Real-time wind power forecasting for grid operations using numerical weather model in Jeju

**Introduction**

This study is the first attempt to estimate the capability of real-time forecasting of potential wind power over Jeju Island in HanGueng, based on the state-of-the-art numerical model and hybrid statistical model module for appropriate target lead time.

**Objectives**

- Technical and long-term forecasting of wind power for Jeju Island in HanGueng.
- Statistical model: ARIMA
- Derivation of parameters for ARIMA model module for appropriate target lead time.
- Forecasting of potential wind power over Jeju Island in HanGueng.

**Methods**

- Derivation of parameters for ARIMA model module for appropriate target lead time.
- Forecasting of potential wind power over Jeju Island in HanGueng.

**Optimization**

- Real-time wind power forecasting for grid operations using numerical weather model in Jeju.
- The Research strategy and the main methodologies applied to each procedure.

**Results**

- Dependent and independent variables of neural network model combined with ARIMA.
- The economic value of wind power forecasting in the Korean electricity market.

**Economic Value**

- The economic value of wind power forecasting in the Korean electricity market.
- The Research strategy and the main methodologies applied to each procedure.

**Summary of basic statistics derived from observation and the four experiments**

<table>
<thead>
<tr>
<th>Name</th>
<th>Wind speed (m/s)</th>
<th>Wind direction (°)</th>
<th>Deviation</th>
<th>Standard</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXP1</td>
<td>5.14%</td>
<td>19.8</td>
<td>4.0</td>
<td>2.6</td>
<td>3.8</td>
</tr>
<tr>
<td>EXP2</td>
<td>6.0</td>
<td>4.9</td>
<td>4.9</td>
<td>2.9</td>
<td>3.8</td>
</tr>
<tr>
<td>EXP3</td>
<td>3.9</td>
<td>3.7</td>
<td>3.7</td>
<td>2.9</td>
<td>3.8</td>
</tr>
<tr>
<td>EXP4</td>
<td>6.1</td>
<td>4.9</td>
<td>4.9</td>
<td>2.9</td>
<td>3.8</td>
</tr>
</tbody>
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**Dependent and independent variables of neural network model combined with ARIMA**

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**Wind speed statistics**

- Wind speed history data in 15 minute intervals at W3M.
- Wind speed history data: 10, 15, and 20 minutes, and wind speed by ARIMA.
- Derivation of weighting factors for neural network model using factors.
- Derivation of physical error of neural network model using factors.
- Statistical model: ARIMA
- Design process for real-time wind power prediction for Jeju wind farm operation.
- Design of process appropriate for domestic wind farm environment and infra.

**Neural network model combined with ARIMA**

- Neural network model combined with ARIMA for wind speed prediction.
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**Economic value of wind power forecasting**

- The economic value of wind power forecasting in the Korean electricity market.
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