# BIM & ARTIFICIAL INTELLIGENCE (AI) FOR SUSTAINANBILITY

## The Introduction / Issue

Statistically, about 40-50% of energy use emanates from buildings and this in turn generates about 30% of the annual greenhouse gas emissions in the world. The diverse means of sourcing energy for any form of building poses a problem in the energy sector as users mostly waste energy due to a lack of efficient use of appliances and building models.

To solve this issue, a lot of approaches employing the use of Artificial Intelligence to control and schedule energy use in different structures to reduce wastage and save cost for users.

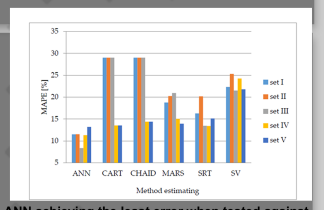
This work looks into establishing the comparative efficiency of two popular methods of forecasting and ways to store the positive contributing factors in a Common Data Environment CDE through BIM in other to aid the modeling of energy-optimized buildings and infrastructure.

## Aims & Objectives

- To reduce energy wastage in structures by use of AI for scheduling energy usage in both domestic and commercial buildings
- To establish an efficient means of AI training and data capture
- To establish means of storing advantageous data and factors in a CDE to aid easier modeling of energy-efficient buildings

## Existing Practice / Research

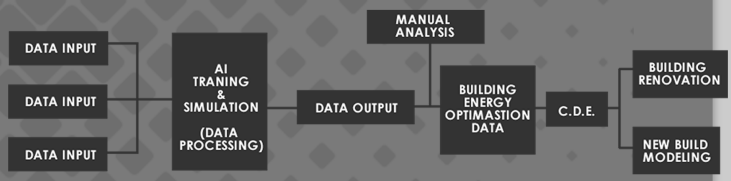
Different AI methods have been used by researchers but Artificial Neural Networks (ANN), most especially when used in a hybrid format, remains the most efficient. The ANN has been recorded to reduce energy wastage by about 30%. For example in the chart below shows the efficiency of ANN against other methods;




ANN achieving the least error when tested against other methods (Szul et al., 2020)

## Process Design / Flow

To enhance the efficiency of the proposed methods under review (Artificial Neural Network and Recurring Neural Network), data will be fed into them from two sources (user-generated data and synthetically optimized data) by which difficulty in training and efficiency of both systems are noted. Finally, the most impactful factors are stored in the buildings' BIM Model CDE.




Brief process flow of the project.

## Expected Industry Impact

- Faster decision-making in building renovations and fresh modeling with regards to energy use efficiency.
- Cost savings for facility managers and homeowners as already seen in some commercial and domestic case studies.
- Energy-efficient design implementations from available data.

## Future Prospects

- Smarter systems capable of up to 50% reduction in energy use without reduction in comfort or optimum structural usability.
- Implementation of efficient energy use data and BIM CDE in other sectors eg. Blockchain, Transportation

## Conclusion

The building sector constitutes one of the largest users of energy in the world and this when looked into, can help keep energy use in this sector within sustainable limits by use of smart systems to regulate energy use while maintaining appreciable human comfort and optimal facility usage.

## Reference

Szul, T.; Nęcka, K.; Mathia, T. G. (2020). Neural Methods Comparison for Prediction of Heating Energy Based on Few Hundreds Enhanced Buildings in Four Season's Climate.
MDPI AG. Energies (Basel). 2020-10-01, Vol.13 (5453), p.5453

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