**Tables: Data Overview**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Frequency** | **Micro** | **Industry** | **Macro** | **Finance** | **Demographic** | **Other** | **Total** |
| **Yearly** | 6,538 | 3,716 | 3,903 | 6,519 | 1,088 | 1,236 | 23,000 |
| **Quarterly** | 6,020 | 4,637 | 5,315 | 5,305 | 1,858 | 865 | 24,000 |
| **Monthly** | 10,975 | 10,017 | 10,016 | 10,987 | 5,728 | 277 | 48,000 |
| **Weekly** | 112 | 6 | 41 | 164 | 24 | 12 | 359 |
| **Daily** | 1,476 | 422 | 127 | 1,559 | 10 | 633 | 4227 |
| **Hourly** |  |  |  |  |  | 414 | 414 |
| **Total** | 25,121 | 18,798 | 19,402 | 24,534 | 8,708 | 3,437 | 100,000 |

**Benchmark methods overview:**

|  |  |  |
| --- | --- | --- |
| **Methods** | **Description** | **Type** |
| Naïve 2 | Seasonally adjusted naïve forecast using a multiplicative decomposition. | M4 Benchmark used to scale OWA. |
| Comb | Combination benchmark consisting of three forecasts: SES, Holt, Damped exponential smoothing. Combined using the arithmetic average of the three methods. | M4 Benchmark |
| L&K | Theta method after Box-Cox transformation with optimized transformation parameter. | M4 Competition method (Rank 8) |
| ARIMA | Automatic ARIMA framework based on information criteria. | Comparison benchmark |
| ETS | Automatic exponential smoothing state space model based on information criteria. | Comparison benchmark |
| ETSARIMA | Arithmetic average of ETS and ARIMA forecasts. | Comparison benchmark |

**RNN methods generation:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Generation** | **Method** | **Local/Global** | **Description / Issues** |
| Zero | Simple RNN | Local RNN with short “memory”. |  |
|  | RNN (LSTM, GRU cells) | Local RNN with |  |
| First | DeepAR | Global RNN; Uses autoregressive features to capture seasonality |  |
|  | DeepAR\* | Same as DeepAR but uses series-specific dummies to “recognize” individual series. |  |
|  | DeepState |  |  |
|  | DF-RNN |  |  |
|  | MQ-RNN |  |  |
|  | Smyl | Hybrid of global RNN and local ES. |  |
| Second |  |  |  |
|  |  |  |  |

**Computational Complexity:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Method** | **OWA** | **sMAPE** | **MASE** | **Rank / Type** | **Software** | **Complexity vs. Naïve2** |
| Smyl | 0.821 | 0.114 | 1.536 | 1 | C++ | 8056.0 |
| Montero-Manso, et al. | 0.838 | 0.117 | 1.551 | 2 | R | 46108.3 |
| Legaki & Koutsouri | 0.861 | 0.119 | 1.601 | 8 | R | 25.0 |
| Naïve 2 | 1.000 | 0,136 | 1.912 | Benchmark |  |  |
| Comb | 0.898 | 0.125 | 1.663 | Benchmark | R | 33.2 |
| ARIMA | 0.903 | 0.127 | 1.666 | Comparison | R | 3030.9 |
| ETS | 0.908 | 0.127 | 1.680 | Comparison | R | 888.8 |
| ETSARIMA |  |  |  | Comparison | R | 3919.7 |
| DeepAR |  |  |  | Global RNN | Python | - |
| DeepState |  |  |  | Global RNN / ES | Python | - |