.16%	47.83%	81.03%	0.2225
					High	6.5	100.00%	100.00%	100.00%	1.0000	71.43%	0.00%	100.00%	N/A
TK/FGFR/FGFR3	4	1	6	15	Medium	5.667	100.00%	100.00%	100.00%	1.0000	76.19%	16.67%	100.00%	0.3536
					Low	5	95.24%	100.00%	93.33%	0.8944	76.19%	33.33%	93.33%	0.3443
					High	1.571	98.00%	100.00%	97.85%	0.8724	93.00%	28.57%	97.85%	0.3440
TK/JakA/JAK1	13	12	7	93	Medium	0.857	96.00%	100.00%	95.70%	0.7804	93.00%	57.14%	95.70%	0.4970
					Low	0.429	91.00%	100.00%	90.32%	0.6286	89.00%	71.43%	90.32%	0.4541
					High	4.75	94.76%	95.00%	94.74%	0.7509	89.08%	30.00%	94.74%	0.2664
TK/JakA/JAK2	7	3	20	209	Medium	3.95	93.45%	100.00%	92.82%	0.7283	89.52%	55.00%	92.82%	0.4256
					Low	3.4	90.83%	100.00%	89.95%	0.6624	87.77%	65.00%	89.95%	0.4363
					High	7.111	96.38%	100.00%	96.12%	0.7861	92.75%	44.44%	96.12%	0.4057
TK/JakA/JAK3	2	3	9	129	Medium	6.111	94.93%	100.00%	94.57%	0.7294	94.20%	88.89%	94.57%	0.6621
					Low	5.333	89.13%	100.00%	88.37%	0.5757	89.13%	100.00%	88.37%	0.5757
					High	4.25	94.38%	100.00%	93.83%	0.7599	87.64%	25.00%	93.83%	0.2000
TK/JakA/Tyk2	4	8	8	81	Medium	3.375	92.13%	100.00%	91.36%	0.6980	86.52%	37.50%	91.36%	0.2614
					Low	2.75	83.15%	100.00%	81.48%	0.5324	79.78%	62.50%	81.48%	0.3014
					High	3.5	93.80%	100.00%	92.23%	0.8398	93.02%	96.15%	92.23%	0.8126
TK/Met/Met	14	1	26	103	Medium	2.731	86.05%	100.00%	82.52%	0.6983	86.05%	100.00%	82.52%	0.6983
					Low	2.231	83.72%	100.00%	79.61%	0.6636	83.72%	100.00%	79.61%	0.6636
					High	7	100.00%	100.00%	100.00%	1.0000	87.88%	0.00%	100.00%	N/A
TK/Met/Ron	4	2	4	29	Medium	5.75	100.00%	100.00%	100.00%	1.0000	87.88%	0.00%	100.00%	N/A
					Low	5	100.00%	100.00%	100.00%	1.0000	87.88%	0.00%	100.00%	N/A
					High	1.214	96.30%	100.00%	95.52%	0.8869	83.95%	28.57%	95.52%	0.3242
TK/Ret	15	14	14	67	Medium	0.857	90.12%	100.00%	88.06%	0.7486	79.01%	35.71%	88.06%	0.2449
					Low	0.643	88.89%	100.00%	86.57%	0.7259	77.78%	35.71%	86.57%	0.2228
					High	6.625	92.63%	50.00%	96.55%	0.4948	88.42%	0.00%	96.55%	-0.0548
TK/Src/Fgr	3	1	8	87	Medium	5.875	90.53%	62.50%	93.10%	0.4826	87.37%	25.00%	93.10%	0.1810
					Low	5.375	86.32%	87.50%	86.21%	0.5117	81.05%	25.00%	86.21%	0.0878
					High	6.667	97.62%	100.00%	97.44%	0.8549	92.86%	33.33%	97.44%	0.3721
TK/Src/Yes	7	2	6	78	Medium	5.333	91.67%	100.00%	91.03%	0.6482	89.29%	66.67%	91.03%	0.4404

TK/Src/HCK	10	2	12	164	Low	4.333	89.29%	100.00%	88.46%	0.5948	86.90%	66.67%	88.46%	0.3926
					High	3.917	96.02%	100.00%	95.73%	0.7776	92.05%	41.67%	95.73%	0.3740
					Medium	3.167	92.05%	100.00%	91.46%	0.6497	88.07%	41.67%	91.46%	0.2691
TK/Src/BLK	1	3	4	12	Low	2.667	88.07%	100.00%	87.20%	0.5631	84.66%	50.00%	87.20%	0.2601
					High	8.25	100.00%	100.00%	100.00%	1.0000	87.50%	50.00%	100.00%	0.6547
					Medium	7.25	100.00%	100.00%	100.00%	1.0000	87.50%	50.00%	100.00%	0.6547
TK/Src/Brk	6	1	4	29	Low	6.25	100.00%	100.00%	100.00%	1.0000	87.50%	50.00%	100.00%	0.6547
					High	8	100.00%	100.00%	100.00%	1.0000	90.91%	25.00%	100.00%	0.4760
					Medium	6.5	100.00%	100.00%	100.00%	1.0000	93.94%	50.00%	100.00%	0.6839
TK/Syk/ZAP70	10	11	20	112	Low	5.5	100.00%	100.00%	100.00%	1.0000	100.00%	100.00%	100.00%	1.0000
					High	2.15	90.91%	100.00%	89.29%	0.7470	85.61%	65.00%	89.29%	0.4968
					Medium	1.6	82.58%	100.00%	79.46%	0.6079	78.03%	70.00%	79.46%	0.3949
TK/Tec/BTK	5	2	18	261	Low	1.25	77.27%	100.00%	73.21%	0.5412	73.48%	75.00%	73.21%	0.3647
					High	6.056	94.62%	83.33%	95.40%	0.6543	93.91%	72.22%	95.40%	0.5817
					Medium	5.111	88.89%	88.89%	88.89%	0.5195	88.53%	83.33%	88.89%	0.4868
TK/Tec/ITK	2	15	7	92	Low	4.444	83.51%	94.44%	82.76%	0.4562	82.80%	83.33%	82.76%	0.3952
					High	3.571	95.96%	100.00%	95.65%	0.7802	91.92%	42.86%	95.65%	0.3851
					Medium	2.857	93.94%	100.00%	93.48%	0.7095	89.90%	42.86%	93.48%	0.3240
TK/Tec/Tec	7	5	4	100	Low	2.286	90.91%	100.00%	90.22%	0.6283	86.87%	42.86%	90.22%	0.2598
					High	7	93.27%	100.00%	93.00%	0.5815	91.35%	50.00%	93.00%	0.2941
					Medium	5.5	90.38%	100.00%	90.00%	0.5071	89.42%	75.00%	90.00%	0.3780
TK/Tec/TXK	4	7	5	48	Low	4	83.65%	100.00%	83.00%	0.3976	82.69%	75.00%	83.00%	0.2830
					High	6.6	100.00%	100.00%	100.00%	1.0000	96.23%	60.00%	100.00%	0.7589
					Medium	4.8	98.11%	100.00%	97.92%	0.9033	94.34%	60.00%	97.92%	0.6409
TK/Tie	1	2	6	71	Low	3.6	96.23%	100.00%	95.83%	0.8274	94.34%	80.00%	95.83%	0.6996
					High	8.833	92.21%	100.00%	91.55%	0.6766	88.31%	50.00%	91.55%	0.3467
					Medium	7.833	92.21%	100.00%	91.55%	0.6766	90.91%	83.33%	91.55%	0.5736
TK/Trk	4	4	13	69	Low	7.167	89.61%	100.00%	88.73%	0.6167	88.31%	83.33%	88.73%	0.5157
					High	5.231	96.34%	100.00%	95.65%	0.8816	92.68%	76.92%	95.65%	0.7258
					Medium	4.308	93.90%	100.00%	92.75%	0.8185	92.68%	92.31%	92.75%	0.7664
TK/Trk/TRKA	14	1	5	8	Low	3.692	89.02%	100.00%	86.96%	0.7168	87.80%	92.31%	86.96%	0.6633
					High	3.6	100.00%	100.00%	100.00%	1.0000	69.23%	20.00%	100.00%	0.3651
					Medium	2.6	100.00%	100.00%	100.00%	1.0000	69.23%	20.00%	100.00%	0.3651
TK/Trk/TRKB	4	4	8	61	Low	2	100.00%	100.00%	100.00%	1.0000	76.92%	40.00%	100.00%	0.5394
					High	5.625	97.10%	100.00%	96.72%	0.8796	88.41%	25.00%	96.72%	0.2976
					Medium	4.625	92.75%	100.00%	91.80%	0.7516	86.96%	50.00%	91.80%	0.3974

					Low	4	86.96%	100.00%	85.25%	0.6334	84.06%	75.00%	85.25%	0.4676
					High	6.947	95.00%	57.89%	98.90%	0.6755	91.50%	21.05%	98.90%	0.3429
TK/VEGFR	1	2	19	181	Medium	6.421	90.00%	57.89%	93.37%	0.4712	88.50%	42.11%	93.37%	0.3467
					Low	5.947	84.50%	78.95%	85.08%	0.4609	82.50%	57.89%	85.08%	0.3212
					High	6.5	100.00%	100.00%	100.00%	1.0000	92.00%	0.00%	100.00%	N/A
TK/VEGFR/FLT1	5	2	4	46	Medium	5.5	94.00%	100.00%	93.48%	0.7309	86.00%	0.00%	93.48%	-0.0745
					Low	4.75	92.00%	100.00%	91.30%	0.6757	84.00%	0.00%	91.30%	-0.0870
					High	5.4	96.23%	100.00%	95.83%	0.8274	92.45%	60.00%	95.83%	0.5583
TK/VEGFR/FLT4	8	3	5	48	Medium	4	94.34%	100.00%	93.75%	0.7655	94.34%	100.00%	93.75%	0.7655
					Low	3.2	90.57%	100.00%	89.58%	0.6693	90.57%	100.00%	89.58%	0.6693
					High	3.1	93.53%	100.00%	93.02%	0.6997	89.21%	40.00%	93.02%	0.2931
TK/VEGFR/KDR	15	1	10	129	Medium	2.3	90.65%	100.00%	89.92%	0.6253	87.77%	60.00%	89.92%	0.3755
					Low	1.8	87.05%	100.00%	86.05%	0.5544	84.89%	70.00%	86.05%	0.3771
					High	7.235	88.30%	52.94%	92.21%	0.4116	86.55%	35.29%	92.21%	0.2681
TK/PDGFR/PDGFRb	2	1	17	154	Medium	6.529	80.70%	52.94%	83.77%	0.2752	80.12%	47.06%	83.77%	0.2337
					Low	6	76.61%	52.94%	79.22%	0.2254	76.61%	52.94%	79.22%	0.2254
					High	8	97.87%	100.00%	97.67%	0.8840	89.36%	0.00%	97.67%	-0.0450
TK/PDGFR/PDGFRa	4	1	4	43	Medium	6.75	95.74%	100.00%	95.35%	0.7973	91.49%	50.00%	95.35%	0.4535
					Low	6	93.62%	100.00%	93.02%	0.7291	89.36%	50.00%	93.02%	0.3894
					High	7.25	97.56%	100.00%	97.30%	0.8823	90.24%	25.00%	97.30%	0.3071
TK/PDGFR/FLT3	3	2	4	37	Medium	6	92.68%	100.00%	91.89%	0.7246	90.24%	75.00%	91.89%	0.5616
					Low	5	78.05%	100.00%	75.68%	0.4825	75.61%	75.00%	75.68%	0.3305
					High	6.25	100.00%	100.00%	100.00%	1.0000	95.24%	50.00%	100.00%	0.6892
TK/PDGFR/KIT	10	2	4	38	Medium	4.75	92.86%	100.00%	92.11%	0.7255	90.48%	75.00%	92.11%	0.5629
					Low	3.75	83.33%	100.00%	81.58%	0.5447	80.95%	75.00%	81.58%	0.3899
					High	3.25	90.67%	100.00%	89.55%	0.6911	86.67%	62.50%	89.55%	0.4383
TK/PDGFR/CSF1R	4	15	8	67	Medium	2.375	80.00%	100.00%	77.61%	0.5196	78.67%	87.50%	77.61%	0.4415
					Low	1.75	74.67%	100.00%	71.64%	0.4607	73.33%	87.50%	71.64%	0.3836
					High	4.5	96.50%	100.00%	96.43%	0.5922	95.00%	25.00%	96.43%	0.1531
TKL/IRAK	2	1	4	196	Medium	3.5	89.00%	100.00%	88.78%	0.3696	88.00%	50.00%	88.78%	0.1671
					Low	3	87.00%	100.00%	86.73%	0.3401	86.00%	50.00%	86.73%	0.1482
					High	1.938	89.96%	100.00%	89.74%	0.3994	89.01%	56.25%	89.74%	0.2120
TKL/MLK	2	15	16	721	Medium	1.312	81.28%	100.00%	80.86%	0.2898	80.60%	68.75%	80.86%	0.1800
					Low	1	75.17%	100.00%	74.62%	0.2449	74.76%	81.25%	74.62%	0.1843
					High	3.556	94.50%	100.00%	94.37%	0.5321	93.19%	44.44%	94.37%	0.2380
TKL/MLK/ILK	2	6	9	373	Medium	2.444	83.77%	100.00%	83.38%	0.3251	82.98%	66.67%	83.38%	0.1984

					Low	2	79.06%	100.00%	78.55%	0.2818	78.27%	66.67%	78.55%	0.1642
					High	5	94.03%	100.00%	93.91%	0.4845	93.03%	50.00%	93.91%	0.2409
TKL/MLK/TAK1	1	2	4	197	Medium	4	88.56%	100.00%	88.32%	0.3617	87.56%	50.00%	88.32%	0.1622
					Low	3.5	85.07%	100.00%	84.77%	0.3158	84.08%	50.00%	84.77%	0.1327
					High	4.667	97.40%	66.67%	98.01%	0.5044	96.10%	0.00%	98.01%	-0.0199
TKL/MLK/MLK/MAP3K11	1	1	3	151	Medium	3.667	89.61%	100.00%	89.40%	0.3757	88.96%	66.67%	89.40%	0.2412
					Low	3.333	84.42%	100.00%	84.11%	0.3057	83.77%	66.67%	84.11%	0.1873
					High	4.8	99.48%	100.00%	99.46%	0.9104	98.95%	80.00%	99.46%	0.7946
TKL/RAF	11	1	5	186	Medium	3	95.29%	100.00%	95.16%	0.5830	94.76%	80.00%	95.16%	0.4765
					Low	2	95.29%	100.00%	95.16%	0.5830	94.76%	80.00%	95.16%	0.4765
					High	3.889	98.21%	100.00%	98.13%	0.8242	96.41%	55.56%	98.13%	0.5369
TKL/STKR	3	9	9	214	Medium	3.222	93.72%	100.00%	93.46%	0.6047	92.38%	66.67%	93.46%	0.4141
					Low	2.889	91.48%	100.00%	91.12%	0.5412	90.13%	66.67%	91.12%	0.3605
					High	6.75	96.25%	75.00%	97.37%	0.6516	95.00%	50.00%	97.37%	0.4737
Atypical/PDHK	1	3	4	76	Medium	5.25	93.75%	100.00%	93.42%	0.6444	91.25%	50.00%	93.42%	0.3349
					Low	4.5	93.75%	100.00%	93.42%	0.6444	91.25%	50.00%	93.42%	0.3349
					High	2.71	98.49%	100.00%	98.47%	0.6848	97.66%	40.00%	98.47%	0.3152
Atypical/PIKK/ATR	7	7	10	717	Medium	2	97.39%	100.00%	97.35%	0.5794	96.70%	50.00%	97.35%	0.3087
					Low	1.6	96.84%	100.00%	96.79%	0.5416	96.15%	50.00%	96.79%	0.2832
					High	2.952	96.78%	100.00%	96.73%	0.5634	96.33%	71.43%	96.73%	0.4160
Atypical/PIKK/DNAPK	10	7	21	1313	Medium	1.905	92.58%	100.00%	92.46%	0.4022	92.43%	90.48%	92.46%	0.3636
					Low	1.524	88.61%	100.00%	88.42%	0.3276	88.53%	95.24%	88.42%	0.3107
					High	5.8	96.36%	93.33%	96.46%	0.6353	95.15%	53.33%	96.46%	0.3898
Atypical/PIKK/FRAP	4	5	15	480	Medium	3	92.53%	100.00%	92.29%	0.5160	92.12%	86.67%	92.29%	0.4492
					Low	2.067	88.69%	100.00%	88.33%	0.4320	88.48%	93.33%	88.33%	0.4018
					High	3.536	96.58%	64.29%	97.46%	0.4965	95.73%	32.14%	97.46%	0.2657
Other/AUR/AUR-A	6	1	28	1025	Medium	2.786	92.69%	75.00%	93.17%	0.3903	92.21%	57.14%	93.17%	0.2956
					Low	2.393	88.79%	85.71%	88.88%	0.3556	88.13%	60.71%	88.88%	0.2417
					High	5.69	95.48%	72.41%	96.28%	0.5202	94.90%	55.17%	96.28%	0.4086
Other/AUR/AUR-B	3	4	29	834	Medium	3.621	90.96%	89.66%	91.01%	0.4522	90.50%	75.86%	91.01%	0.3815
					Low	2.759	86.33%	96.55%	85.97%	0.3978	86.10%	89.66%	85.97%	0.3665
					High	6.211	95.05%	52.63%	96.86%	0.4429	94.62%	42.11%	96.86%	0.3633
Other/AUR/IPL1-yeast	3	1	19	446	Medium	4.579	91.18%	63.16%	92.38%	0.3682	90.75%	52.63%	92.38%	0.3044
					Low	3.789	86.67%	68.42%	87.44%	0.3111	86.45%	63.16%	87.44%	0.2835
					High	6.5	99.16%	100.00%	99.13%	0.8905	97.48%	50.00%	99.13%	0.5649
Other/CK2/CK2b	6	4	4	115	Medium	5	94.12%	100.00%	93.91%	0.5844	94.12%	100.00%	93.91%	0.5844

					Low	4	91.60%	100.00%	91.30%	0.5108	91.60%	100.00%	91.30%	0.5108
					High	4	99.04%	100.00%	99.03%	0.7241	98.57%	55.56%	99.03%	0.4553
Other/IKK/IKKa	7	4	9	828	Medium	2.778	95.46%	100.00%	95.41%	0.4274	95.10%	66.67%	95.41%	0.2869
					Low	2.222	92.23%	100.00%	92.15%	0.3348	92.00%	77.78%	92.15%	0.2572
					High	1.875	95.26%	100.00%	95.18%	0.4956	94.64%	62.50%	95.18%	0.3150
Other/IKK/IKKb	11	14	8	477	Medium	1.125	89.07%	100.00%	88.89%	0.3414	88.45%	62.50%	88.89%	0.2017
					Low	0.75	85.77%	100.00%	85.53%	0.2981	85.15%	62.50%	85.53%	0.1701
					High	4.077	98.47%	84.62%	98.94%	0.7800	96.43%	23.08%	98.94%	0.2978
Other/NEK	4	1	13	379	Medium	3.231	95.41%	84.62%	95.78%	0.5684	93.88%	38.46%	95.78%	0.2723
					Low	2.846	93.37%	84.62%	93.67%	0.4916	92.09%	46.15%	93.67%	0.2682
					High	6.667	98.99%	100.00%	98.96%	0.8615	96.97%	33.33%	98.96%	0.3934
Other/NEK/NEK2	1	1	3	96	Medium	4.333	91.92%	100.00%	91.67%	0.5000	90.91%	66.67%	91.67%	0.3318
					Low	3.667	88.89%	100.00%	88.54%	0.4356	88.89%	100.00%	88.54%	0.4356
					High	4.857	99.03%	100.00%	98.96%	0.9305	94.17%	28.57%	98.96%	0.4120
Other/NEK/NEK6	4	1	7	96	Medium	3.857	96.12%	100.00%	95.83%	0.7809	92.23%	42.86%	95.83%	0.3869
					Low	3.286	93.20%	100.00%	92.71%	0.6808	91.26%	71.43%	92.71%	0.5031
					High	8.333	97.89%	100.00%	97.86%	0.6476	97.89%	100.00%	97.86%	0.6476
Other/NEK/NEK9	1	2	3	187	Medium	6	96.32%	100.00%	96.26%	0.5374	96.32%	100.00%	96.26%	0.5374
					Low	5	93.16%	100.00%	93.05%	0.4177	93.16%	100.00%	93.05%	0.4177
					High	5.2	96.44%	100.00%	96.39%	0.4909	96.20%	80.00%	96.39%	0.3987
Other/Other-Unique/KIS	2	14	5	416	Medium	3.2	91.21%	100.00%	91.11%	0.3293	91.21%	100.00%	91.11%	0.3293
					Low	2.4	87.65%	100.00%	87.50%	0.2770	87.65%	100.00%	87.50%	0.2770
					High	2.5	96.92%	100.00%	96.68%	0.8201	92.07%	31.25%	96.68%	0.3195
Other/PEK	4	3	16	211	Medium	2	89.87%	100.00%	89.10%	0.6046	86.34%	50.00%	89.10%	0.2914
					Low	1.75	86.78%	100.00%	85.78%	0.5462	83.70%	56.25%	85.78%	0.2852
					High	2.562	96.48%	100.00%	96.21%	0.8009	90.75%	18.75%	96.21%	0.1783
Other/PEK/PKR	4	3	16	211	Medium	2.062	89.43%	100.00%	88.63%	0.5954	85.90%	50.00%	88.63%	0.2841
					Low	1.812	85.90%	100.00%	84.83%	0.5318	82.82%	56.25%	84.83%	0.2734
					High	4.167	93.60%	83.33%	93.98%	0.5028	93.60%	83.33%	93.98%	0.5028
Other/Wnk	3	1	6	166	Medium	3	90.12%	100.00%	89.76%	0.4839	89.53%	83.33%	89.76%	0.4016
					Low	2.667	85.47%	100.00%	84.94%	0.4055	84.88%	83.33%	84.94%	0.3301

**Table S4** - We compared GPS 2.1 and GPS 2.0. In GPS 2.0, the average *Sn* values of LOO and self-consistency were calculated as 55.11% and 96.46%, while the two *Sn* values were 70.73% and 94.18% in GPS 2.1. In this regard, with the MLS method, the average *Sn* of the LOO was significantly increased 15.62%, while the average *Sn* value of the self-consistency was reduced 2.28%.

Kinase Family	Not Selection <sup>a</sup>				Motif length selection <sup>b</sup>			
	Up <sup>c</sup>	Down <sup>d</sup>	LOO <sup>e</sup>	Self <sup>f</sup>	Up	Down	LOO	Self
AGC	7	7	66.00%	68.50%	6	14	67.83%	71.91%
AGC/AKT	7	7	92.06%	97.22%	5	1	92.46%	92.46%
AGC/AKT/AKT2	7	7	50.00%	100.00%	6	1	100.00%	100.00%
AGC/DMPK	7	7	56.57%	100.00%	15	8	65.66%	100.00%
AGC/DMPK/ROCK	7	7	52.08%	97.92%	9	1	64.58%	87.50%
AGC/DMPK/ROCK/ROCK1	7	7	38.46%	100.00%	9	2	64.10%	100.00%
AGC/GRK	7	7	58.33%	95.24%	6	13	59.92%	99.60%
AGC/GRK/BARK	7	7	36.46%	100.00%	5	15	53.12%	100.00%
AGC/GRK/BARK/GRK-2	7	7	38.10%	100.00%	5	15	59.52%	100.00%
AGC/GRK/BARK/GRK-3	7	7	0.00%	100.00%	13	1	50.00%	100.00%
AGC/GRK/GRK	7	7	38.67%	100.00%	2	15	54.67%	100.00%
AGC/GRK/GRK/GRK-1	7	7	25.00%	100.00%	1	15	50.00%	100.00%
AGC/GRK/GRK/GRK-4	7	7	41.67%	100.00%	8	5	66.67%	100.00%
AGC/GRK/GRK/GRK-5	7	7	45.45%	100.00%	12	2	51.52%	100.00%
AGC/PKA	7	7	86.35%	89.42%	9	3	87.54%	89.02%
AGC/PKB	7	7	66.67%	100.00%	8	9	72.97%	100.00%
AGC/PKB/PDK1	7	7	70.59%	100.00%	8	8	74.51%	100.00%
AGC/PKC	7	7	71.44%	76.04%	11	8	71.96%	79.08%
AGC/PKC/Alpha	7	7	63.89%	77.22%	6	4	67.22%	72.78%
AGC/PKC/Delta	7	7	44.44%	100.00%	3	2	65.56%	84.44%
AGC/PKC/Eta	7	7	43.59%	100.00%	2	3	58.97%	92.31%
AGC/PKC/Iota	7	7	45.45%	100.00%	1	5	63.64%	93.94%
AGC/PKC/Alpha/PKCa	7	7	65.77%	77.98%	6	4	68.75%	72.92%
AGC/PKC/Alpha/PKCb	7	7	33.33%	100.00%	1	2	50.00%	64.29%
AGC/PKC/Alpha/PKcγ	7	7	26.67%	100.00%	12	11	53.33%	100.00%
AGC/PKC/Delta/PKcδ	7	7	40.91%	100.00%	3	10	54.55%	100.00%
AGC/PKC/Delta/PKcτ	7	7	25.00%	100.00%	1	3	54.17%	95.83%
AGC/PKC/Eta/PKcε	7	7	70.37%	100.00%	7	2	81.48%	100.00%
AGC/PKC/Eta/PKcχ	7	7	0.00%	100.00%	6	1	33.33%	100.00%
AGC/PKC/Iota/PKcζ	7	7	45.45%	100.00%	4	8	66.67%	100.00%
AGC/PKG	7	7	73.96%	100.00%	4	2	82.29%	89.58%
AGC/PKG/PKG1	7	7	74.36%	100.00%	5	6	89.74%	100.00%
AGC/PKG/PKG2	7	7	66.67%	100.00%	3	1	100.00%	100.00%
AGC/RSK	7	7	76.79%	100.00%	8	2	82.14%	95.24%
AGC/RSK/p70	7	7	83.33%	100.00%	3	2	91.67%	91.67%
AGC/RSK/MSK/RSK5	7	7	51.85%	100.00%	2	1	66.67%	88.89%
AGC/RSK/RSK	7	7	75.00%	100.00%	11	1	81.48%	100.00%

AGC/RSK/RSK/RSK1	7	7	50.00%	100.00%	3	1	70.00%	90.00%
AGC/RSK/RSK/RSK2	7	7	86.67%	100.00%	7	7	86.67%	100.00%
AGC/SGK	7	7	89.47%	100.00%	4	1	92.98%	96.49%
CAMK	7	7	65.25%	76.23%	13	4	67.57%	81.01%
CAMK/CAMK1	7	7	70.83%	100.00%	11	5	83.33%	100.00%
CAMK/CAMK1/CAMK1a	7	7	66.67%	100.00%	4	2	75.00%	100.00%
CAMK/CAMK1/CAMK4	7	7	44.44%	100.00%	5	1	77.78%	96.30%
CAMK/CAMK2	7	7	75.58%	94.57%	7	7	75.58%	94.57%
CAMK/CAMK2/CAMK2a	7	7	87.36%	100.00%	7	4	91.95%	100.00%
CAMK/CAMKL	7	7	76.44%	95.56%	7	3	80.44%	89.33%
CAMK/CAMKL/AMPK	7	7	76.07%	100.00%	7	1	87.18%	98.29%
CAMK/CAMKL/CHK1	7	7	76.19%	100.00%	6	1	80.95%	100.00%
CAMK/CAMKL/LKB	7	7	93.33%	100.00%	1	2	93.33%	93.33%
CAMK/DAPK	7	7	58.73%	98.41%	11	1	66.67%	92.06%
CAMK/DAPK/DAPK3	7	7	60.78%	100.00%	11	1	68.63%	96.08%
CAMK/MAPKAPK	7	7	55.21%	100.00%	5	2	62.50%	79.17%
CAMK/MAPKAPK/MAPKAPK	7	7	58.06%	92.47%	5	2	61.29%	74.19%
CAMK/MLCK	7	7	40.00%	100.00%	3	2	73.33%	100.00%
CAMK/PHK	7	7	54.55%	100.00%	12	1	71.21%	100.00%
CAMK/PKD	7	7	75.00%	100.00%	5	2	87.50%	100.00%
CAMK/PKD/PKD1	7	7	73.33%	100.00%	5	1	100.00%	100.00%
CAMK/RAD53	7	7	68.63%	100.00%	8	1	72.55%	100.00%
CK1	7	7	40.38%	70.89%	15	9	47.42%	100.00%
CK1/CK1	7	7	41.79%	76.62%	15	10	50.25%	100.00%
CK1/CK1/CK1a	7	7	56.25%	100.00%	5	15	75.00%	100.00%
CK1/CK1/CK1d	7	7	22.22%	100.00%	1	3	44.44%	100.00%
CK1/CK1/CK1e	7	7	33.33%	100.00%	6	1	51.52%	100.00%
CK1/VRK	7	7	33.33%	100.00%	2	2	50.00%	100.00%
CMGC	7	7	71.75%	75.47%	4	4	76.69%	77.64%
CMGC/CDK	7	7	81.08%	86.91%	2	10	83.17%	86.69%
CMGC/CDK/CDC2	7	7	82.08%	87.46%	1	10	84.77%	87.81%
CMGC/CDK/CDC2/CDC2	7	7	83.33%	86.92%	2	9	83.85%	85.90%
CMGC/CDK/CDC2/CDK2	7	7	81.97%	96.17%	2	9	87.43%	93.44%
CMGC/CDK/CDK4	7	7	100.00%	100.00%	2	4	100.00%	100.00%
CMGC/CDK/CDK4/CDK4	7	7	100.00%	100.00%	2	4	100.00%	100.00%
CMGC/CDK/CDK4/CDK6	7	7	33.33%	100.00%	1	6	88.89%	100.00%
CMGC/CDK/CDK5	7	7	70.37%	100.00%	2	1	96.30%	96.30%
CMGC/CDK/CDK7	7	7	46.30%	100.00%	4	9	57.41%	100.00%
CMGC/DYRK	7	7	33.33%	100.00%	4	1	70.00%	93.33%
CMGC/DYRK/Dyrk1	7	7	0.00%	100.00%	1	12	40.00%	100.00%
CMGC/GSK	7	7	53.33%	78.22%	2	5	61.33%	71.11%
CMGC/GSK/GSK3A	7	7	83.33%	100.00%	5	2	83.33%	100.00%
CMGC/GSK/GSK3B	7	7	53.49%	95.35%	1	5	68.99%	79.84%
CMGC/MAPK	7	7	77.27%	83.40%	2	4	80.33%	80.89%
CMGC/MAPK/ERK	7	7	77.10%	87.54%	2	5	82.32%	83.19%



CMGC/MAPK/ERK/MAPK1	7	7	80.89%	86.59%	3	2	84.55%	86.99%
CMGC/MAPK/ERK/MAPK3	7	7	74.44%	90.56%	2	1	83.89%	86.67%
CMGC/MAPK/ERK/MAPK7	7	7	61.54%	100.00%	8	5	71.79%	100.00%
CMGC/MAPK/JNK	7	7	73.50%	100.00%	3	2	88.89%	93.16%
CMGC/MAPK/JNK/MAPK8	7	7	79.01%	95.06%	12	2	86.42%	97.53%
CMGC/MAPK/JNK/MAPK9	7	7	48.15%	100.00%	4	1	72.22%	85.19%
CMGC/MAPK/JNK/MAPK10	7	7	12.50%	100.00%	2	1	83.33%	95.83%
CMGC/MAPK/p38	7	7	70.99%	91.98%	3	4	74.07%	77.16%
CMGC/MAPK/p38/MAPK11	7	7	66.67%	100.00%	3	1	100.00%	100.00%
CMGC/MAPK/p38/MAPK12	7	7	100.00%	100.00%	1	1	100.00%	100.00%
CMGC/MAPK/p38/MAPK13	7	7	88.89%	100.00%	1	4	100.00%	100.00%
CMGC/MAPK/p38/MAPK14	7	7	65.22%	96.38%	2	1	71.74%	72.46%
STE	7	7	55.00%	81.39%	6	7	55.83%	80.28%
STE/STE7	7	7	78.85%	100.00%	9	7	80.77%	100.00%
STE/STE7/MAP2K1	7	7	95.24%	100.00%	9	5	100.00%	100.00%
STE/STE7/MAP2K2	7	7	87.88%	100.00%	1	5	90.91%	100.00%
STE/STE7/MAP2K3	7	7	50.00%	100.00%	1	11	75.00%	100.00%
STE/STE7/MAP2K6	7	7	66.67%	100.00%	1	2	100.00%	100.00%
STE/STE7/MAP2K7	7	7	50.00%	100.00%	14	10	83.33%	100.00%
STE/STE11	7	7	62.50%	100.00%	5	1	62.50%	100.00%
STE/STE20	7	7	51.67%	98.89%	3	3	60.00%	76.11%
STE/STE20/PAKA	7	7	52.94%	100.00%	3	3	62.75%	78.43%
STE/STE20/PAKA/PAK1	7	7	58.33%	100.00%	3	1	71.43%	83.33%
STE/STE20/PAKA/PAK2	7	7	23.81%	100.00%	6	2	52.38%	100.00%
STE/STE20/PAKA/PAK3	7	7	0.00%	100.00%	1	11	22.22%	100.00%
STE/STE-Unique	7	7	87.88%	100.00%	5	4	90.91%	100.00%
STE/STE-Unique/COT	7	7	85.71%	100.00%	1	2	85.71%	100.00%
STE/STE-Unique/NIK	7	7	91.67%	100.00%	4	5	100.00%	100.00%
TK	7	7	46.45%	51.06%	15	13	55.22%	73.76%
TK/Abl	7	7	47.06%	90.20%	4	14	54.25%	99.35%
TK/Abl/Abl	7	7	48.00%	92.67%	4	14	55.33%	100.00%
TK/Abl/Abl2	7	7	0.00%	100.00%	2	2	22.22%	100.00%
TK/AIk	7	7	0.00%	100.00%	9	2	16.67%	100.00%
TK/Axl	7	7	0.00%	100.00%	2	1	9.52%	61.90%
TK/Axl/Axl	7	7	0.00%	100.00%	1	2	88.89%	100.00%
TK/Axl/Mer	7	7	87.88%	100.00%	7	7	90.91%	100.00%
TK/Csk	7	7	100.00%	100.00%	1	1	100.00%	100.00%
TK/EGFR	7	7	51.72%	88.51%	15	4	56.32%	100.00%
TK/EGFR/EGFR	7	7	54.09%	88.68%	15	4	59.12%	100.00%
TK/EGFR/ErbB2	7	7	66.67%	100.00%	12	13	100.00%	100.00%
TK/Eph	7	7	50.00%	92.42%	1	3	59.09%	65.15%
TK/Eph/EphB2	7	7	0.00%	95.24%	1	3	28.57%	90.48%
TK/Eph/EphA3	7	7	66.67%	100.00%	1	2	66.67%	100.00%
TK/Eph/EphB1	7	7	83.33%	100.00%	6	4	91.67%	100.00%
TK/Fak	7	7	66.67%	100.00%	6	6	68.75%	100.00%

TK/Fak/FAK	7	7	51.28%	100.00%	5	7	56.41%	100.00%
TK/Fak/PYK2	7	7	55.56%	100.00%	4	5	77.78%	100.00%
TK/Fer	7	7	50.00%	100.00%	13	4	83.33%	100.00%
TK/Fer/Fer	7	7	41.67%	100.00%	12	4	75.00%	100.00%
TK/Fer/Fes	7	7	44.44%	100.00%	13	4	70.37%	100.00%
TK/FGFR	7	7	36.67%	93.33%	12	4	52.22%	100.00%
TK/FGFR/FGFR1	7	7	21.74%	78.26%	1	3	30.43%	40.58%
TK/FGFR/FGFR3	7	7	33.33%	100.00%	4	1	66.67%	100.00%
TK/InsR	7	7	47.22%	85.00%	15	15	67.22%	100.00%
TK/InsR/IGF1R	7	7	49.33%	100.00%	1	8	58.67%	86.67%
TK/InsR/InsR	7	7	48.89%	80.74%	5	7	50.37%	75.56%
TK/JakA	7	7	51.45%	97.83%	8	14	66.67%	100.00%
TK/JakA/JAK1	7	7	25.93%	100.00%	14	12	55.56%	100.00%
TK/JakA/JAK2	7	7	65.38%	100.00%	6	6	66.67%	98.72%
TK/JakA/JAK3	7	7	87.50%	100.00%	4	3	100.00%	100.00%
TK/JakA/Tyk2	7	7	50.00%	100.00%	1	15	66.67%	100.00%
TK/Met	7	7	74.60%	100.00%	11	12	95.24%	100.00%
TK/Met/Met	7	7	70.59%	100.00%	13	12	88.24%	100.00%
TK/Met/Ron	7	7	0.00%	100.00%	4	2	75.00%	100.00%
TK/Ret	7	7	4.76%	100.00%	15	14	33.33%	100.00%
TK/Src	7	7	55.43%	64.88%	15	10	56.32%	86.85%
TK/Src/Fgr	7	7	12.50%	100.00%	3	1	25.00%	70.83%
TK/Src/Fyn	7	7	49.66%	80.95%	6	10	53.74%	92.52%
TK/Src/Yes	7	7	61.90%	100.00%	4	2	80.95%	100.00%
TK/Src/HCK	7	7	22.22%	100.00%	10	2	44.44%	100.00%
TK/Src/Lyn	7	7	38.33%	95.83%	15	5	55.00%	100.00%
TK/Src/Lck	7	7	63.83%	90.07%	6	7	66.67%	87.94%
TK/Src/Src	7	7	52.94%	67.65%	7	8	54.66%	70.59%
TK/Src/BLK	7	7	66.67%	100.00%	1	3	83.33%	100.00%
TK/Src/Brk	7	7	100.00%	100.00%	6	1	100.00%	100.00%
TK/Syk	7	7	72.31%	90.26%	14	5	80.00%	98.97%
TK/Syk/Syk	7	7	74.51%	90.85%	15	2	83.66%	96.73%
TK/Syk/ZAP70	7	7	51.67%	98.33%	10	11	63.33%	100.00%
TK/Tec	7	7	63.44%	98.92%	8	2	63.44%	80.65%
TK/Tec/BTK	7	7	70.37%	98.15%	5	2	83.33%	85.19%
TK/Tec/ITK	7	7	7.41%	100.00%	11	7	55.56%	100.00%
TK/Tec/Tec	7	7	33.33%	100.00%	7	5	66.67%	100.00%
TK/Tec/TXK	7	7	60.00%	100.00%	4	7	86.67%	100.00%
TK/Tie	7	7	80.00%	100.00%	7	2	100.00%	100.00%
TK/Trk	7	7	80.00%	100.00%	13	1	93.33%	100.00%
TK/Trk/TRKA	7	7	0.00%	100.00%	14	1	80.00%	100.00%
TK/Trk/TRKB	7	7	36.67%	100.00%	13	3	63.33%	100.00%
TK/VEGFR	7	7	29.82%	100.00%	3	2	43.86%	80.70%
TK/VEGFR/FLT1	7	7	0.00%	100.00%	5	2	16.67%	100.00%
TK/VEGFR/FLT4	7	7	60.00%	100.00%	8	3	100.00%	100.00%

TK/VEGFR/KDR	7	7	0.00%	100.00%	9	1	43.33%	100.00%
TK/PDGFR	7	7	63.64%	92.42%	7	14	65.91%	100.00%
TK/PDGFR/PDGFRb	7	7	54.17%	100.00%	7	6	62.50%	100.00%
TK/PDGFR/PDGFRa	7	7	60.00%	100.00%	4	1	73.33%	100.00%
TK/PDGFR/FLT3	7	7	0.00%	100.00%	3	2	75.00%	100.00%
TK/PDGFR/KIT	7	7	33.33%	100.00%	10	2	66.67%	100.00%
TK/PDGFR/CSF1R	7	7	37.50%	91.67%	4	15	54.17%	95.83%
TKL	7	7	58.12%	100.00%	6	13	72.65%	100.00%
TKL/IRAK	7	7	33.33%	100.00%	2	1	50.00%	100.00%
TKL/MLK	7	7	36.84%	100.00%	4	15	56.14%	100.00%
TKL/MLK/ILK	7	7	44.44%	100.00%	2	6	59.26%	100.00%
TKL/MLK/TAK1	7	7	42.86%	100.00%	3	11	52.38%	100.00%
TKL/MLK/MLK/MAP3K11	7	7	44.44%	100.00%	1	1	66.67%	88.89%
TKL/RAF	7	7	80.00%	100.00%	11	1	86.67%	100.00%
TKL/STKR	7	7	66.67%	100.00%	3	9	74.07%	100.00%
Atypical/PDHK	7	7	50.00%	100.00%	1	3	66.67%	91.67%
Atypical/PIKK	7	7	82.78%	94.87%	2	4	87.18%	89.38%
Atypical/PIKK/ATM	7	7	98.18%	100.00%	8	2	100.00%	100.00%
Atypical/PIKK/ATR	7	7	76.67%	100.00%	1	1	100.00%	100.00%
Atypical/PIKK/DNAPK	7	7	88.89%	100.00%	12	2	93.65%	100.00%
Atypical/PIKK/FRAP	7	7	88.10%	100.00%	1	7	92.86%	97.62%
Other/AUR	7	7	53.25%	90.91%	4	1	61.90%	64.50%
Other/AUR/AUR-A	7	7	43.21%	100.00%	6	1	56.79%	81.48%
Other/AUR/AUR-B	7	7	73.74%	98.99%	3	4	78.79%	87.88%
Other/AUR/IPL1-yeast	7	7	49.12%	100.00%	3	1	59.65%	63.16%
Other/CK2	7	7	76.02%	77.78%	5	15	77.78%	80.09%
Other/CK2/CK2a	7	7	73.52%	86.29%	3	9	78.19%	84.74%
Other/CK2/CK2b	7	7	41.67%	100.00%	6	4	100.00%	100.00%
Other/IKK	7	7	45.45%	100.00%	6	9	48.48%	100.00%
Other/IKK/IKKa	7	7	66.67%	100.00%	4	3	75.00%	100.00%
Other/IKK/IKKb	7	7	11.11%	100.00%	5	5	66.67%	100.00%
Other/NEK	7	7	52.38%	100.00%	10	1	71.43%	100.00%
Other/NEK/NEK2	7	7	0.00%	100.00%	1	1	77.78%	100.00%
Other/NEK/NEK6	7	7	61.90%	100.00%	4	1	76.19%	100.00%
Other/NEK/NEK9	7	7	100.00%	100.00%	1	2	100.00%	100.00%
Other/Other-Unique/KIS	7	7	93.33%	100.00%	2	14	100.00%	100.00%
Other/PEK	7	7	31.25%	100.00%	4	3	45.83%	100.00%
Other/PEK/PKR	7	7	31.25%	100.00%	4	3	47.92%	100.00%
Other/PLK	7	7	30.56%	100.00%	3	13	35.42%	100.00%
Other/PLK/PLK1	7	7	22.96%	100.00%	4	9	30.37%	100.00%
Other/Wnk	7	7	100.00%	100.00%	2	1	100.00%	100.00%
<b>AVERAGE</b>			<b>55.11%</b>	<b>96.46%</b>			<b>70.73%</b>	<b>94.18%</b>

**Table S5** - The comparison for 72 PK groups with  $\geq 30$  sites. For the 72 PK groups, the results of leave-one-out validation are quite similar with *n*-fold cross-validation. In GPS 2.0, the average *Sn* values of LOO and self-consistency were calculated as 62.89% and 90.19%, while the two *Sn* values were 69.46% and 89.09% in GPS 2.1. In this regard, with the MLS method, the average *Sn* of the LOO was significantly increased 6.57%, while the average *Sn* value of the self-consistency was reduced 1.10%.

Kinase Family	Not Selection				Motif length selection			
	Up	Down	LOO	Self	Up	Down	LOO	Self
AGC	7	7	66.00%	68.50%	6	14	67.83%	71.91%
AGC/AKT	7	7	92.06%	97.22%	5	1	92.46%	92.46%
AGC/DMPK	7	7	56.57%	100.00%	15	8	65.66%	100.00%
AGC/DMPK/ROCK	7	7	52.08%	97.92%	9	1	64.58%	87.50%
AGC/GRK	7	7	58.33%	95.24%	6	13	59.92%	99.60%
AGC/GRK/BARK	7	7	36.46%	100.00%	5	15	53.12%	100.00%
AGC/PKA	7	7	86.35%	89.42%	9	3	87.54%	89.02%
AGC/PKB	7	7	66.67%	100.00%	8	9	72.97%	100.00%
AGC/PKB/PDK1	7	7	70.59%	100.00%	8	8	74.51%	100.00%
AGC/PKC	7	7	71.44%	76.04%	11	8	71.96%	79.08%
AGC/PKC/Alpha	7	7	63.89%	77.22%	6	4	67.22%	72.78%
AGC/PKC/Delta	7	7	44.44%	100.00%	3	2	65.56%	84.44%
AGC/PKC/Alpha/PKCa	7	7	65.77%	77.98%	6	4	68.75%	72.92%
AGC/PKG	7	7	73.96%	100.00%	4	2	82.29%	89.58%
AGC/RSK	7	7	76.79%	100.00%	8	2	82.14%	95.24%
AGC/RSK/RSK	7	7	75.00%	100.00%	11	1	81.48%	100.00%
CAMK	7	7	65.25%	76.23%	13	4	67.57%	81.01%
CAMK/CAMK2	7	7	75.58%	94.57%	7	7	75.58%	94.57%
CAMK/CAMK2/CAMK2a	7	7	87.36%	100.00%	7	4	91.95%	100.00%
CAMK/CAMKL	7	7	76.44%	95.56%	7	3	80.44%	89.33%
CAMK/CAMKL/AMPK	7	7	76.07%	100.00%	7	1	87.18%	98.29%
CAMK/MAPKAPK	7	7	55.21%	100.00%	5	2	62.50%	79.17%
CAMK/MAPKAPK/MAPKAPK	7	7	58.06%	92.47%	5	2	61.29%	74.19%
CK1	7	7	40.38%	70.89%	15	9	47.42%	100.00%
CK1/CK1	7	7	41.79%	76.62%	15	10	50.25%	100.00%
CMGC	7	7	71.75%	75.47%	4	4	76.69%	77.64%
CMGC/CDK	7	7	81.08%	86.91%	2	10	83.17%	86.69%
CMGC/CDK/CDC2	7	7	82.08%	87.46%	1	10	84.77%	87.81%
CMGC/CDK/CDC2/CDC2	7	7	83.33%	86.92%	2	9	83.85%	85.90%
CMGC/CDK/CDC2/CDK2	7	7	81.97%	96.17%	2	9	87.43%	93.44%
CMGC/GSK	7	7	53.33%	78.22%	2	5	61.33%	71.11%
CMGC/GSK/GSK3B	7	7	53.49%	95.35%	1	5	68.99%	79.84%
CMGC/MAPK	7	7	77.27%	83.40%	2	4	80.33%	80.89%
CMGC/MAPK/ERK	7	7	77.10%	87.54%	2	5	82.32%	83.19%
CMGC/MAPK/ERK/MAPK1	7	7	80.89%	86.59%	3	2	84.55%	86.99%
CMGC/MAPK/ERK/MAPK3	7	7	74.44%	90.56%	2	1	83.89%	86.67%

CMGC/MAPK/JNK	7	7	73.50%	100.00%	3	2	88.89%	93.16%
CMGC/MAPK/JNK/MAPK8	7	7	79.01%	95.06%	12	2	86.42%	97.53%
CMGC/MAPK/p38	7	7	70.99%	91.98%	3	4	74.07%	77.16%
CMGC/MAPK/p38/MAPK14	7	7	65.22%	96.38%	2	1	71.74%	72.46%
STE	7	7	55.00%	81.39%	6	7	55.83%	80.28%
STE/STE20	7	7	51.67%	98.89%	3	3	60.00%	76.11%
STE/STE20/PAKA	7	7	52.94%	100.00%	3	3	62.75%	78.43%
TK	7	7	46.45%	51.06%	15	13	55.22%	73.76%
TK/Abl	7	7	47.06%	90.20%	4	14	54.25%	99.35%
TK/Abl/Abl	7	7	48.00%	92.67%	4	14	55.33%	100.00%
TK/EGFR	7	7	51.72%	88.51%	15	4	56.32%	100.00%
TK/EGFR/EGFR	7	7	54.09%	88.68%	15	4	59.12%	100.00%
TK/FGFR	7	7	36.67%	93.33%	12	4	52.22%	100.00%
TK/InsR	7	7	47.22%	85.00%	15	15	67.22%	100.00%
TK/InsR/IGF1R	7	7	49.33%	100.00%	1	8	58.67%	86.67%
TK/InsR/InsR	7	7	48.89%	80.74%	5	7	50.37%	75.56%
TK/JakA	7	7	51.45%	97.83%	8	14	66.67%	100.00%
TK/Met	7	7	74.60%	100.00%	11	12	95.24%	100.00%
TK/Src	7	7	55.43%	64.88%	15	10	56.32%	86.85%
TK/Src/Fyn	7	7	49.66%	80.95%	6	10	53.74%	92.52%
TK/Src/Lyn	7	7	38.33%	95.83%	15	5	55.00%	100.00%
TK/Src/Lck	7	7	63.83%	90.07%	6	7	66.67%	87.94%
TK/Src/Src	7	7	52.94%	67.65%	7	8	54.66%	70.59%
TK/Syk	7	7	72.31%	90.26%	14	5	80.00%	98.97%
TK/Syk/Syk	7	7	74.51%	90.85%	15	2	83.66%	96.73%
TK/Tec	7	7	63.44%	98.92%	8	2	63.44%	80.65%
TK/PDGFR	7	7	63.64%	92.42%	7	14	65.91%	100.00%
TKL	7	7	58.12%	100.00%	6	13	72.65%	100.00%
Atypical/PIKK	7	7	82.78%	94.87%	2	4	87.18%	89.38%
Atypical/PIKK/ATM	7	7	98.18%	100.00%	8	2	100.00%	100.00%
Other/AUR	7	7	53.25%	90.91%	4	1	61.90%	64.50%
Other/CK2	7	7	76.02%	77.78%	5	15	77.78%	80.09%
Other/CK2/CK2a	7	7	73.52%	86.29%	3	9	78.19%	84.74%
Other/IKK	7	7	45.45%	100.00%	6	9	48.48%	100.00%
Other/PLK	7	7	30.56%	100.00%	3	13	35.42%	100.00%
Other/PLK/PLK1	7	7	22.96%	100.00%	4	9	30.37%	100.00%
<b>AVERAGE</b>			<b>62.89%</b>	<b>90.19%</b>			<b>69.46%</b>	<b>89.09%</b>