

# Heating & Cooling Energy Loads



Predicting Building Heating & Cooling Energy  
Loads

**Presented by:** Alberto SYLVEUS – Data scientist

# Business Understanding

## Goal:

Buildings consume a large amount of energy for heating and cooling.  
We need a way to predict energy demand based on building design.

## Why it matters:

- Supports energy-efficient architecture
- Reduces costs and environmental impact

# Data understanding

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**Data Source:** Energy Efficiency dataset (768 samples)

**Features (Inputs):**

- **X1–X8** → Building geometry & orientation

**Targets (Outputs):**

- **Y1** → Heating Load ( $\text{kWh/m}^2$ )
  - **Y2** → Cooling Load ( $\text{kWh/m}^2$ )
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- A decorative background graphic at the bottom of the slide. It consists of a series of vertical bars of varying heights, creating a bar chart effect. Overlaid on this is a line graph with circular markers at each data point, showing a fluctuating trend across the width of the slide.

# Data preparation

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- ❑ Removed unnecessary features
- ❑ Encoded categorical variable (Orientation → X6\_3, X6\_4, X6\_5)
- ❑ Scaled numeric features (for Linear Regression)
- ❑ Split data (80% train / 20% test)

# Models used

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## Supervised ML Models:

- Linear Regression
- Decision Tree
- Random Forest



# MODEL RESULTS

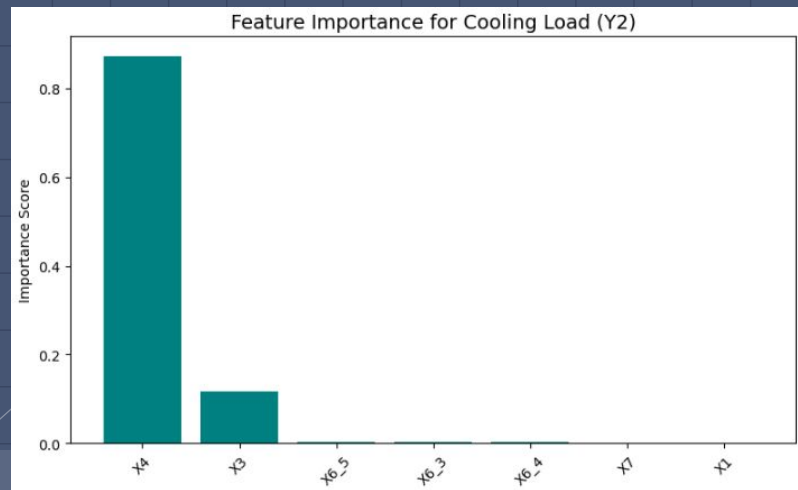
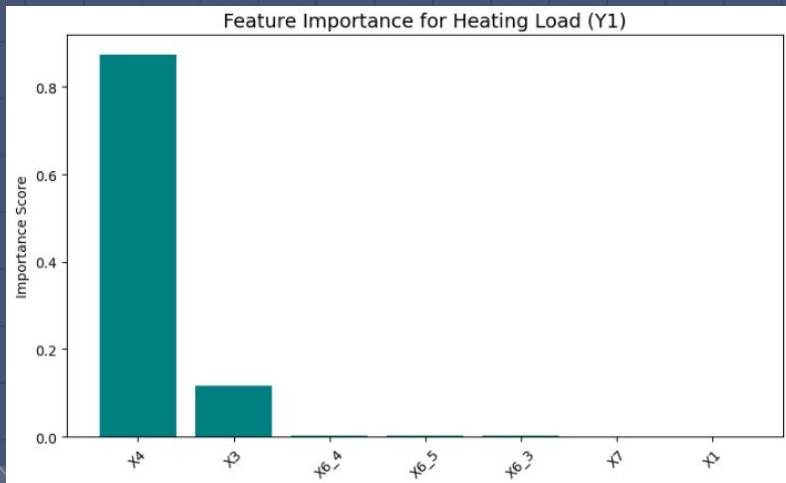
Model	Y1 ( $R^2$ )	Y2 ( $R^2$ )	MSE
Linear Regression	0.79	0.77	21.9
Decision Tree	0.89	0.90	11.3
Random Forest	0.89	0.91	8.7

The best model is **Random Forest**

# Feature importance

## Top Influencing Features:

- $X_4$  → Roof Area
- $X_3$  → Wall Area

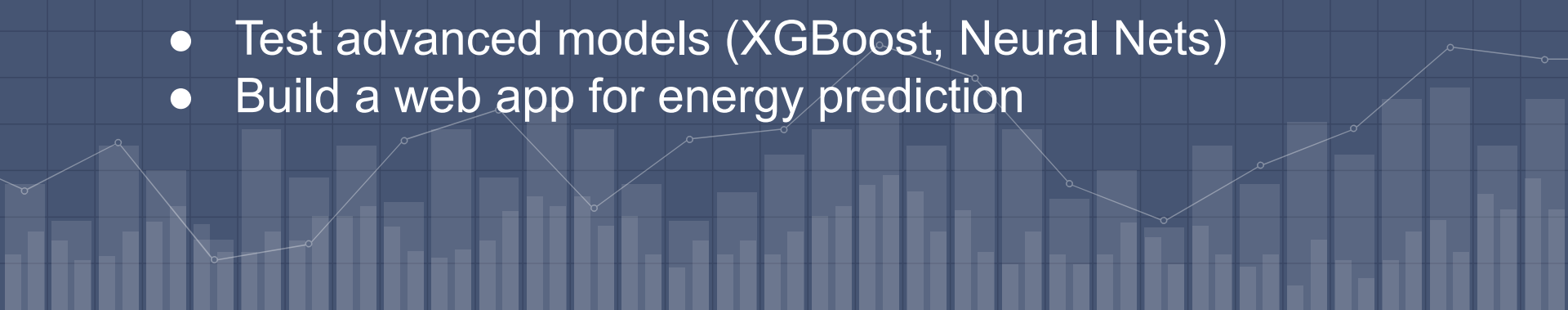


# Conclusion & Next steps

The model can:

- Accurately predict heating and cooling needs
- Help design energy-efficient buildings
- Support sustainable architecture decisions

Future Work:

- Add more real-world data
  - Test advanced models (XGBoost, Neural Nets)
  - Build a web app for energy prediction
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# THANKS!

**Any questions?**

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