University of Peradeniya

NON-INTRUSIVE LOAD MONITORING FOR SMART GRID

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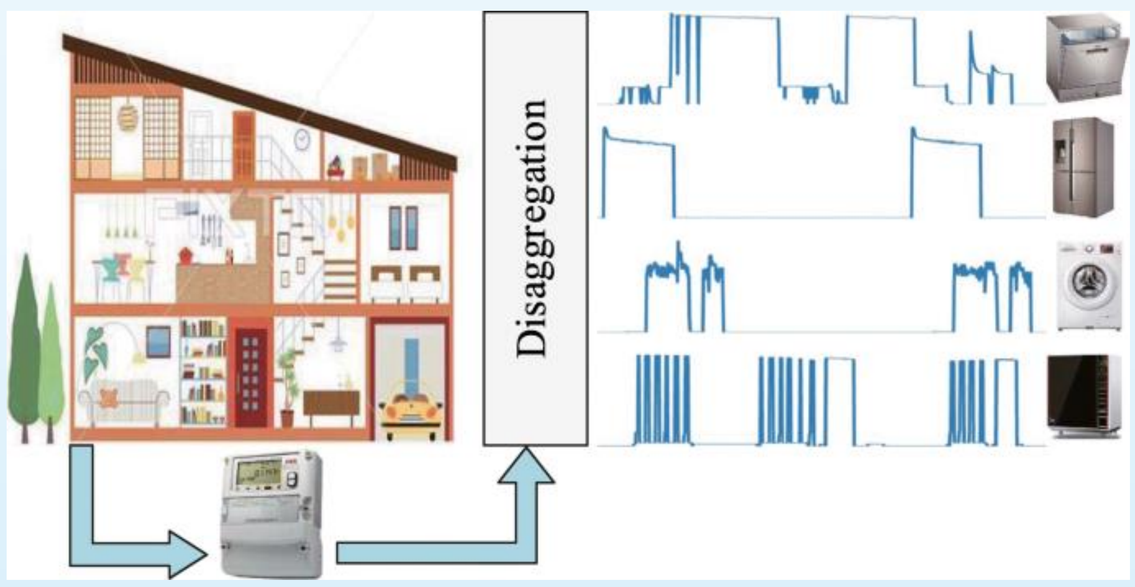
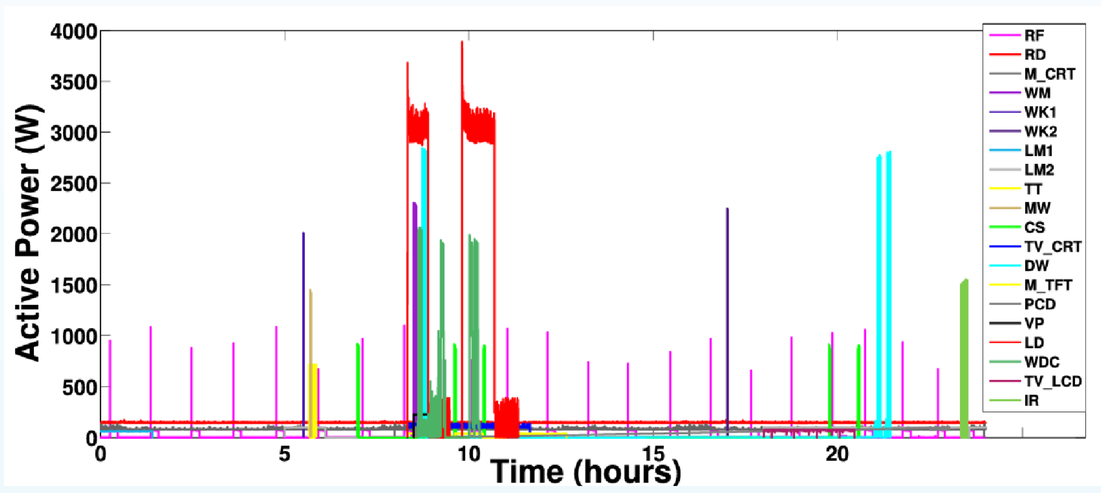
Abstract- This research focuses on Non-Intrusive Load Monitoring (NILM). It allows disaggregating overall electricity usage into individual appliance consumption without multiple sensors. This method offers energy savings, convenience, and economic benefits by optimizing energy use, reducing costs, and enhancing fault detection and maintenance. Another advantage of this is that it enables us to forecast the aggregate demand. This is a vital benefit of NILM for efficient power monitoring.

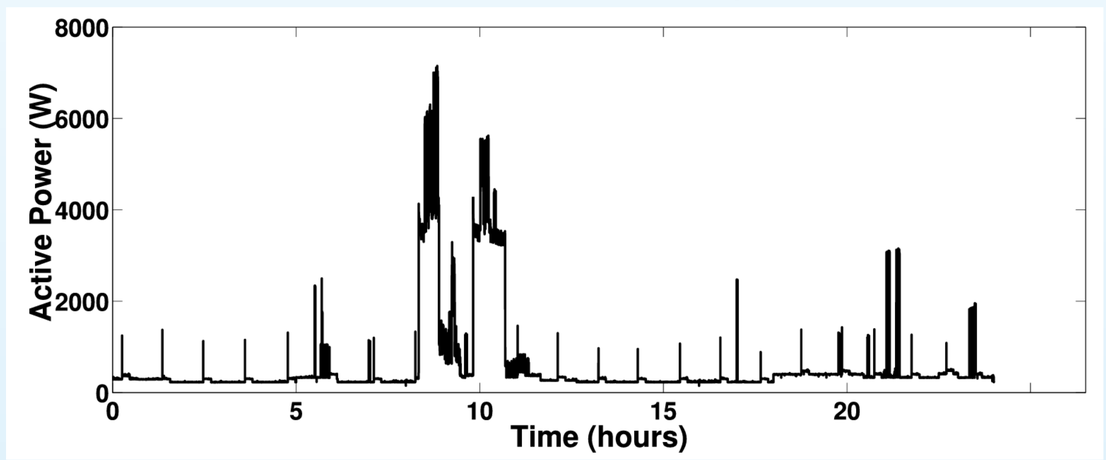
WHAT IS NILM?

- Non-Intrusive Load Monitoring (NILM) is a technique used to determine the power consumption of individual appliances within a building without the need for installing sensors on each device.
- It analyzes the overall electricity usage data from a single point, usually the main electrical panel, and disaggregates it into the consumption patterns of individual appliances.
- Measurement of aggregate voltage, current, active power and reactive power can be used.





Individual Active Power Signals

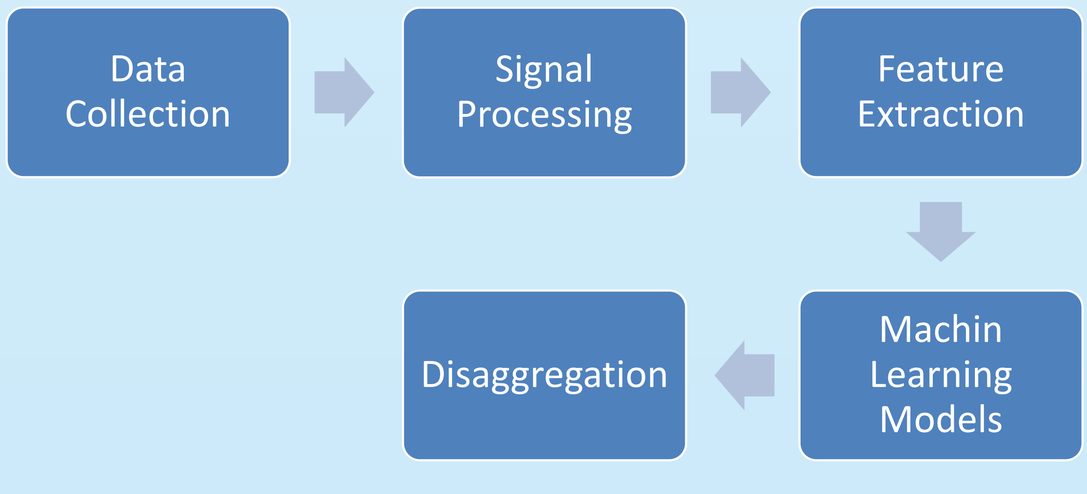


Aggregate Active Power Signal

ECONOMICAL BENEFITS

- Cost-Effective Implementation
- Energy Efficiency Programs
- Reduced Operational Costs
- Enhanced Asset Management

METHODOLOGY



RESULTS

House	Mean Accuracy (%)	Execution Time (s)
1	94.2	5.2
2	95.9	4.8
3	88.7	6.1
4	86.7	6.3
5	86.2	6.6
6	85.4	5.9

CURRENT TRENDS

- Forecasting the possible loads
- Train models using less samples
- Models adaptive for unknown loads

ACHIEVEMENTS

- Multiple journal papers
- Multiple conference papers
- Presidential trophies

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