**Appendix A**

Here the results of precision and recall are provided in Tables 1A-12A.

**Table 1A.** Precision for the Jaffe dataset.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of features | ANT-EHFS | Correlation | ReliefF | Fisher Score | t-test | MIC | RFS | Chi-Squared | Borda Count | Weighted Borda Count | Plurality Voting | M-DFIFS | MI | PEFS |
| *1* | 0.52 | 0.79 | 0.85 | 0.83 | 0.71 | 0.78 | 0.86 | 0.71 | 0.92 | 0.93 | 0.91 | 0.89 | 0.68 | **0.95** |
| *5* | 0.96 | 0.87 | 0.97 | 0.94 | 0.81 | **0.98** | 0.87 | 0.91 | 0.96 | 0.95 | 0.97 | 0.96 | 0.95 | 0.96 |
| *10* | 0.98 | 0.92 | 0.93 | 0.91 | 0.85 | **0.99** | 0.96 | 0.93 | **0.99** | 0.97 | 0.98 | 0.98 | 0.96 | 0.95 |
| *15* | **1.00** | 0.90 | 0.89 | 0.90 | 0.78 | 0.96 | 0.90 | 0.89 | 0.91 | 0.94 | 0.97 | 0.95 | 0.87 | 0.95 |
| *20* | **1.00** | 0.97 | 0.91 | 0.92 | 0.91 | 0.95 | 0.95 | 0.92 | 0.91 | 0.96 | 0.95 | 0.98 | 0.90 | 0.96 |
| *25* | **1.00** | 0.95 | 0.93 | 0.94 | 0.81 | 0.97 | 0.89 | 0.90 | 0.98 | 0.99 | **1.00** | 0.97 | 0.87 | 0.98 |
| *30* | **1.00** | 0.99 | 0.98 | 0.97 | 0.84 | 0.99 | 0.95 | 0.95 | 0.99 | 0.99 | 0.99 | 0.99 | 0.94 | 0.98 |
| *35* | **1.00** | 0.91 | 0.92 | 0.93 | 0.77 | 0.94 | 0.96 | 0.95 | 0.97 | 0.92 | 0.93 | 0.99 | 0.91 | 0.94 |
| *40* | **1.00** | 0.94 | 0.93 | 0.96 | 0.82 | 0.97 | 0.98 | 0.95 | 0.96 | 0.94 | 0.94 | 0.99 | 0.92 | 0.95 |
| *45* | **1.00** | 0.89 | 0.95 | 0.90 | 0.76 | 0.96 | 0.95 | 0.94 | 0.92 | 0.94 | 0.93 | 0.85 | 0.91 | 0.94 |
| *50* | **1.00** | 0.91 | 0.95 | 0.95 | 0.88 | 0.97 | 0.98 | 0.96 | 0.98 | 0.97 | 0.97 | 0.92 | 0.93 | 0.95 |
| *55* | **1.00** | 0.89 | 0.85 | 0.94 | 0.71 | 0.95 | 0.90 | 0.82 | 0.85 | 0.92 | 0.91 | 0.97 | 0.95 | 0.98 |
| *60* | **1.00** | 0.92 | 0.87 | 0.94 | 0.81 | 0.96 | 0.94 | 0.89 | 0.87 | 0.93 | 0.90 | 0.95 | 0.95 | 0.94 |
| *65* | **1.00** | 0.94 | 0.91 | 0.95 | 0.73 | 0.91 | 0.91 | 0.95 | 0.92 | 0.93 | 0.91 | 0.98 | 0.91 | 0.93 |
| *70* | **1.00** | 0.96 | 0.91 | 0.94 | 0.84 | 0.94 | 0.95 | 0.95 | 0.94 | 0.94 | 0.94 | 0.98 | 0.97 | 0.97 |
| *75* | **1.00** | 0.94 | 0.92 | 0.95 | 0.80 | 0.98 | 0.93 | 0.95 | 0.96 | 0.99 | 0.94 | **1.00** | 0.98 | 0.97 |
| *80* | **1.00** | **1.00** | 0.92 | 0.96 | 0.90 | 0.99 | 0.97 | 0.93 | 0.95 | 0.98 | 0.93 | **1.00** | 0.97 | 0.95 |
| *85* | **1.00** | 0.88 | 0.90 | 0.92 | 0.78 | 0.96 | 0.88 | 0.87 | 0.90 | 0.96 | 0.90 | **1.00** | 0.94 | 0.96 |
| *90* | **1.00** | 0.93 | 0.89 | 0.98 | 0.83 | 0.97 | 0.91 | 0.88 | 0.89 | 0.93 | 0.95 | **1.00** | 0.94 | 0.98 |
| *95* | **1.00** | 0.88 | 0.90 | 0.96 | 0.77 | 0.96 | 0.92 | 0.87 | 0.94 | 0.94 | 0.93 | 0.96 | 0.93 | 0.94 |
| *100* | **1.00** | 0.94 | 0.93 | 0.95 | 0.84 | 0.96 | 0.88 | 0.89 | 0.92 | 0.95 | 0.95 | 0.97 | 0.97 | 0.97 |
| *Mean* | **0.97** | 0.92 | 0.91 | 0.94 | 0.81 | 0.95 | 0.93 | 0.91 | 0.93 | 0.95 | 0.94 | **0.97** | 0.92 | 0.95 |
| *Win* | **18/2** | 1/21 | 0 | 0 | 0 | 2/21 | 0 | 0 | 1/21 | 0 | 1/21 | 4/21 | 0 | 1/21 |

**Table 2A.** Precision for the ORL dataset.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of features | ANT-EHFS | Correlation | ReliefF | Fisher Score | t-test | MIC | RFS | Chi-Squared | Borda Count | Weighted Borda Count | Plurality Voting | M-DFIFS | MI | PEFS |
| *1* | 0.09 | 0.18 | 0.26 | 0.34 | 0.13 | 0.50 | 0.38 | 0.39 | 0.45 | 0.37 | 0.41 | 0.41 | 0.22 | **0.75** |
| *5* | 0.40 | 0.44 | 0.53 | 0.63 | 0.30 | 0.56 | 0.63 | 0.54 | 0.65 | 0.64 | 0.48 | 0.62 | 0.31 | **0.73** |
| *10* | 0.56 | 0.25 | 0.63 | 0.71 | 0.51 | 0.65 | 0.71 | 0.61 | 0.71 | 0.66 | 0.61 | 0.66 | 0.38 | **0.75** |
| *15* | 0.60 | 0.38 | 0.50 | 0.65 | 0.35 | 0.65 | 0.69 | 0.55 | 0.62 | 0.56 | 0.46 | 0.64 | 0.37 | **0.76** |
| *20* | 0.73 | 0.41 | 0.58 | 0.73 | 0.37 | **0.77** | 0.73 | 0.62 | 0.71 | 0.64 | 0.49 | 0.70 | 0.38 | 0.69 |
| *25* | **0.83** | 0.31 | 0.50 | 0.71 | 0.31 | 0.70 | 0.60 | 0.55 | 0.58 | 0.63 | 0.55 | 0.67 | 0.29 | 0.76 |
| *30* | **0.85** | 0.29 | 0.64 | 0.62 | 0.43 | 0.68 | 0.65 | 0.57 | 0.74 | 0.72 | 0.56 | 0.75 | 0.39 | 0.74 |
| *35* | **0.85** | 0.37 | 0.56 | 0.61 | 0.23 | 0.60 | 0.71 | 0.45 | 0.64 | 0.55 | 0.47 | 0.58 | 0.31 | 0.69 |
| *40* | **0.85** | 0.22 | 0.63 | 0.62 | 0.44 | 0.67 | 0.71 | 0.56 | 0.69 | 0.60 | 0.64 | 0.64 | 0.38 | 0.70 |
| *45* | **0.84** | 0.31 | 0.49 | 0.66 | 0.38 | 0.61 | 0.68 | 0.51 | 0.69 | 0.61 | 0.57 | 0.62 | 0.39 | 0.79 |
| *50* | **0.83** | 0.40 | 0.65 | 0.67 | 0.49 | 0.74 | 0.76 | 0.60 | 0.68 | 0.66 | 0.50 | 0.68 | 0.46 | 0.67 |
| *55* | **0.83** | 0.62 | 0.57 | 0.59 | 0.33 | 0.58 | 0.68 | 0.54 | 0.59 | 0.59 | 0.48 | 0.70 | 0.38 | 0.70 |
| *60* | **0.88** | 0.46 | 0.65 | 0.71 | 0.41 | 0.58 | 0.74 | 0.57 | 0.67 | 0.68 | 0.54 | 0.70 | 0.38 | 0.81 |
| *65* | **0.88** | 0.53 | 0.59 | 0.71 | 0.26 | 0.60 | 0.66 | 0.49 | 0.66 | 0.62 | 0.55 | 0.68 | 0.48 | 0.72 |
| *70* | **0.87** | 0.54 | 0.59 | 0.74 | 0.43 | 0.61 | 0.70 | 0.55 | 0.63 | 0.67 | 0.55 | 0.63 | 0.58 | 0.77 |
| *75* | **0.88** | 0.58 | 0.51 | 0.63 | 0.33 | 0.62 | 0.65 | 0.39 | 0.59 | 0.51 | 0.40 | 0.63 | 0.47 | 0.76 |
| *80* | **0.88** | 0.50 | 0.58 | 0.75 | 0.39 | 0.66 | 0.70 | 0.53 | 0.67 | 0.63 | 0.51 | 0.62 | 0.56 | 0.72 |
| *85* | **0.88** | 0.54 | 0.46 | 0.56 | 0.27 | 0.52 | 0.66 | 0.62 | 0.70 | 0.62 | 0.44 | 0.65 | 0.30 | 0.72 |
| *90* | **0.91** | 0.41 | 0.54 | 0.62 | 0.45 | 0.62 | 0.72 | 0.53 | 0.71 | 0.65 | 0.51 | 0.70 | 0.33 | 0.67 |
| *95* | **0.90** | 0.52 | 0.56 | 0.61 | 0.28 | 0.60 | 0.65 | 0.43 | 0.64 | 0.53 | 0.63 | 0.68 | 0.53 | 0.70 |
| *100* | **0.90** | 0.56 | 0.65 | 0.70 | 0.37 | 0.63 | 0.72 | 0.62 | 0.70 | 0.65 | 0.63 | 0.69 | 0.58 | 0.70 |
| *Mean* | **0.77** | 0.42 | 0.56 | 0.65 | 0.36 | 0.63 | 0.67 | 0.53 | 0.65 | 0.61 | 0.52 | 0.65 | 0.40 | 0.72 |
| *Win* | **16/21** | 0 | 0 | 0 | 0 | 1/21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4/21 |

**Table 3A.** Precision for the Yale dataset.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of features | ANT-EHFS | Correlation | ReliefF | Fisher Score | t-test | MIC | RFS | Chi-Squared | Borda Count | Weighted Borda Count | Plurality Voting | M-DFIFS | MI | PEFS |
| *1* | 0.10 | 0.25 | 0.28 | **0.55** | 0.13 | 0.39 | 0.17 | 0.41 | 0.21 | 0.32 | 0.44 | 0.23 | 0.32 | 0.49 |
| *5* | 0.31 | 0.24 | 0.39 | 0.53 | 0.20 | 0.42 | 0.31 | **0.59** | 0.28 | 0.43 | 0.45 | 0.38 | 0.31 | 0.53 |
| *10* | 0.29 | 0.40 | 0.45 | 0.57 | 0.36 | 0.40 | 0.39 | 0.44 | 0.46 | 0.42 | 0.58 | **0.60** | 0.38 | 0.50 |
| *15* | 0.43 | 0.41 | 0.46 | 0.58 | 0.25 | 0.50 | 0.38 | 0.52 | 0.50 | 0.50 | 0.57 | 0.56 | 0.37 | **0.61** |
| *20* | 0.39 | 0.30 | 0.47 | 0.61 | 0.22 | 0.45 | 0.50 | 0.51 | 0.38 | 0.54 | 0.52 | 0.61 | 0.42 | **0.68** |
| *25* | 0.39 | 0.56 | 0.48 | **0.71** | 0.44 | 0.39 | 0.30 | 0.52 | 0.43 | 0.55 | 0.51 | 0.54 | 0.30 | 0.58 |
| *30* | **0.70** | 0.57 | 0.54 | 0.50 | 0.31 | 0.59 | 0.38 | 0.63 | 0.38 | 0.60 | 0.59 | 0.49 | 0.32 | 0.55 |
| *35* | 0.43 | 0.21 | 0.43 | 0.45 | 0.22 | 0.44 | 0.43 | **0.62** | 0.28 | 0.56 | 0.46 | 0.56 | 0.32 | 0.61 |
| *40* | 0.45 | 0.30 | 0.37 | 0.44 | 0.29 | 0.50 | 0.40 | 0.50 | 0.48 | 0.51 | 0.49 | **0.60** | 0.49 | 0.46 |
| *45* | 0.69 | 0.51 | 0.46 | 0.44 | 0.24 | 0.44 | 0.44 | 0.44 | 0.56 | 0.41 | 0.42 | **0.70** | 0.28 | 0.54 |
| *50* | **0.65** | 0.40 | 0.60 | 0.54 | 0.38 | 0.57 | 0.44 | 0.46 | 0.58 | 0.43 | 0.55 | 0.60 | 0.33 | 0.48 |
| *55* | 0.64 | 0.35 | 0.33 | 0.65 | 0.35 | 0.63 | 0.32 | 0.57 | 0.43 | 0.57 | **0.68** | 0.59 | 0.44 | 0.45 |
| *60* | 0.66 | 0.45 | 0.49 | 0.56 | 0.33 | 0.56 | 0.34 | 0.59 | 0.56 | 0.55 | **0.69** | 0.54 | 0.49 | 0.48 |
| *65* | **0.63** | 0.36 | 0.41 | 0.57 | 0.38 | 0.57 | 0.20 | 0.52 | 0.45 | 0.51 | 0.58 | 0.43 | 0.46 | 0.46 |
| *70* | 0.55 | 0.40 | 0.43 | **0.63** | 0.44 | 0.55 | 0.35 | 0.57 | 0.49 | 0.58 | 0.53 | 0.37 | 0.43 | 0.54 |
| *75* | 0.51 | 0.24 | 0.37 | 0.45 | 0.32 | 0.43 | 0.28 | 0.44 | 0.42 | 0.46 | **0.54** | 0.45 | 0.25 | 0.41 |
| *80* | **0.60** | 0.35 | 0.47 | 0.56 | 0.41 | 0.42 | 0.44 | 0.51 | 0.44 | 0.52 | 0.44 | 0.34 | 0.29 | 0.50 |
| *85* | 0.61 | 0.40 | 0.51 | 0.60 | 0.25 | **0.69** | 0.43 | 0.49 | 0.49 | 0.39 | 0.63 | 0.47 | 0.30 | 0.41 |
| *90* | 0.64 | 0.52 | 0.57 | **0.68** | 0.42 | 0.65 | 0.44 | 0.56 | 0.53 | 0.53 | 0.58 | 0.60 | 0.45 | 0.46 |
| *95* | **0.61** | 0.40 | 0.39 | 0.44 | 0.28 | **0.61** | 0.41 | 0.55 | 0.41 | 0.49 | 0.43 | 0.44 | 0.32 | 0.62 |
| *100* | 0.61 | 0.42 | 0.46 | 0.45 | 0.43 | **0.67** | 0.46 | 0.38 | 0.46 | 0.46 | 0.50 | 0.45 | 0.33 | 0.49 |
| *Mean* | 0.52 | 0.38 | 0.45 | **0.55** | 0.32 | 0.52 | 0.37 | 0.52 | 0.44 | 0.49 | 0.53 | 0.50 | 0.36 | 0.52 |
| *Win* | **5/21** | 0 | 0 | 4/21 | 0 | 3/21 | 0 | 2/21 | 0 | 0 | 3/21 | 3/21 | 0 | 2/21 |

**Table 4A.** Precision for the WarpPIE10P dataset.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of features | ANT-EHFS | Correlation | ReliefF | Fisher Score | t-test | MIC | RFS | Chi-Squared | Borda Count | Weighted Borda Count | Plurality Voting | M-DFIFS | MI | PEFS |
| *1* | 0.39 | 0.54 | 0.56 | 0.78 | 0.40 | 0.82 | 0.46 | 0.54 | 0.60 | 0.81 | 0.66 | 0.56 | 0.37 | **0.83** |
| *5* | 0.71 | 0.60 | 0.80 | 0.80 | 0.42 | 0.79 | 0.66 | 0.67 | 0.76 | **0.91** | 0.74 | 0.81 | 0.29 | 0.82 |
| *10* | 0.82 | 0.71 | 0.82 | 0.86 | 0.58 | 0.81 | 0.73 | 0.69 | 0.68 | 0.87 | 0.81 | 0.78 | 0.36 | **0.90** |
| *15* | **0.91** | 0.66 | 0.79 | 0.84 | 0.55 | 0.81 | 0.68 | 0.65 | 0.72 | 0.85 | 0.71 | 0.85 | 0.58 | 0.83 |
| *20* | **0.98** | 0.72 | 0.83 | 0.84 | 0.53 | 0.84 | 0.76 | 0.57 | 0.75 | 0.85 | 0.82 | 0.82 | 0.56 | 0.92 |
| *25* | **0.98** | 0.67 | 0.80 | 0.91 | 0.51 | 0.88 | 0.78 | 0.66 | 0.75 | 0.83 | 0.78 | 0.79 | 0.22 | 0.86 |
| *30* | **0.98** | 0.73 | 0.76 | 0.88 | 0.53 | 0.85 | 0.76 | 0.64 | 0.73 | 0.87 | 0.86 | 0.85 | 0.41 | 0.87 |
| *35* | **0.98** | 0.58 | 0.74 | 0.78 | 0.39 | 0.87 | 0.73 | 0.51 | 0.65 | 0.84 | 0.73 | 0.77 | 0.41 | 0.94 |
| *40* | **0.96** | 0.72 | 0.79 | 0.79 | 0.51 | 0.89 | 0.73 | 0.52 | 0.68 | 0.86 | 0.77 | 0.84 | 0.45 | 0.89 |
| *45* | **0.96** | 0.72 | 0.78 | 0.90 | 0.57 | 0.88 | 0.66 | 0.64 | 0.83 | 0.83 | 0.80 | 0.78 | 0.43 | 0.87 |
| *50* | **0.96** | 0.78 | 0.81 | 0.89 | 0.64 | 0.89 | 0.75 | 0.64 | 0.80 | 0.88 | 0.79 | 0.80 | 0.48 | 0.86 |
| *55* | **1.00** | 0.74 | 0.78 | 0.84 | 0.6 | 0.81 | 0.58 | 0.58 | 0.64 | 0.83 | 0.83 | 0.85 | 0.34 | 0.84 |
| *60* | **0.98** | 0.72 | 0.79 | 0.83 | 0.55 | 0.86 | 0.67 | 0.65 | 0.67 | 0.9 | 0.8 | 0.85 | 0.39 | 0.89 |
| *65* | **0.98** | 0.71 | 0.88 | 0.89 | 0.48 | 0.84 | 0.74 | 0.65 | 0.76 | 0.93 | 0.85 | 0.76 | 0.49 | 0.89 |
| *70* | **0.98** | 0.76 | 0.90 | 0.88 | 0.64 | 0.89 | 0.81 | 0.69 | 0.75 | 0.92 | 0.87 | 0.77 | 0.50 | 0.92 |
| *75* | **0.98** | 0.66 | 0.73 | 0.88 | 0.27 | 0.85 | 0.65 | 0.59 | 0.75 | 0.83 | 0.7 | 0.73 | 0.36 | 0.86 |
| *80* | **0.98** | 0.62 | 0.78 | 0.83 | 0.42 | 0.84 | 0.70 | 0.57 | 0.71 | 0.85 | 0.74 | 0.68 | 0.35 | 0.82 |
| *85* | **1.00** | 0.75 | 0.74 | 0.84 | 0.52 | 0.80 | 0.72 | 0.64 | 0.64 | 0.91 | 0.81 | 0.77 | 0.44 | 0.89 |
| *90* | **1.00** | 0.83 | 0.80 | 0.83 | 0.60 | 0.85 | 0.76 | 0.59 | 0.70 | 0.88 | 0.82 | 0.82 | 0.57 | 0.80 |
| *95* | **1.00** | 0.65 | 0.84 | 0.87 | 0.40 | 0.88 | 0.78 | 0.65 | 0.76 | 0.87 | 0.76 | 0.77 | 0.50 | 0.82 |
| *100* | **1.00** | 0.74 | 0.83 | 0.86 | 0.56 | 0.92 | 0.78 | 0.65 | 0.73 | 0.85 | 0.80 | 0.85 | 0.52 | 0.91 |
| *Mean* | **0.93** | 0.70 | 0.79 | 0.85 | 0.51 | 0.85 | 0.71 | 0.62 | 0.72 | 0.87 | 0.78 | 0.78 | 0.43 | 0.87 |
| *Win* | **18/21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1/21 | 0 | 0 | 0 | 2/21 |

**Table 5A.** Precision for the Lung dataset.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of features | ANT-EHFS | Correlation | ReliefF | Fisher Score | t-test | MIC | RFS | Chi-Squared | Borda Count | Weighted Borda Count | Plurality Voting | M-DFIFS | MI | PEFS |
| *1* | 0.61 | 0.77 | 0.81 | 0.67 | 0.34 | 0.34 | 0.76 | 0.62 | 0.65 | 0.72 | 0.84 | **0.89** | 0.66 | 0.78 |
| *5* | 0.84 | 0.90 | 0.82 | 0.92 | 0.67 | **0.97** | 0.92 | **0.97** | 0.73 | 0.94 | 0.96 | 0.78 | 0.89 | 0.78 |
| *10* | 0.82 | 0.89 | 0.86 | 0.96 | 0.75 | 0.97 | **0.99** | 0.94 | 0.92 | 0.97 | 0.98 | 0.84 | 0.82 | 0.83 |
| *15* | **1.00** | 0.80 | 0.91 | 0.98 | 0.60 | 0.92 | 0.98 | 0.82 | 0.76 | 0.98 | 0.88 | 0.70 | 0.62 | 0.63 |
| *20* | 0.94 | 0.85 | **0.99** | **0.99** | 0.78 | 0.83 | **0.99** | 0.72 | 0.76 | 0.98 | 0.85 | 0.71 | 0.65 | 0.78 |
| *25* | 0.91 | 0.65 | 0.75 | 0.72 | 0.62 | 0.70 | 0.75 | 0.76 | 0.72 | 0.71 | 0.69 | 0.72 | **0.96** | 0.90 |
| *30* | **0.91** | 0.64 | 0.76 | 0.74 | 0.65 | 0.75 | 0.78 | 0.77 | 0.72 | 0.76 | 0.75 | 0.73 | 0.98 | 0.86 |
| *35* | 0.91 | 0.83 | 0.68 | 0.87 | 0.48 | 0.68 | **0.95** | 0.81 | 0.68 | 0.76 | 0.86 | 0.71 | 0.84 | 0.79 |
| *40* | 0.89 | 0.80 | 0.88 | 0.85 | 0.73 | 0.74 | **0.97** | 0.65 | 0.90 | **0.97** | 0.95 | 0.71 | 0.93 | 0.94 |
| *45* | 0.91 | 0.93 | 0.87 | **0.98** | 0.63 | 0.89 | 0.93 | 0.95 | 0.97 | **0.98** | 0.92 | 0.72 | 0.74 | 0.94 |
| *50* | 0.93 | 0.96 | 0.96 | 0.84 | 0.73 | 0.96 | 0.97 | 0.94 | **0.99** | 0.88 | 0.97 | 0.73 | 0.71 | 0.74 |
| *55* | 0.93 | 0.89 | 0.77 | 0.92 | 0.66 | 0.89 | 0.92 | **0.98** | 0.65 | 0.97 | 0.96 | 0.64 | 0.67 | 0.76 |
| *60* | 0.93 | 0.95 | 0.77 | 0.73 | 0.71 | 0.92 | 0.89 | 0.96 | 0.72 | **0.98** | 0.96 | 0.67 | 0.91 | **0.98** |
| *65* | **0.98** | 0.97 | 0.85 | 0.87 | 0.61 | **0.98** | 0.85 | 0.90 | 0.97 | 0.71 | 0.89 | 0.71 | 0.74 | 0.73 |
| *70* | **0.98** | 0.88 | 0.89 | 0.66 | 0.75 | 0.97 | 0.93 | 0.89 | 0.95 | 0.88 | 0.89 | 0.74 | 0.76 | 0.85 |
| *75* | 0.93 | 0.93 | 0.88 | 0.93 | 0.56 | **0.98** | **0.98** | 0.75 | 0.74 | 0.97 | 0.96 | 0.63 | 0.59 | 0.92 |
| *80* | 0.93 | 0.94 | 0.88 | 0.94 | 0.71 | 0.88 | **0.98** | 0.95 | 0.77 | 0.97 | 0.96 | 0.71 | 0.90 | 0.96 |
| *85* | 0.93 | 0.92 | 0.59 | **0.97** | 0.90 | 0.94 | 0.92 | 0.77 | 0.73 | **0.97** | **0.97** | 0.69 | 0.79 | 0.87 |
| *90* | 0.93 | **0.97** | 0.92 | 0.94 | 0.71 | **0.97** | 0.94 | 0.74 | 0.78 | 0.94 | 0.93 | 0.72 | 0.88 | 0.93 |
| *95* | **0.93** | 0.65 | 0.65 | 0.90 | 0.45 | **0.93** | 0.76 | 0.72 | 0.75 | 0.88 | 0.92 | 0.76 | **0.93** | **0.93** |
| *100* | 0.93 | 0.92 | 0.73 | 0.86 | 0.77 | 0.95 | 0.95 | 0.93 | 0.78 | 0.95 | 0.93 | 0.76 | **0.98** | 0.83 |
| *Mean* | **0.91** | 0.86 | 0.82 | 0.87 | 0.66 | 0.86 | **0.91** | 0.84 | 0.79 | 0.90 | **0.91** | 0.73 | 0.81 | 0.85 |
| *Win* | 5/21 | 1/21 | 1/21 | 3/21 | 0 | 5/21 | **6/21** | 2/21 | 1/21 | 4/21 | 1/21 | 1/21 | 3/21 | 2/21 |

**Table 6A.** Precision for the GLIOMA dataset.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of features | ANT-EHFS | Correlation | ReliefF | Fisher Score | t-test | MIC | RFS | Chi-Squared | Borda Count | Weighted Borda Count | Plurality Voting | M-DFIFS | MI | PEFS |
| *1* | 0.59 | 0.29 | 0.20 | 0.29 | 0.13 | 0.47 | 0.20 | 0.45 | 0.28 | 0.65 | **0.69** | 0.65 | 0.47 | 0.49 |
| *5* | 0.42 | 0.65 | 0.45 | 0.73 | 0.33 | 0.56 | 0.21 | 0.64 | 0.74 | **0.85** | 0.63 | 0.70 | 0.70 | 0.53 |
| *10* | 0.69 | 0.53 | 0.54 | **0.86** | 0.52 | 0.84 | 0.53 | 0.67 | 0.71 | 0.78 | 0.69 | 0.68 | 0.65 | 0.60 |
| *15* | 0.80 | 0.48 | 0.63 | **0.81** | 0.47 | 0.48 | 0.33 | 0.51 | 0.66 | **0.81** | 0.44 | 0.79 | 0.54 | 0.49 |
| *20* | 0.67 | 0.70 | 0.77 | 0.66 | 0.58 | 0.46 | 0.69 | 0.61 | 0.84 | **0.87** | 0.40 | 0.66 | 0.62 | 0.52 |
| *25* | 0.57 | 0.32 | 0.63 | 0.68 | 0.44 | 0.58 | 0.35 | 0.67 | **0.88** | 0.58 | 0.86 | 0.58 | 0.43 | 0.67 |
| *30* | 0.77 | 0.25 | 0.48 | 0.49 | 0.50 | 0.42 | 0.46 | 0.60 | **0.89** | 0.58 | 0.78 | 0.61 | 0.79 | 0.55 |
| *35* | **0.77** | 0.16 | 0.57 | 0.65 | 0.40 | 0.56 | 0.20 | 0.53 | 0.64 | 0.70 | 0.41 | 0.55 | 0.63 | 0.40 |
| *40* | 0.77 | 0.21 | 0.74 | 0.60 | 0.55 | 0.51 | 0.28 | 0.60 | 0.62 | 0.71 | 0.30 | **0.84** | 0.60 | 0.35 |
| *45* | **0.77** | 0.38 | 0.65 | 0.39 | 0.24 | 0.60 | 0.48 | 0.48 | 0.56 | 0.71 | 0.44 | 0.41 | 0.60 | 0.51 |
| *50* | **0.77** | 0.35 | 0.52 | 0.51 | 0.44 | **0.77** | 0.54 | 0.49 | 0.65 | 0.71 | 0.44 | 0.56 | 0.64 | 0.48 |
| *55* | 0.77 | 0.36 | 0.62 | 0.77 | 0.61 | 0.49 | 0.26 | **0.80** | 0.75 | 0.72 | 0.62 | 0.46 | 0.41 | 0.45 |
| *60* | 0.82 | 0.49 | 0.71 | 0.79 | 0.51 | 0.49 | 0.39 | **0.84** | 0.78 | 0.66 | 0.48 | 0.49 | 0.48 | 0.40 |
| *65* | **0.82** | 0.26 | 0.22 | 0.28 | 0.46 | 0.27 | 0.16 | 0.44 | 0.66 | 0.49 | 0.38 | 0.38 | 0.36 | 0.49 |
| *70* | **0.82** | 0.39 | 0.37 | 0.34 | 0.48 | 0.32 | 0.43 | 0.41 | 0.55 | 0.63 | 0.42 | 0.38 | 0.39 | 0.54 |
| *75* | **0.92** | 0.34 | 0.58 | 0.68 | 0.43 | 0.45 | 0.60 | 0.63 | 0.65 | 0.79 | 0.56 | 0.53 | 0.54 | 0.47 |
| *80* | **0.92** | 0.47 | 0.58 | 0.63 | 0.65 | 0.65 | 0.67 | 0.65 | 0.73 | 0.83 | 0.46 | 0.58 | 0.53 | 0.57 |
| *85* | **0.92** | 0.58 | 0.39 | 0.83 | 0.19 | 0.71 | 0.73 | 0.84 | 0.74 | 0.70 | 0.75 | 0.77 | **0.92** | 0.59 |
| *90* | **0.92** | 0.66 | 0.63 | 0.84 | 0.75 | 0.82 | 0.40 | 0.89 | 0.79 | 0.73 | 0.53 | 0.82 | 0.82 | 0.50 |
| *95* | **0.92** | 0.28 | 0.47 | 0.82 | 0.28 | 0.65 | 0.21 | 0.62 | 0.69 | 0.73 | 0.58 | 0.71 | 0.70 | 0.62 |
| *100* | **0.92** | 0.27 | 0.49 | 0.75 | 0.37 | 0.71 | 0.34 | 0.71 | 0.45 | 0.80 | 0.46 | 0.75 | 0.43 | 0.50 |
| *Mean* | **0.79** | 0.40 | 0.54 | 0.64 | 0.44 | 0.56 | 0.40 | 0.62 | 0.68 | 0.72 | 0.54 | 0.61 | 0.58 | 0.51 |
| *Win* | **11/21** | 0 | 0 | 2/21 | 0 | 1/21 | 0 | 2/21 | 2/21 | 3/21 | 1/21 | 1/21 | 1/21 | 0 |

**Table 7A.** Recall for the Jaffe dataset.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of features | ANT-EHFS | Correlation | ReliefF | Fisher Score | t-test | MIC | RFS | Chi-Squared | Borda Count | Weighted Borda Count | Plurality Voting | M-DFIFS | MI | PEFS |
| *1* | 0.51 | 0.78 | 0.85 | 0.77 | 0.69 | 0.75 | 0.86 | 0.69 | 0.93 | 0.92 | 0.91 | 0.92 | 0.67 | **0.94** |
| *5* | 0.96 | 0.85 | 0.96 | 0.94 | 0.78 | **0.98** | 0.87 | 0.91 | 0.96 | 0.95 | 0.97 | 0.97 | 0.96 | 0.97 |
| *10* | 0.98 | 0.91 | 0.93 | 0.95 | 0.84 | **0.99** | 0.96 | 0.80 | 0.98 | 0.96 | 0.97 | **0.99** | 0.97 | 0.94 |
| *15* | **1.00** | 0.91 | 0.91 | 0.90 | 0.78 | 0.94 | 0.92 | 0.93 | 0.91 | 0.92 | 0.94 | 0.94 | 0.86 | 0.95 |
| *20* | **1.00** | 0.97 | 0.93 | 0.93 | 0.91 | 0.93 | 0.96 | 0.91 | 0.92 | 0.94 | 0.95 | 0.97 | 0.88 | 0.96 |
| *25* | **1.00** | 0.93 | 0.93 | 0.89 | 0.78 | 0.96 | 0.88 | 0.88 | 0.98 | 0.99 | **1.00** | 0.97 | 0.84 | 0.98 |
| *30* | **1.00** | 0.99 | 0.97 | 0.95 | 0.84 | 0.99 | 0.94 | 0.96 | 0.99 | 0.99 | 0.99 | 0.99 | 0.94 | 0.98 |
| *35* | **1.00** | 0.91 | 0.91 | 0.92 | 0.76 | 0.94 | 0.96 | 0.92 | 0.97 | 0.93 | 0.94 | 0.99 | 0.90 | 0.96 |
| *40* | **1.00** | 0.94 | 0.93 | 0.95 | 0.83 | 0.97 | 0.98 | 0.96 | 0.96 | 0.95 | 0.94 | 0.99 | 0.91 | 0.96 |
| *45* | **1.00** | 0.89 | 0.96 | 0.94 | 0.78 | 0.96 | 0.95 | 0.90 | 0.93 | 0.95 | 0.94 | 0.87 | 0.90 | 0.94 |
| *50* | **1.00** | 0.91 | 0.94 | 0.95 | 0.89 | 0.98 | 0.99 | 0.95 | 0.98 | 0.97 | 0.97 | 0.94 | 0.93 | 0.95 |
| *55* | **1.00** | 0.83 | 0.89 | 0.98 | 0.72 | 0.96 | 0.93 | 0.93 | 0.89 | 0.95 | 0.93 | 0.98 | 0.96 | 0.98 |
| *60* | **1.00** | 0.94 | 0.90 | 0.97 | 0.81 | 0.97 | 0.96 | 0.93 | 0.91 | 0.96 | 0.94 | 0.97 | 0.97 | 0.93 |
| *65* | **1.00** | 0.94 | 0.91 | 0.93 | 0.77 | 0.92 | 0.92 | 0.93 | 0.94 | 0.93 | 0.92 | 0.98 | 0.91 | 0.92 |
| *70* | **1.00** | 0.95 | 0.92 | 0.93 | 0.86 | 0.94 | 0.95 | 0.85 | 0.96 | 0.95 | 0.95 | 0.98 | 0.97 | 0.95 |
| *75* | **1.00** | 0.94 | 0.92 | 0.96 | 0.79 | 0.97 | 0.94 | 0.93 | 0.95 | 0.99 | 0.93 | **1.00** | 0.97 | 0.98 |
| *80* | **1.00** | **1.00** | 0.92 | 0.98 | 0.90 | 0.99 | 0.98 | 0.86 | 0.95 | 0.98 | 0.93 | **1.00** | 0.97 | 0.94 |
| *85* | **1.00** | 0.87 | 0.89 | 0.89 | 0.78 | 0.95 | 0.88 | 0.94 | 0.90 | 0.95 | 0.90 | **1.00** | 0.93 | 0.95 |
| *90* | **1.00** | 0.93 | 0.86 | 0.95 | 0.82 | 0.96 | 0.91 | 0.89 | 0.88 | 0.92 | 0.94 | **1.00** | 0.93 | 0.96 |
| *95* | **1.00** | 0.89 | 0.90 | 0.94 | 0.78 | 0.96 | 0.91 | 0.96 | 0.92 | 0.94 | 0.93 | 0.96 | 0.94 | 0.92 |
| *100* | **1.00** | 0.92 | 0.91 | 0.94 | 0.85 | 0.96 | 0.89 | 0.88 | 0.92 | 0.95 | 0.95 | 0.97 | 0.97 | 0.97 |
| *Mean* | **0.97** | 0.91 | 0.92 | 0.93 | 0.81 | 0.95 | 0.93 | 0.90 | 0.94 | 0.95 | 0.94 | **0.97** | 0.92 | 0.95 |
| *Win* | **18/21** | 1/21 | 0 | 0 | 0 | 2/21 | 0 | 0 | 0 | 0 | 1/21 | 5/21 | 0 | 1/21 |

**Table 8A.** Recall for the ORL dataset.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of features | ANT-EHFS | Correlation | ReliefF | Fisher Score | t-test | MIC | RFS | Chi-Squared | Borda Count | Weighted Borda Count | Plurality Voting | M-DFIFS | MI | PEFS |
| *1* | 0.11 | 0.25 | 0.34 | 0.37 | 0.18 | 0.47 | 0.43 | 0.36 | 0.45 | 0.38 | 0.38 | 0.42 | 0.19 | **0.71** |
| *5* | 0.34 | 0.39 | 0.59 | 0.63 | 0.25 | 0.57 | 0.61 | 0.45 | 0.66 | 0.58 | 0.53 | 0.64 | 0.28 | **0.75** |
| *10* | 0.54 | 0.57 | 0.61 | 0.68 | 0.45 | 0.68 | 0.68 | 0.56 | 0.69 | 0.64 | 0.57 | 0.68 | 0.35 | **0.71** |
| *15* | 0.60 | 0.31 | 0.49 | 0.59 | 0.34 | 0.63 | 0.65 | 0.48 | 0.61 | 0.56 | 0.48 | 0.61 | 0.31 | **0.74** |
| *20* | 0.72 | 0.48 | 0.55 | 0.70 | 0.35 | 0.73 | 0.70 | 0.53 | 0.67 | 0.59 | 0.51 | 0.63 | 0.35 | **0.75** |
| *25* | **0.76** | 0.32 | 0.53 | 0.67 | 0.29 | 0.65 | 0.58 | 0.54 | 0.60 | 0.59 | 0.55 | 0.63 | 0.32 | 0.73 |
| *30* | **0.80** | 0.50 | 0.60 | 0.68 | 0.40 | 0.63 | 0.65 | 0.57 | 0.69 | 0.65 | 0.54 | 0.73 | 0.36 | 0.69 |
| *35* | **0.80** | 0.36 | 0.55 | 0.66 | 0.21 | 0.64 | 0.67 | 0.40 | 0.59 | 0.54 | 0.44 | 0.58 | 0.30 | 0.68 |
| *40* | **0.80** | 0.47 | 0.56 | 0.67 | 0.39 | 0.73 | 0.67 | 0.53 | 0.65 | 0.55 | 0.56 | 0.65 | 0.39 | 0.69 |
| *45* | **0.80** | 0.31 | 0.49 | 0.62 | 0.38 | 0.61 | 0.68 | 0.47 | 0.67 | 0.54 | 0.55 | 0.66 | 0.37 | 0.69 |
| *50* | **0.79** | 0.56 | 0.65 | 0.67 | 0.44 | 0.71 | 0.72 | 0.59 | 0.65 | 0.63 | 0.52 | 0.71 | 0.43 | 0.67 |
| *55* | **0.79** | 0.34 | 0.58 | 0.57 | 0.32 | 0.59 | 0.69 | 0.43 | 0.59 | 0.53 | 0.55 | 0.66 | 0.34 | 0.73 |
| *60* | **0.82** | 0.46 | 0.63 | 0.68 | 0.39 | 0.63 | 0.72 | 0.47 | 0.65 | 0.64 | 0.54 | 0.67 | 0.37 | 0.79 |
| *65* | **0.82** | 0.39 | 0.56 | 0.66 | 0.26 | 0.59 | 0.65 | 0.47 | 0.61 | 0.60 | 0.50 | 0.65 | 0.47 | 0.73 |
| *70* | **0.81** | 0.51 | 0.54 | 0.72 | 0.36 | 0.61 | 0.65 | 0.54 | 0.58 | 0.65 | 0.53 | 0.63 | 0.57 | 0.77 |
| *75* | **0.85** | 0.26 | 0.47 | 0.64 | 0.37 | 0.65 | 0.67 | 0.36 | 0.56 | 0.51 | 0.50 | 0.64 | 0.51 | 0.73 |
| *80* | **0.85** | 0.45 | 0.52 | 0.70 | 0.34 | 0.65 | 0.67 | 0.46 | 0.64 | 0.59 | 0.53 | 0.59 | 0.58 | 0.73 |
| *85* | **0.85** | 0.26 | 0.47 | 0.56 | 0.29 | 0.56 | 0.62 | 0.53 | 0.61 | 0.59 | 0.47 | 0.65 | 0.29 | 0.76 |
| *90* | **0.86** | 0.45 | 0.51 | 0.62 | 0.41 | 0.63 | 0.66 | 0.51 | 0.66 | 0.64 | 0.48 | 0.62 | 0.31 | 0.66 |
| *95* | **0.86** | 0.44 | 0.59 | 0.69 | 0.22 | 0.63 | 0.59 | 0.43 | 0.62 | 0.51 | 0.60 | 0.67 | 0.52 | 0.73 |
| *100* | **0.88** | 0.56 | 0.66 | 0.75 | 0.35 | 0.63 | 0.71 | 0.58 | 0.69 | 0.66 | 0.60 | 0.70 | 0.57 | 0.70 |
| *Mean* | **0.74** | 0.41 | 0.55 | 0.64 | 0.33 | 0.63 | 0.65 | 0.49 | 0.63 | 0.58 | 0.52 | 0.64 | 0.39 | 0.71 |
| *Win* | **16/21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5/21 |

**Table 9A.** Recall for the Yale dataset.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of features | ANT-EHFS | Correlation | ReliefF | Fisher Score | t-test | MIC | RFS | Chi-Squared | Borda Count | Weighted Borda Count | Plurality Voting | M-DFIFS | MI | PEFS |
| *1* | 0.09 | 0.25 | 0.31 | **0.50** | 0.25 | 0.40 | 0.19 | 0.36 | 0.17 | 0.30 | 0.42 | 0.29 | 0.23 | 0.46 |
| *5* | 0.30 | 0.25 | 0.35 | 0.53 | 0.28 | 0.43 | 0.34 | 0.41 | 0.36 | 0.39 | 0.48 | 0.44 | 0.29 | **0.54** |
| *10* | 0.36 | 0.34 | 0.37 | 0.48 | 0.34 | 0.48 | 0.39 | 0.39 | 0.47 | 0.39 | 0.46 | **0.56** | 0.33 | 0.50 |
| *15* | 0.52 | 0.29 | 0.39 | 0.50 | 0.33 | 0.46 | 0.38 | 0.39 | 0.47 | 0.45 | 0.47 | 0.51 | 0.41 | **0.57** |
| *20* | 0.45 | 0.28 | 0.37 | 0.51 | 0.30 | 0.42 | 0.38 | 0.38 | 0.35 | 0.46 | 0.41 | 0.47 | 0.47 | **0.64** |
| *25* | 0.45 | 0.38 | 0.45 | **0.64** | 0.32 | 0.35 | 0.32 | 0.47 | 0.42 | 0.52 | 0.48 | 0.43 | 0.26 | 0.58 |
| *30* | 0.52 | 0.48 | 0.48 | **0.59** | 0.33 | 0.53 | 0.36 | 0.53 | 0.42 | 0.54 | 0.53 | 0.44 | 0.24 | 0.57 |
| *35* | 0.52 | 0.24 | 0.43 | 0.41 | 0.34 | 0.43 | 0.40 | 0.46 | 0.34 | 0.46 | 0.42 | 0.49 | 0.31 | **0.58** |
| *40* | **0.52** | 0.26 | 0.42 | 0.42 | 0.35 | 0.47 | 0.39 | 0.45 | 0.35 | 0.50 | 0.46 | 0.49 | 0.44 | 0.43 |
| *45* | **0.61** | 0.35 | 0.48 | 0.52 | 0.31 | 0.54 | 0.42 | 0.41 | 0.50 | 0.49 | 0.51 | 0.52 | 0.31 | 0.53 |
| *50* | **0.64** | 0.36 | 0.48 | 0.53 | 0.37 | 0.57 | 0.44 | 0.44 | 0.50 | 0.47 | 0.51 | 0.55 | 0.31 | 0.53 |
| *55* | 0.58 | 0.37 | 0.38 | 0.59 | 0.37 | **0.61** | 0.33 | 0.44 | 0.41 | 0.52 | 0.55 | 0.50 | 0.44 | 0.41 |
| *60* | 0.61 | 0.40 | 0.48 | 0.56 | 0.41 | 0.56 | 0.40 | 0.51 | 0.48 | 0.55 | **0.62** | 0.50 | 0.50 | 0.43 |
| *65* | **0.61** | 0.30 | 0.46 | 0.56 | 0.31 | 0.53 | 0.24 | 0.42 | 0.43 | 0.52 | 0.44 | 0.48 | 0.38 | 0.50 |
| *70* | 0.55 | 0.34 | 0.36 | **0.58** | 0.42 | 0.57 | 0.35 | 0.40 | 0.43 | 0.54 | 0.45 | 0.42 | 0.43 | 0.46 |
| *75* | **0.55** | 0.40 | 0.36 | 0.44 | 0.39 | 0.53 | 0.32 | 0.40 | 0.46 | **0.55** | 0.51 | 0.40 | 0.27 | 0.46 |
| *80* | 0.58 | 0.46 | 0.41 | 0.51 | 0.42 | 0.46 | 0.50 | 0.50 | 0.41 | **0.59** | 0.50 | 0.37 | 0.31 | 0.49 |
| *85* | 0.61 | 0.44 | 0.47 | **0.62** | 0.30 | 0.59 | 0.49 | 0.51 | 0.47 | 0.44 | 0.58 | 0.54 | 0.36 | 0.44 |
| *90* | 0.61 | 0.44 | 0.44 | **0.63** | 0.40 | 0.59 | 0.49 | 0.52 | 0.49 | 0.54 | 0.55 | 0.61 | 0.35 | 0.50 |
| *95* | **0.61** | 0.31 | 0.45 | 0.49 | 0.31 | 0.55 | 0.35 | 0.46 | 0.40 | 0.47 | 0.46 | 0.50 | 0.34 | 0.60 |
| *100* | **0.61** | 0.35 | 0.46 | 0.49 | 0.40 | 0.55 | 0.41 | 0.43 | 0.46 | 0.52 | 0.50 | 0.48 | 0.36 | 0.50 |
| *Mean* | 0.52 | 0.35 | 0.42 | **0.53** | 0.35 | 0.51 | 0.38 | 0.44 | 0.42 | 0.49 | 0.49 | 0.48 | 0.35 | 0.51 |
| *Win* | **7/21** | 0 | 0 | 6/21 | 0 | 1/21 | 0 | 0 | 0 | 2/21 | 1/21 | 1/21 | 0 | 4/21 |

**Table 10A.** Recall for the WarpPIE10P dataset.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of features | ANT-EHFS | Correlation | ReliefF | Fisher Score | t-test | MIC | RFS | Chi-Squared | Borda Count | Weighted Borda Count | Plurality Voting | M-DFIFS | MI | PEFS |
| *1* | 0.29 | 0.55 | 0.55 | 0.73 | 0.35 | 0.83 | 0.46 | 0.49 | 0.48 | **0.85** | 0.61 | 0.48 | 0.30 | **0.85** |
| *5* | 0.62 | 0.61 | 0.61 | 0.80 | 0.43 | 0.81 | 0.67 | 0.59 | 0.72 | **0.89** | 0.75 | 0.79 | 0.31 | 0.79 |
| *10* | 0.76 | 0.66 | 0.66 | 0.86 | 0.62 | 0.84 | 0.72 | 0.63 | 0.70 | **0.88** | 0.81 | 0.76 | 0.33 | 0.87 |
| *15* | **0.88** | 0.65 | 0.65 | 0.86 | 0.47 | 0.82 | 0.66 | 0.67 | 0.71 | 0.85 | 0.71 | 0.86 | 0.54 | 0.85 |
| *20* | **0.98** | 0.68 | 0.68 | 0.84 | 0.63 | 0.82 | 0.70 | 0.62 | 0.74 | 0.86 | 0.82 | 0.81 | 0.54 | 0.91 |
| *25* | **0.98** | 0.64 | 0.64 | 0.89 | 0.41 | 0.86 | 0.71 | 0.62 | 0.73 | 0.81 | 0.77 | 0.82 | 0.19 | 0.87 |
| *30* | **0.98** | 0.69 | 0.69 | 0.87 | 0.55 | 0.82 | 0.68 | 0.58 | 0.70 | 0.84 | 0.87 | 0.82 | 0.31 | 0.89 |
| *35* | **0.98** | 0.58 | 0.58 | 0.77 | 0.33 | 0.87 | 0.72 | 0.46 | 0.61 | 0.84 | 0.69 | 0.71 | 0.39 | 0.91 |
| *40* | **0.95** | 0.69 | 0.69 | 0.79 | 0.50 | 0.88 | 0.71 | 0.46 | 0.63 | 0.85 | 0.73 | 0.82 | 0.43 | 0.90 |
| *45* | **0.95** | 0.70 | 0.70 | 0.90 | 0.57 | 0.90 | 0.68 | 0.63 | 0.82 | 0.86 | 0.83 | 0.78 | 0.42 | 0.88 |
| *50* | **0.95** | 0.76 | 0.76 | 0.90 | 0.65 | 0.89 | 0.78 | 0.62 | 0.80 | 0.89 | 0.80 | 0.77 | 0.39 | 0.85 |
| *55* | **1.00** | 0.59 | 0.59 | 0.81 | 0.59 | 0.82 | 0.58 | 0.59 | 0.61 | 0.81 | 0.81 | 0.80 | 0.30 | 0.86 |
| *60* | **0.98** | 0.66 | 0.66 | 0.82 | 0.50 | 0.86 | 0.65 | 0.60 | 0.66 | 0.86 | 0.79 | 0.77 | 0.36 | 0.89 |
| *65* | **0.98** | 0.66 | 0.66 | 0.86 | 0.46 | 0.82 | 0.67 | 0.63 | 0.71 | 0.88 | 0.83 | 0.69 | 0.49 | 0.90 |
| *70* | **0.98** | 0.69 | 0.69 | 0.85 | 0.63 | 0.87 | 0.80 | 0.66 | 0.74 | 0.88 | 0.86 | 0.71 | 0.48 | 0.89 |
| *75* | **0.98** | 0.61 | 0.61 | 0.89 | 0.29 | 0.84 | 0.60 | 0.42 | 0.69 | 0.80 | 0.69 | 0.73 | 0.32 | 0.87 |
| *80* | **0.98** | 0.59 | 0.59 | 0.83 | 0.48 | 0.85 | 0.64 | 0.41 | 0.66 | 0.86 | 0.72 | 0.66 | 0.32 | 0.76 |
| *85* | **1.00** | 0.70 | 0.70 | 0.82 | 0.49 | 0.82 | 0.65 | 0.60 | 0.64 | 0.92 | 0.81 | 0.72 | 0.38 | 0.89 |
| *90* | **1.00** | 0.76 | 0.76 | 0.84 | 0.61 | 0.83 | 0.73 | 0.58 | 0.69 | 0.89 | 0.79 | 0.79 | 0.50 | 0.78 |
| *95* | **1.00** | 0.69 | 0.69 | 0.87 | 0.37 | 0.89 | 0.75 | 0.59 | 0.71 | 0.86 | 0.67 | 0.71 | 0.48 | 0.82 |
| *100* | **1.00** | 0.67 | 0.67 | 0.86 | 0.48 | 0.90 | 0.77 | 0.60 | 0.74 | 0.85 | 0.75 | 0.82 | 0.50 | 0.89 |
| *Mean* | **0.92** | 0.66 | 0.66 | 0.84 | 0.50 | 0.85 | 0.68 | 0.57 | 0.69 | 0.86 | 0.77 | 0.75 | 0.39 | 0.86 |
| *Win* | **18/21** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3/21 | 0 | 0 | 0 | 1/21 |

**Table 11A.** Recall for the Lung dataset.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of features | ANT-EHFS | Correlation | ReliefF | Fisher Score | t-test | MIC | RFS | Chi-Squared | Borda Count | Weighted Borda Count | Plurality Voting | M-DFIFS | MI | PEFS |
| *1* | **0.78** | 0.62 | 0.60 | 0.55 | 0.25 | 0.68 | 0.71 | 0.47 | 0.57 | 0.68 | 0.75 | 0.75 | 0.40 | 0.65 |
| *5* | 0.85 | 0.74 | 0.77 | 0.79 | 0.59 | 0.86 | 0.86 | 0.77 | 0.66 | 0.88 | **0.94** | 0.82 | 0.77 | 0.65 |
| *10* | 0.88 | 0.83 | 0.73 | 0.92 | 0.74 | 0.84 | 0.94 | 0.83 | 0.74 | 0.84 | **0.98** | 0.83 | 0.77 | 0.81 |
| *15* | **1.00** | 0.71 | 0.70 | 0.67 | 0.53 | 0.79 | 0.70 | 0.78 | 0.63 | 0.73 | 0.73 | 0.68 | 0.68 | 0.59 |
| *20* | **0.95** | 0.75 | 0.80 | 0.83 | 0.67 | 0.82 | 0.80 | 0.73 | 0.67 | 0.67 | 0.79 | 0.69 | 0.66 | 0.74 |
| *25* | **0.93** | 0.53 | 0.54 | 0.64 | 0.56 | 0.69 | 0.62 | 0.6 | 0.59 | 0.62 | 0.65 | 0.70 | 0.85 | 0.83 |
| *30* | **0.93** | 0.55 | 0.60 | 0.67 | 0.59 | 0.76 | 0.74 | 0.68 | 0.63 | 0.60 | 0.70 | 0.72 | 0.80 | **0.93** |
| *35* | **0.93** | 0.61 | 0.67 | 0.63 | 0.52 | 0.73 | 0.81 | 0.71 | 0.68 | 0.55 | 0.63 | 0.76 | 0.74 | 0.71 |
| *40* | **0.90** | 0.64 | 0.73 | 0.65 | 0.70 | 0.68 | 0.88 | 0.60 | 0.74 | 0.70 | 0.85 | 0.76 | 0.79 | 0.73 |
| *45* | **0.93** | 0.86 | 0.79 | 0.86 | 0.54 | 0.89 | 0.89 | 0.84 | 0.71 | 0.79 | 0.89 | 0.64 | 0.63 | 0.85 |
| *50* | **0.95** | 0.86 | 0.94 | 0.90 | 0.66 | 0.92 | **0.95** | 0.89 | **0.95** | 0.86 | **0.95** | 0.67 | 0.65 | 0.79 |
| *55* | **0.95** | 0.84 | 0.61 | 0.86 | 0.54 | 0.81 | 0.82 | 0.76 | 0.58 | 0.72 | **0.95** | 0.64 | 0.63 | 0.78 |
| *60* | **0.95** | 0.85 | 0.61 | 0.76 | 0.69 | 0.88 | 0.94 | 0.90 | 0.65 | 0.85 | **0.95** | 0.68 | 0.76 | 0.84 |
| *65* | **0.98** | 0.79 | 0.65 | 0.75 | 0.54 | 0.81 | 0.70 | 0.70 | 0.71 | 0.70 | 0.75 | 0.62 | 0.61 | 0.72 |
| *70* | **0.98** | 0.78 | 0.67 | 0.51 | 0.68 | 0.79 | 0.80 | 0.71 | 0.81 | 0.73 | 0.78 | 0.67 | 0.72 | 0.88 |
| *75* | **0.95** | 0.65 | 0.66 | 0.70 | 0.52 | 0.78 | 0.78 | 0.67 | 0.68 | 0.69 | 0.79 | 0.62 | 0.65 | 0.86 |
| *80* | **0.95** | 0.71 | 0.70 | 0.79 | 0.65 | 0.79 | 0.80 | 0.79 | 0.66 | 0.73 | 0.79 | 0.67 | 0.80 | 0.66 |
| *85* | **0.95** | 0.86 | 0.48 | 0.82 | 0.63 | 0.81 | 0.87 | 0.6 | 0.61 | 0.84 | 0.83 | 0.74 | 0.84 | 0.91 |
| *90* | **0.95** | 0.83 | 0.82 | 0.79 | 0.61 | **0.95** | 0.91 | 0.63 | 0.73 | 0.86 | 0.78 | 0.74 | 0.84 | 0.84 |
| *95* | **0.95** | 0.64 | 0.56 | 0.75 | 0.47 | 0.74 | 0.68 | 0.65 | 0.71 | 0.73 | 0.74 | 0.75 | 0.86 | 0.76 |
| *100* | **0.95** | 0.78 | 0.58 | 0.73 | 0.60 | 0.84 | 0.78 | 0.81 | 0.72 | 0.81 | 0.77 | 0.75 | 0.81 | 0.79 |
| *Mean* | **0.93** | 0.73 | 0.68 | 0.74 | 0.58 | 0.80 | 0.81 | 0.72 | 0.69 | 0.74 | 0.81 | 0.71 | 0.73 | 0.78 |
| *Win* | **19/21** | 0 | 0 | 0 | 0 | 1/21 | 1/21 | 0 | 1/21 | 0 | 5/21 | 0 | 0 | 1/21 |

**Table 12A.** Recall for the GLIOMA dataset.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Number of features | ANT-EHFS | Correlation | ReliefF | Fisher Score | t-test | MIC | RFS | Chi-Squared | Borda Count | Weighted Borda Count | Plurality Voting | M-DFIFS | MI | PEFS |
| *1* | 0.40 | 0.11 | 0.22 | 0.38 | 0.16 | 0.49 | 0.25 | 0.62 | 0.32 | **0.65** | 0.50 | 0.61 | 0.52 | 0.46 |
| *5* | 0.60 | 0.38 | 0.49 | 0.72 | 0.41 | 0.56 | 0.31 | 0.60 | 0.70 | **0.74** | 0.54 | 0.65 | 0.65 | 0.48 |
| *10* | 0.70 | 0.44 | 0.49 | **0.76** | 0.52 | 0.75 | 0.44 | 0.63 | 0.65 | 0.74 | 0.61 | 0.68 | 0.61 | 0.53 |
| *15* | 0.70 | 0.44 | 0.65 | **0.77** | 0.56 | 0.49 | 0.19 | 0.33 | 0.68 | 0.76 | 0.44 | 0.74 | 0.57 | 0.46 |
| *20* | 0.60 | 0.64 | 0.72 | 0.68 | 0.63 | 0.43 | 0.66 | 0.67 | **0.80** | 0.77 | 0.42 | 0.68 | 0.63 | 0.58 |
| *25* | 0.60 | 0.23 | 0.63 | 0.66 | 0.43 | 0.70 | 0.41 | 0.72 | **0.84** | 0.62 | **0.84** | 0.63 | 0.43 | 0.61 |
| *30* | 0.70 | 0.26 | 0.43 | 0.48 | 0.38 | 0.60 | 0.48 | 0.64 | **0.87** | 0.61 | 0.74 | 0.66 | 0.81 | 0.51 |
| *35* | **0.70** | 0.21 | 0.39 | 0.65 | 0.28 | 0.63 | 0.29 | 0.53 | 0.66 | 0.68 | 0.36 | 0.61 | 0.60 | 0.34 |
| *40* | 0.70 | 0.25 | 0.58 | 0.60 | 0.52 | 0.58 | 0.26 | 0.60 | 0.61 | 0.71 | 0.40 | **0.90** | 0.65 | 0.36 |
| *45* | **0.70** | 0.44 | 0.69 | 0.42 | 0.24 | 0.68 | 0.32 | 0.44 | 0.64 | 0.68 | 0.43 | 0.42 | 0.68 | 0.46 |
| *50* | 0.70 | 0.32 | 0.57 | 0.51 | 0.33 | **0.76** | 0.53 | 0.43 | 0.72 | 0.68 | 0.43 | 0.59 | 0.73 | 0.49 |
| *55* | 0.70 | 0.28 | 0.50 | 0.69 | 0.59 | 0.59 | 0.31 | **0.72** | 0.66 | 0.69 | 0.63 | 0.59 | 0.53 | 0.44 |
| *60* | **0.80** | 0.47 | 0.63 | 0.72 | 0.56 | 0.59 | 0.50 | 0.78 | 0.72 | 0.63 | 0.59 | 0.59 | 0.56 | 0.37 |
| *65* | **0.80** | 0.32 | 0.29 | 0.38 | 0.27 | 0.38 | 0.28 | 0.55 | 0.60 | 0.34 | 0.50 | 0.50 | 0.39 | 0.51 |
| *70* | **0.80** | 0.32 | 0.48 | 0.45 | 0.34 | 0.45 | 0.46 | 0.55 | 0.47 | 0.54 | 0.55 | 0.50 | 0.43 | 0.54 |
| *75* | **0.90** | 0.44 | 0.58 | 0.67 | 0.46 | 0.57 | 0.62 | 0.63 | 0.58 | 0.77 | 0.58 | 0.55 | 0.55 | 0.47 |
| *80* | **0.90** | 0.46 | 0.63 | 0.67 | 0.50 | 0.58 | 0.65 | 0.63 | 0.70 | 0.81 | 0.51 | 0.60 | 0.55 | 0.47 |
| *85* | 0.90 | 0.51 | 0.48 | 0.85 | 0.24 | 0.73 | 0.61 | 0.86 | 0.72 | 0.58 | 0.58 | 0.70 | **0.91** | 0.49 |
| *90* | **0.90** | 0.52 | 0.59 | 0.83 | 0.57 | 0.81 | 0.43 | **0.90** | 0.81 | 0.74 | 0.53 | 0.82 | 0.82 | 0.47 |
| *95* | **0.90** | 0.34 | 0.38 | 0.77 | 0.37 | 0.53 | 0.23 | 0.62 | 0.57 | 0.67 | 0.60 | 0.72 | 0.57 | 0.50 |
| *100* | **0.90** | 0.35 | 0.52 | 0.78 | 0.38 | 0.59 | 0.34 | 0.72 | 0.50 | 0.71 | 0.48 | 0.74 | 0.51 | 0.50 |
| *Mean* | **0.74** | 0.37 | 0.52 | 0.64 | 0.42 | 0.59 | 0.41 | 0.63 | 0.66 | 0.67 | 0.54 | 0.64 | 0.60 | 0.47 |
| *Win* | **10/21** | 0 | 0 | 2/21 | 0 | 1/21 | 0 | 2/21 | 3/21 | 3/21 | 1/21 | 1/21 | 1/21 | 0 |