|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **类型** | **名称** | **URL** | **蛋白互作的总数（千）** | **物种数** |
| 通路数据库 | Reactome | https://reactome.org/ | 2161 | 28 |
| 实验验证 | BioGRID | <http://thebiogrid.org/> | 372 | 40 |
| IntAct | <http://www.ebi.ac.uk/intact/> | 2331 | 397 |
| MINT | <https://mint.bio.uniroma2.it/> | 95 | 434 |
| DIP | <http://dip.doe-mbi.ucla.edu/> | 68 | 485 |
| 预测数据库 | STRING | <http://string-db.org/> | 224346 | 1133 |
| GeneMANIA | http://genemania.org/ | 96208 | 7 |
| BIND | http://bind.ca/ | - | - |
| HPRD | <http://www.hprd.org/> | 37 | 1 |
| PIPs | <http://www.compbio.dundee.ac.uk/www-pips/> | 78 | 1 |
| PrePPI | https://bhapp.c2b2.columbia.edu/PrePPI | - | - |

表1 PPI相关数据库

表2 PTM 相关数据库

|  |  |  |
| --- | --- | --- |
| **数据库名称** | **URL** | **PTM位点数量** |
| PhosphoSitePlus | https://www.phosphosite.org/homeAction.action | 62,801 |
| iPTMnet | https://research.bioinformatics.udel | 250,000 |
| dbPTM | http://dbptm.mbc.nctu.edu.tw/ | 22,363 |
| PTMD | http://ptmd.biocuckoo.org/ | 1,950 |
| Phospho3D | [http://www.phospho3d.org/](http://www.phospho3d.org/" \t "https://bigd.big.ac.cn/databasecommons/database/id/_blank) | 2,726 |
| SysPTM | http://lifecenter.sgst.cn/SysPTM/ | 87,068 |
| ProteomeScout | https://proteomescout.wustl.edu/ | 723113 |
| PTMsigdb | http://prot-shiny-vm.broadinstitute.org/ | - |
| ActiveDriverDB | https://www.activedriverdb.org/ | 260,000 |

表3 磷酸化数据库

|  |  |  |  |
| --- | --- | --- | --- |
| **数据库名称** | **URL** | **数量** | |
| **底物数量** | **PTM位点数量** |
| Phospho.ELM | http://phospho.elm.eu.org/ | 7,155 | 29,990 |
| DEPOD | http://www.koehnlab.de/depod/index.php | 298 | 1,096 |
| PHOSIDA | http://phosphat.mpimp-golm.mpg.de | 12,780 | 39,574 |
| PhosphoPOINT | http://kinase.bioinformatics.tw/ | 4,195 | 15,738 |
| PhosphoNET | http://www.phosphonet.ca/ | 12,400 | 74,473 |
| PhosphoNetworks | [http://www.phosphonetworks.org](http://www.phosphonetworks.org/) | 652 | 2591 |
| Phosphopep | http://phosphopep.org/ | 17,614 | - |
| PhosphoGrid | http://www.phosphogrid.org | 1,776 | 6,440 |

表4 PTM相关工具

|  |  |  |  |
| --- | --- | --- | --- |
| **工具** | | | **URL** |
| ***Mapping*** | 插件 | PhosphoPath | <http://apps.cytoscape.org/apps/phosphopath> |
| Omics Visualizer | http://apps.cytoscape.org/apps/omicsvisualizer |
| PTMOracle | [http://apps.cytoscape.org/apps/PTMOracle](http://apps.cytoscape.org/apps/ptmoracle) |
| Java | PTMapper | <https://github.com/y-narushima/PTMapper> |
| 在线  网页 | PoGo | <http://www.sanger.ac.uk/science/tools/pogo> |
| ***Scoring*** | 软件 | FoldX | http://foldxsuite.crg.eu/ |
| 在线  网页 | PTMsnp | [http://gcode.kaist.ac.kr/ptmsnp](http://gcode.kaist.ac.kr/ptmsnp" \t "https://bigd.big.ac.cn/databasecommons/database/id/_blank) |
| ***Perturbation*** | R包 | PTM-SEA | https://github.com/broadinstitute/ssGSEA2.0. |
| 在线  网页 | piNET | http://pinet-server.org, |