|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time  category | Heuristic values | GA values | Ordinal encoding | Actual | Predicted  GA | Predicted  MNLR | Accuracy  MNLR | Accuracy  GA |  |
| mid night | 3.8 | 3.635819 | 4 | 52.08 | 48.64 | 52.25 | 99.67 | 93.40 | |
| mid night | 4.2 | 3.635819 | 4 | 50.65 | 48.64 | 61.46 | 78.67 | 96.03 | |
| mid night | 4.1 | 3.635819 | 4 | 48.52 | 48.64 | 59.10 | 78.19 | 99.75 | |
| mid night | 4 | 3.635819 | 4 | 47.29 | 48.64 | 56.78 | 79.93 | 97.14 | |
| mid night | 3.9 | 3.635819 | 4 | 44.77 | 48.64 | 54.50 | 78.27 | 91.35 | |
| mid night | 3.8 | 3.635819 | 4 | 43.59 | 43.06 | 46.26 | 93.88 | 98.79 | |
| mid night | 3.7 | 3.635819 | 4 | 41.44 | 43.06 | 44.30 | 93.10 | 96.09 | |
| mid night | 3.6 | 3.635819 | 4 | 38.48 | 43.06 | 42.38 | 89.87 | 88.09 | |
| mid night | 3.55 | 3.635819 | 4 | 37.39 | 43.06 | 41.43 | 89.20 | 84.83 | |
| mid night | 3.5 | 3.635819 | 4 | 36.45 | 43.06 | 40.48 | 88.93 | 81.86 | |

Dawn

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time  category | Heuristic  values | GA values | Ordinal encoding | Actual | Predicted GA | Predicted  MNLR | Accuracy  MNLR | Accuracy  GA |
| dawn | 3.45 | 3.18 | 2 | 35.38 | 34.72 | 39.55 | 88.21 | 98.12 |
| dawn | 3.40 | 3.18 | 2 | 35.70 | 34.72 | 38.63 | 91.80 | 97.25 |
| dawn | 3.35 | 3.18 | 2 | 35.04 | 34.72 | 37.71 | 92.38 | 99.08 |
| dawn | 3.30 | 3.18 | 2 | 34.38 | 34.72 | 36.80 | 92.96 | 99.02 |
| dawn | 3.25 | 3.18 | 2 | 32.68 | 34.72 | 35.90 | 90.14 | 93.77 |
| dawn | 3.20 | 3.18 | 2 | 32.79 | 34.72 | 35.01 | 93.23 | 94.12 |
| dawn | 3.15 | 3.18 | 2 | 33.71 | 34.72 | 34.13 | 98.76 | 97.01 |
| dawn | 3.13 | 3.18 | 2 | 33.86 | 34.72 | 33.69 | 99.50 | 97.47 |
| dawn | 3.10 | 3.18 | 2 | 34.52 | 34.72 | 33.25 | 96.34 | 99.43 |
| dawn | 3.08 | 3.18 | 2 | 33.59 | 34.72 | 32.82 | 97.71 | 96.65 |
| dawn | 3.05 | 3.18 | 2 | 31.71 | 34.72 | 32.39 | 97.86 | 90.52 |

Morning

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time Category | Heuristic  values | GA values | Ordinal encoding | Actual | Predicted GA | Predicted  MNLR | Accuracy  MNLR | Accuracy  GA |
| morning | 3.03 | 2.85 | 1 | 28.67 | 29.02 | 31.96 | 88.52 | 98.77 |
| morning | 3.00 | 2.85 | 1 | 29.38 | 29.02 | 31.53 | 92.67 | 98.78 |
| morning | 2.98 | 2.85 | 1 | 28.22 | 29.02 | 31.11 | 89.76 | 97.16 |
| morning | 2.95 | 2.85 | 1 | 30.42 | 29.02 | 30.69 | 99.13 | 95.40 |
| morning | 2.93 | 2.85 | 1 | 29.94 | 29.02 | 30.27 | 98.91 | 96.93 |
| morning | 2.90 | 2.85 | 1 | 29.80 | 29.02 | 29.85 | 99.84 | 97.39 |
| morning | 2.88 | 2.85 | 1 | 30.29 | 29.02 | 29.43 | 97.17 | 95.81 |
| morning | 2.85 | 2.85 | 1 | 30.39 | 29.02 | 29.02 | 95.48 | 95.50 |
| morning | 2.83 | 2.85 | 1 | 31.29 | 29.02 | 28.61 | 91.42 | 92.75 |
| morning | 2.80 | 2.85 | 1 | 31.26 | 29.02 | 28.20 | 90.20 | 92.84 |
| morning | 2.88 | 2.85 | 1 | 30.60 | 29.02 | 29.43 | 96.18 | 94.84 |
| morning | 2.98 | 2.85 | 1 | 31.10 | 29.02 | 31.11 | 99.97 | 93.32 |

Afternoon

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time Category | Heuristic  values | GA values | Ordinal encoding | Actual | Predicted GA | Predicted  MNLR | Accuracy  MNLR | Accuracy  GA |
| afternoon | 3.08 | 3.18 | 3 | 32.31 | 34.72 | 32.82 | 98.42 | 92.55 |
| afternoon | 3.18 | 3.18 | 3 | 34.53 | 34.72 | 34.57 | 99.89 | 99.46 |
| afternoon | 3.28 | 3.18 | 3 | 35.33 | 34.72 | 36.35 | 97.11 | 98.26 |
| afternoon | 3.38 | 3.18 | 3 | 34.97 | 34.72 | 38.17 | 90.86 | 99.28 |
| afternoon | 3.48 | 3.18 | 3 | 34.44 | 34.72 | 40.02 | 83.81 | 99.20 |
| afternoon | 3.53 | 3.18 | 3 | 34.97 | 34.72 | 40.95 | 82.89 | 99.28 |
| afternoon | 3.38 | 3.18 | 3 | 34.91 | 34.72 | 38.17 | 90.67 | 99.45 |
| afternoon | 3.33 | 3.18 | 3 | 35.15 | 34.72 | 37.25 | 94.01 | 98.77 |
| afternoon | 3.28 | 3.18 | 3 | 34.39 | 34.72 | 36.35 | 94.30 | 99.05 |
| afternoon | 3.23 | 3.18 | 3 | 35.18 | 34.72 | 35.46 | 99.22 | 98.68 |
| afternoon | 3.18 | 3.18 | 3 | 35.14 | 34.72 | 34.57 | 98.37 | 98.80 |
| afternoon | 3.13 | 3.18 | 3 | 35.44 | 34.72 | 33.69 | 95.06 | 97.96 |
| afternoon | 3.08 | 3.18 | 3 | 36.05 | 34.72 | 32.82 | 91.04 | 96.30 |
| afternoon | 3.40 | 3.18 | 3 | 35.17 | 34.72 | 38.63 | 90.17 | 98.71 |
| afternoon | 3.35 | 3.18 | 3 | 34.61 | 34.72 | 37.71 | 91.04 | 99.69 |
| afternoon | 3.30 | 3.18 | 3 | 34.41 | 34.72 | 36.80 | 93.05 | 99.11 |
| afternoon | 3.25 | 3.18 | 3 | 33.60 | 34.72 | 35.90 | 93.15 | 96.68 |
| afternoon | 3.20 | 3.18 | 3 | 33.45 | 34.72 | 35.01 | 95.33 | 96.21 |
| afternoon | 3.15 | 3.18 | 3 | 33.23 | 34.72 | 34.13 | 97.30 | 95.53 |
| afternoon | 3.10 | 3.18 | 3 | 31.80 | 34.72 | 33.25 | 95.42 | 90.83 |
| afternoon | 3.05 | 3.18 | 3 | 31.22 | 34.72 | 32.39 | 96.25 | 88.80 |
| afternoon | 3.20 | 3.18 | 3 | 32.02 | 34.72 | 35.01 | 90.66 | 91.58 |
| afternoon | 3.35 | 3.18 | 3 | 33.08 | 34.72 | 37.71 | 86.00 | 95.05 |
| afternoon | 3.50 | 3.18 | 3 | 33.94 | 34.72 | 40.48 | 80.72 | 97.71 |
| afternoon | 3.65 | 3.18 | 3 | 36.88 | 34.72 | 43.33 | 82.50 | 94.13 |
| afternoon | 3.80 | 3.18 | 3 | 42.17 | 34.72 | 46.26 | 90.31 | 82.33 |

Night

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Time Category | Heuristic  values | GA values | Ordinal encoding | Actual | Predicted GA | Predicted  MNLR | Accuracy  MNLR | Accuracy  GA |
| night | 3.95 | 4.36 | 5 | 50.41 | 57.71 | 49.25 | 97.71 | 85.51 |
| night | 4.10 | 4.36 | 5 | 52.57 | 57.71 | 52.32 | 99.53 | 90.22 |
| night | 4.25 | 4.36 | 5 | 53.18 | 57.71 | 55.46 | 95.71 | 91.48 |
| night | 4.40 | 4.36 | 5 | 54.82 | 57.71 | 58.67 | 92.98 | 94.72 |
| night | 4.55 | 4.36 | 5 | 57.20 | 57.71 | 61.94 | 91.71 | 99.10 |
| night | 4.70 | 4.36 | 5 | 57.64 | 57.71 | 65.29 | 86.73 | 99.87 |
| night | 4.50 | 4.36 | 5 | 58.79 | 57.71 | 60.84 | 96.51 | 98.17 |
| night | 4.40 | 4.36 | 5 | 57.41 | 57.71 | 58.67 | 97.81 | 99.47 |
| night | 4.30 | 4.36 | 5 | 57.01 | 57.71 | 56.52 | 99.14 | 98.77 |
| night | 4.20 | 4.36 | 5 | 55.08 | 57.71 | 54.41 | 98.78 | 95.22 |
| night | 4.10 | 4.36 | 5 | 53.87 | 57.71 | 52.32 | 97.13 | 92.87 |
| night | 4.00 | 4.36 | 5 | 51.30 | 57.71 | 50.27 | 97.99 | 87.50 |
| night | 3.90 | 4.36 | 5 | 48.15 | 57.71 | 48.25 | 99.80 | 80.14 |
| night | 3.80 | 4.36 | 5 | 45.91 | 57.71 | 46.26 | 91.76 | 85.51 |

Overall day accuracy

|  |  |  |  |
| --- | --- | --- | --- |
| Time Category | Accuracy GA | Heuristic Accuracy | Accuracy Ordinal |
| midnight | 92.73 | 86.97 | 39.52 |
| dawn | 96.59 | 94.44 | 50.97 |
| morning | 95.79 | 94.94 | 39.91 |
| afternoon | 96.28 | 92.21 | 93.98 |
| night | 92.75 | 95.99 | 9.77 |
| Average | 94.828 | 92.91 | 46.83 |

Time Category Tables with optimal value, Heuristic accuracy and Ordinal encoding

|  |  |  |  |
| --- | --- | --- | --- |
| Time Category | Optimal value | Heuristic Accuracy | Ordinal encoding |
| midnight | 3.64 | 3.80 | 2 |
| midnight | 3.64 | 4.20 | 2 |
| midnight | 3.64 | 4.10 | 2 |
| midnight | 3.64 | 4.00 | 2 |
| midnight | 3.64 | 3.90 | 2 |
| midnight | 3.64 | 3.80 | 2 |
| midnight | 3.64 | 3.70 | 2 |
| midnight | 3.64 | 3.60 | 2 |
| midnight | 3.64 | 3.55 | 2 |
| midnight | 3.64 | 3.50 | 2 |

|  |  |  |  |
| --- | --- | --- | --- |
| Time Category | Optimal value | Heuristic Accuracy | Ordinal encoding |
| morning | 2.85 | 3.03 | 1 |
| morning | 2.85 | 3.00 | 1 |
| morning | 2.85 | 2.98 | 1 |
| morning | 2.85 | 2.95 | 1 |
| morning | 2.85 | 2.93 | 1 |
| morning | 2.85 | 2.90 | 1 |
| morning | 2.85 | 2.88 | 1 |
| morning | 2.85 | 2.85 | 1 |
| morning | 2.85 | 2.83 | 1 |
| morning | 2.85 | 2.80 | 1 |

|  |  |  |  |
| --- | --- | --- | --- |
| Time Category | Optimal value | Heuristic Accuracy | Ordinal encoding |
| dawn | 3.18 | 3.45 | 2 |
| dawn | 3.18 | 3.40 | 2 |
| dawn | 3.18 | 3.35 | 2 |
| dawn | 3.18 | 3.30 | 2 |
| dawn | 3.18 | 3.25 | 2 |
| dawn | 3.18 | 3.20 | 2 |
| dawn | 3.18 | 3.15 | 2 |
| dawn | 3.18 | 3.13 | 2 |
| dawn | 3.18 | 3.10 | 2 |
| dawn | 3.18 | 3.08 | 2 |

|  |  |  |  |
| --- | --- | --- | --- |
| Time Category | Optimal value | Heuristic Accuracy | Ordinal encoding |
| afternoon | 3.18 | 3.08 | 3 |
| afternoon | 3.18 | 3.18 | 3 |
| afternoon | 3.18 | 3.28 | 3 |
| afternoon | 3.18 | 3.38 | 3 |
| afternoon | 3.18 | 3.48 | 3 |
| afternoon | 3.18 | 3.53 | 3 |
| afternoon | 3.18 | 3.38 | 3 |
| afternoon | 3.18 | 3.33 | 3 |
| afternoon | 3.18 | 3.28 | 3 |
| afternoon | 3.18 | 3.23 | 3 |

|  |  |  |  |
| --- | --- | --- | --- |
| Time Category | Optimal value | Heuristic Accuracy | Ordinal encoding |
| night | 4.36 | 3.95 | 5 |
| night | 4.36 | 4.10 | 5 |
| night | 4.36 | 4.25 | 5 |
| night | 4.36 | 4.40 | 5 |
| night | 4.36 | 4.55 | 5 |
| night | 4.36 | 4.70 | 5 |
| night | 4.36 | 4.50 | 5 |
| night | 4.36 | 4.40 | 5 |
| night | 4.36 | 4.30 | 5 |
| night | 4.36 | 4.20 | 5 |

|  |  |  |
| --- | --- | --- |
| Encoding approach | Accuracy | % improve |
| Ordinal | 60.93 | 32.00 |
| Heuristic | 92.91 | 2.00 |
| GA | 94.83 |  |
|  |  |  |