1. Odds Ratios of Significantly Related Anti-Patterns

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **CC&LP** | **AS&CP** | **AS&CC** | **AS&LP** | **BB&CC** | **BB&LP** | **CC&MC** | **YC&RB** | **LP&MC** | **MC&SK** |
| **ArgoUML** | 5.99 |  |  |  |  |  |  |  |  |  |
| **Cocoon** | 6.94 |  |  |  |  |  |  |  |  |  |
| **Log4j** | 4.16 | 62.37 |  |  |  |  |  |  |  |  |
| **Xalan** | 2.77 | 24.63 | 3.04 | 5.30 |  |  |  |  |  |  |
| **Xerces-J** | 7.20 |  |  |  | 1.56 | 1.99 | 4.75 | 3.62 | 3.31 | 7.43 |

1. Data-dependent Anti-patterns

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **AS** | **BB** | **CP** | **CC** | **YC** | **LP** | **MC** | **RB** | **SG** | **SK** |
| **AS** | --- |  | X |  | X | X |  | X | L |  |
| **BB** |  | --- | J | J | J | J | J |  | J | J |
| **CP** | X | J | --- | J | X | XJ | J |  |  | J |
| **CC** | JL | J | JL | --- | AXJ | AJL | J | AJ | JL | J |
| **YC** |  |  | L |  | --- |  |  |  |  |  |
| **LP** | XL | J | XJL | ACXJL | ACJ | --- | J | A | X |  |
| **MC** |  | J | J | J | J | J | --- |  |  | J |
| **RB** | X |  |  |  |  |  |  | --- |  |  |
| **SG** | L | J |  |  | J | X |  |  | --- |  |
| **SK** |  | J | J |  | J | J |  | J |  | --- |

1. Call-dependent Anti-patterns

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **AS** | **BB** | **CP** | **CC** | **YC** | **LP** | **MC** | **RB** | **SG** | **SK** |
| **AS** | --- |  | XJ |  | X | X |  |  | L |  |
| **BB** | J | --- | J | J |  | J | J |  | J | J |
| **CP** |  |  | --- |  | X | J |  |  |  | J |
| **CC** | AJL | J | JL | --- | ACX | CJL | J |  | J | J |
| **YC** |  |  |  | X | --- |  |  | A |  |  |
| **LP** | AXL |  | XJL | CX | AC | --- | J |  |  |  |
| **MC** |  | J | J |  |  | J | --- |  |  | J |
| **RB** |  |  |  |  | AJ |  |  | --- |  |  |
| **SG** | L |  |  |  |  | X |  |  | --- |  |
| **SK** |  |  | J |  |  |  |  |  | J | --- |

1. Co-changed Anti-patterns

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **AS** | **BB** | **CP** | **CC** | **YC** | **LP** | **MC** | **RB** | **SG** | **SK** |
| **AS** |  |  | LX | X |  | LX |  |  | X |  |
| **BB** | J |  |  |  |  |  |  |  |  |  |
| **CP** | L |  |  | L |  | L |  |  |  |  |
| **CC** | AXJ | J | XJ |  | A | AXJ | J | J | XJ | J |
| **YC** |  |  |  | A |  |  |  | X |  |  |
| **LP** | ALJ |  | LX | ALX | AX |  |  | X | XJ |  |
| **MC** | J | J | J | J |  | J |  | J | J | J |
| **RB** |  |  |  |  |  |  |  |  |  |  |
| **SG** | X |  |  | X |  | X |  |  |  |  |
| **SK** | J | J |  | J |  | J | J |  | J |  |

1. Cliff’s for Data Dependent Anti-patterns in ArgoUML

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **AS** | **CC** | **YC** | **LP** | **RB** |
| **AS** |  |  |  |  |  |
| **CC** |  |  | 0.021 | 0.341 | 0.012 |
| **YC** |  |  |  |  |  |
| **LP** |  | 0.150 | 0.016 |  | 0.007 |
| **RB** |  |  |  |  |  |

1. Cliff’s for Call Dependent Anti-patterns in ArgoUML

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **AS** | **CC** | **YC** | **LP** | **RB** |
| **AS** |  |  |  |  |  |
| **CC** | 0.029 |  | 0.069 |  |  |
| **YC** |  |  |  |  | 0.019 |
| **LP** | 0.016 |  | 0.048 |  |  |
| **RB** |  |  | 0.219 |  |  |

1. Cliff’s for Data Dependent Anti-patterns in Cocoon

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **CP** | **CC** | **YC** | **LP** |
| **CP** |  |  |  |  |
| **CC** |  |  |  |  |
| **YC** |  |  |  |  |
| **LP** |  | 0.148 | 0.020 |  |

1. Cliff’s for Call Dependent Anti-patterns in Cocoon

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **CP** | **CC** | **YC** | **LP** |
| **CP** |  |  | 0.010 | 0.330 |
| **CC** |  |  |  |  |
| **YC** |  |  |  |  |
| **LP** |  | 0.266 | 0.037 |  |

1. Cliff’s for Data Dependent Anti-patterns in Log4J

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **AS** | **CP** | **CC** | **YC** | **LP** | **RB** | **SG** |
| **AS** |  |  |  |  |  |  | 0.198 |
| **CP** |  |  |  |  |  |  |  |
| **CC** | 0.052 | 0.048 |  | 0.018 | 0.187 |  | 0.030 |
| **YC** |  | 0.082 |  |  |  |  |  |
| **LP** | 0.087 | 0.058 | 0.165 |  |  |  |  |
| **RB** |  |  |  |  |  |  |  |
| **SG** | 1.000 |  |  |  |  |  |  |

1. Cliff’s for Call Dependent Anti-patterns in Log4J

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **AS** | **CP** | **CC** | **YC** | **LP** | **RB** | **SG** |
| **AS** |  |  |  |  |  |  | 0.182 |
| **CP** |  |  |  |  |  |  |  |
| **CC** | 0.199 | 0.180 |  |  | 0.192 |  |  |
| **YC** |  |  |  |  |  |  |  |
| **LP** | 0.117 | 0.072 |  |  |  |  |  |
| **RB** |  |  |  |  |  |  |  |
| **SG** | 0.944 |  |  |  |  |  |  |

1. Cliff’s for Data Dependent Anti-patterns in Xalan

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **AS** | **CP** | **CC** | **YC** | **LP** | **RB** | **SG** |
| **AS** |  | 0.132 |  | 0.105 | 0.186 | 0.031 |  |
| **CP** | 0.149 |  |  | 0.182 | 0.192 |  |  |
| **CC** |  |  |  | 0.072 |  |  |  |
| **YC** |  |  |  |  |  |  |  |
| **LP** | 0.223 | 0.368 | 0.197 |  |  |  | 0.010 |
| **RB** | 0.548 |  |  |  |  |  |  |
| **SG** |  |  |  |  | 0.960 |  |  |

1. Cliff’s for Call Dependent Anti-patterns in Xalan

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **AS** | **CP** | **CC** | **YC** | **LP** | **RB** | **SG** |
| **AS** |  | 0.159 |  | 0.089 | 0.247 |  |  |
| **CP** |  |  |  | 0.100 |  |  |  |
| **CC** |  |  |  | 0.076 |  |  |  |
| **YC** |  |  | 0.165 |  |  |  |  |
| **LP** | 0.320 | 0.219 | 0.188 |  |  |  |  |
| **RB** |  |  |  |  |  |  |  |
| **SG** |  |  |  |  | 0.902 |  |  |

1. Cliff’s δ for Data-dependent Anti-patterns in Xerces-J

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **AS** | **BB** | **CP** | **CC** | **YC** | **LP** | **MC** | **RB** | **SG** | **SK** |
| **AS** |  |  |  |  |  |  |  |  |  |  |
| **BB** |  |  | 0.154 | 0.465 | 0.117 | 0.409 | 0.375 |  | 0.172 | 0.305 |
| **CP** |  | 0.278 |  | 0.333 |  | 0.412 | 0.199 |  |  | 0.357 |
| **CC** | 0.054 | 0.422 | 0.343 |  | 0.190 | 0.302 | 0.174 | 0.210 | 0.173 | 0.171 |
| **YC** |  |  |  |  |  |  |  |  |  |  |
| **LP** |  | 0.185 | 0.347 | 0.162 | 0.092 |  | 0.119 |  |  |  |
| **MC** |  | 0.475 | 0.436 | 0.442 | 0.252 | 0.308 |  |  |  | 0.171 |
| **RB** |  |  |  |  |  |  |  |  |  |  |
| **SG** |  | 0.678 |  |  | 0.221 |  |  |  |  |  |
| **SK** |  | 0.503 | 0.822 |  | 0.328 | 0.331 |  | 0.306 |  |  |

1. Cliff’s for Call Dependent Anti-patterns in Xerces-J

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **AS** | **BB** | **CP** | **CC** | **YC** | **LP** | **MC** | **RB** | **SG** | **SK** |
| **AS** |  |  | 0.248 |  |  |  |  |  |  |  |
| **BB** | 0.051 |  | 0.110 | 0.206 |  | 0.301 | 0.306 |  | 0.163 | 0.293 |
| **CP** |  |  |  |  |  | 0.391 |  |  |  | 0.288 |
| **CC** | 0.087 | 0.172 | 0.315 |  |  | 0.154 | 0.170 |  | 0.148 | 0.288 |
| **YC** |  |  |  |  |  |  |  |  |  |  |
| **LP** |  |  | 0.253 |  |  |  | 0.130 |  |  |  |
| **MC** |  | 0.206 | 0.409 |  |  | 0.248 |  |  |  | 0.157 |
| **RB** |  |  |  |  | 0.063 |  |  |  |  |  |
| **SG** |  |  |  |  |  |  |  |  |  |  |
| **SK** |  |  | 0.612 |  |  |  |  |  | 0.131 |  |

1. Cliff’s for Co-changed Anti-patterns in ArgoUML

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **AS** | **CC** | **YC** | **LP** | **RB** |
| **AS** |  |  |  |  |  |
| **CC** | 0.062 |  | 0.247 | 0.433 |  |
| **YC** |  | 0.381 |  | 0.360 |  |
| **LP** | 0.055 | 0.360 | 0.167 |  |  |
| **RB** |  |  |  |  |  |

1. Cliff’s for Co-changed Anti-patterns in Log4J

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **AS** | **CP** | **CC** | **YC** | **LP** | **SG** |
| **AS** |  | 0.073 |  |  | 0.115 |  |
| **CP** | 0.052 |  | 0.096 |  | 0.054 |  |
| **CC** |  |  |  |  |  |  |
| **YC** |  |  |  |  |  |  |
| **LP** | 0.126 | 0.082 | 0.108 |  |  |  |
| **SG** |  |  |  |  |  |  |

1. Cliff’s for Co-changed Anti-patterns in Xalan

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | **AS** | **CP** | **CC** | **YC** | **LP** | **RB** | **SG** |
| **AS** |  | 0.281 | 0.477 |  | 0.234 |  | 0.577 |
| **CP** |  |  |  |  |  |  |  |
| **CC** | 0.535 | 0.492 |  |  | 0.460 |  | 0.508 |
| **YC** |  |  |  |  |  | 0.411 |  |
| **LP** |  | 0.101 | 0.142 | 0.108 |  | 0.138 | 0.122 |
| **RB** |  |  |  |  |  |  |  |
| **SG** | 0.674 |  | 0.649 |  | 0.820 |  |  |

1. Cliff’s for Data Dependent Anti-patterns in Xerces-J

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **AS** | **BB** | **CP** | **CC** | **YC** | **LP** | **MC** | **RB** | **SG** | **SK** |
| **AS** |  |  |  |  |  |  |  |  |  |  |
| **BB** | 0.102 |  |  |  |  |  |  |  |  |  |
| **CP** |  |  |  |  |  |  |  |  |  |  |
| **CC** | 0.183 | 0.363 | 0.241 |  |  | 0.386 | 0.362 | 0.273 | 0.201 | 0.389 |
| **YC** |  |  |  |  |  |  |  |  |  |  |
| **LP** | 0.029 |  |  |  |  |  |  |  | 0.103 |  |
| **MC** | 0.156 | 0.429 | 0.143 | 0.434 |  | 0.502 |  | 0.392 | 0.289 | 0.433 |
| **RB** |  |  |  |  |  |  |  |  |  |  |
| **SG** |  |  |  |  |  |  |  |  |  |  |
| **SK** | 0.159 | 0.299 |  | 0.321 |  | 0.299 | 0.289 |  | 0.292 |  |