



A Comprehensive Strategy to Accelerate the integration of electric buses into existing public Transport systems

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Electric Mobility Europe – an 2018 ERA-NET Cofund action to further advance electric mobility in Europe

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## Model based thermal model for TMS

D3.3

Confidentiality level: public

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Deliverable 3.3  
Work package 3 – Simulation  
Development of vehicle model for imulation on vehicle and fleet level  
Status (F: final)  
File Name: COSTART Deliverable 3\_3  
Date of preparation of the deliverable: (2019.10.28)

# E-bus Multi-zone Thermal Management System Design and a framework for e-bus thermal and air quality modeling



**COSTART**

Davide Occello

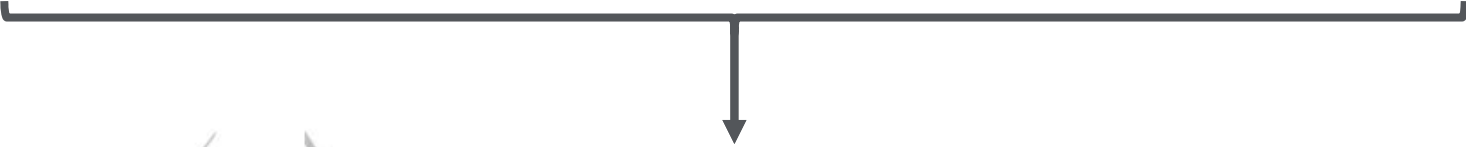


Ir. Anouk Hol  
Ir. Roshni Digumoorthi

**TU/e**

Dr. Ir. Theo Hofman

# Project Partners



# Agenda

- Introduction
- Problem Description
- System Design
- Conclusions



# E-Mobility – Pros & Cons



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Zero Emissions

Low Noise

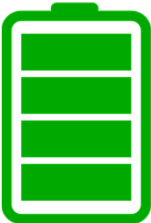
Bus Reliability



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Driving Range

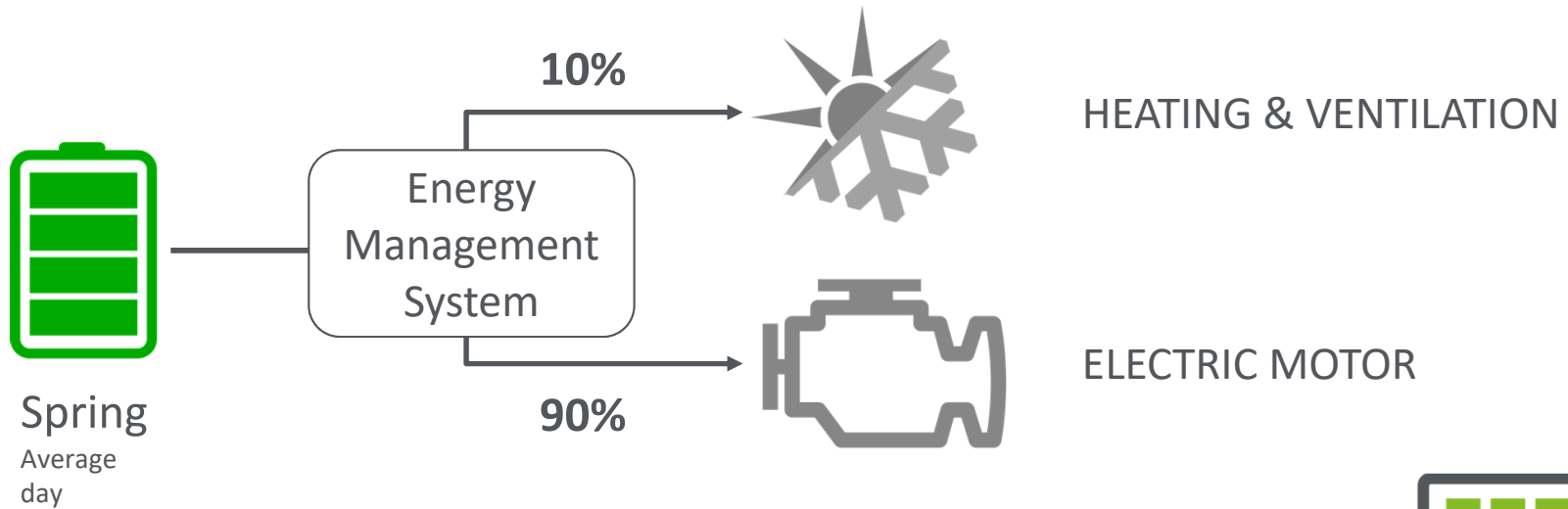
Cost



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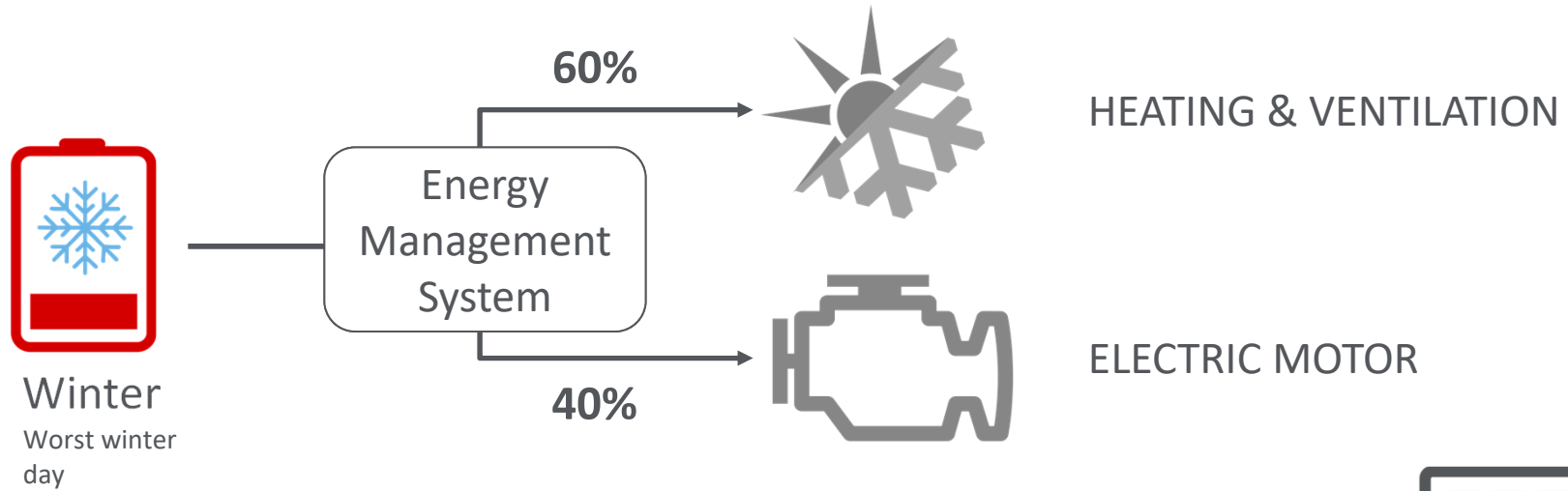
# Problem Description

E-Bus Battery Range



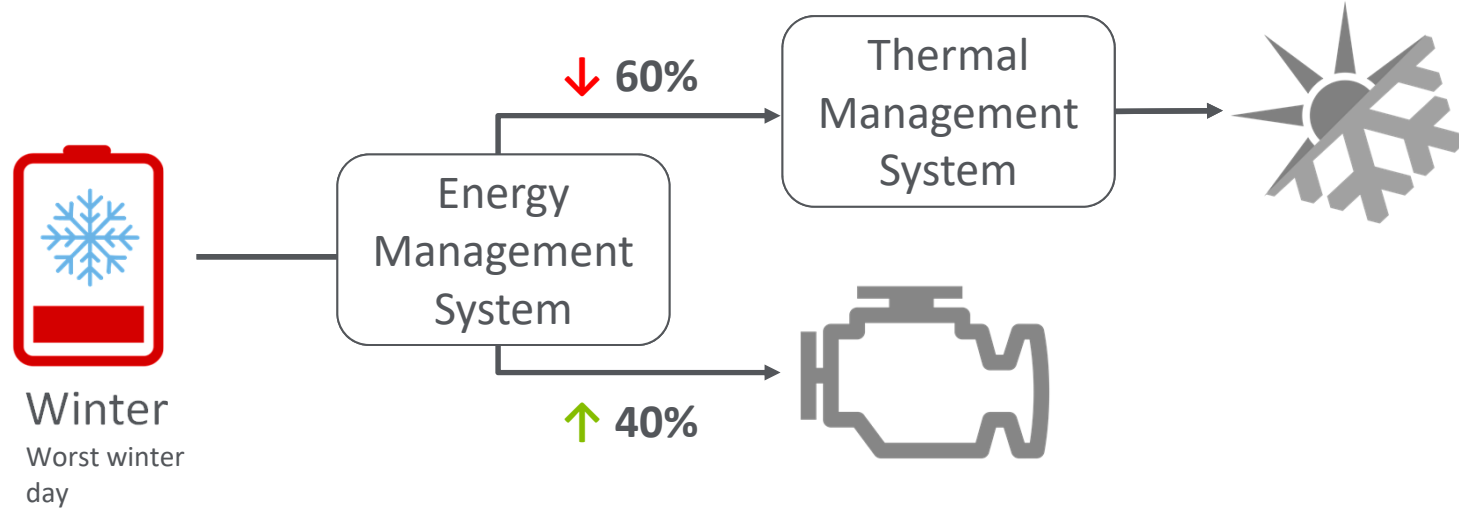
# Problem Description

E-Bus Battery Range



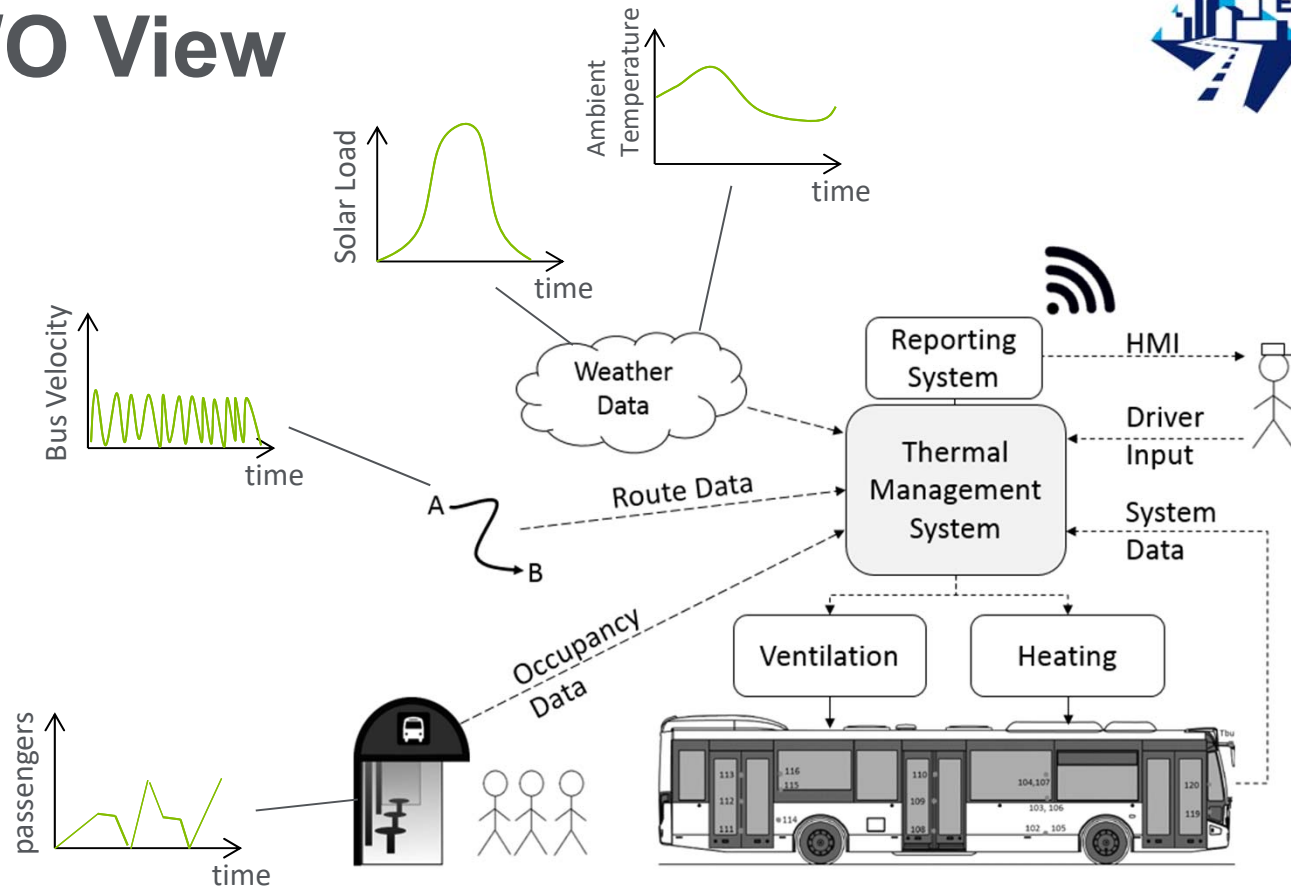
# Problem Description

E-Bus Battery Range





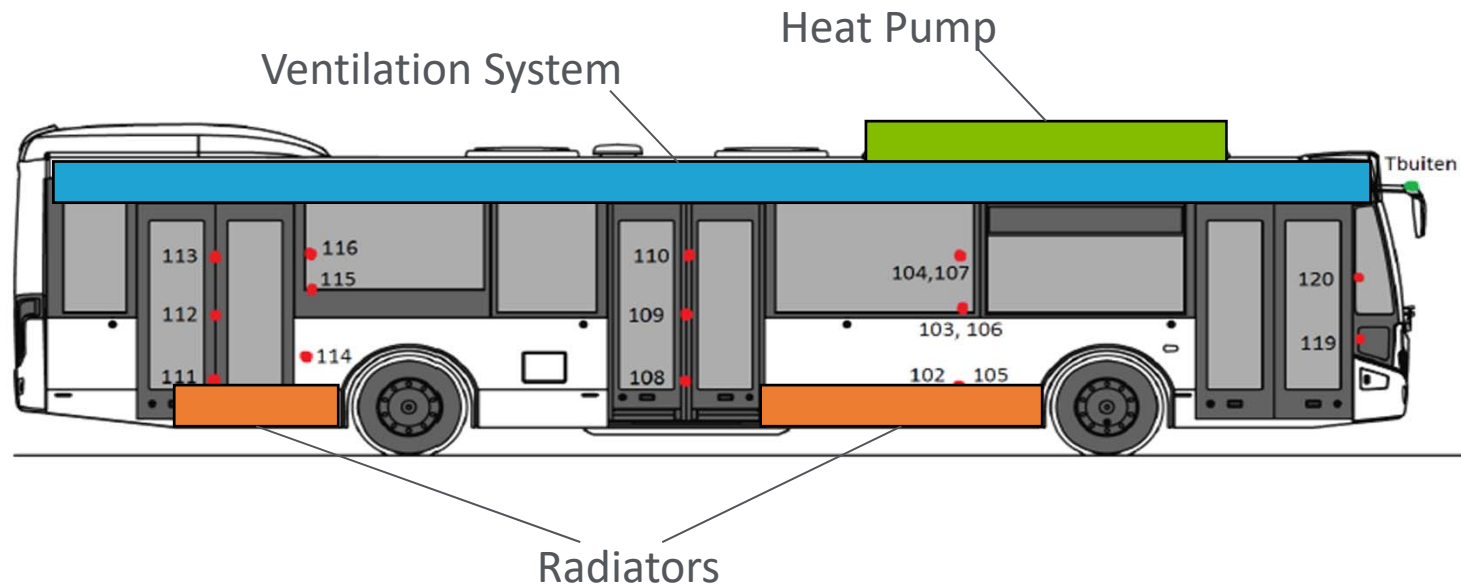
# I/O View



# Project Scope

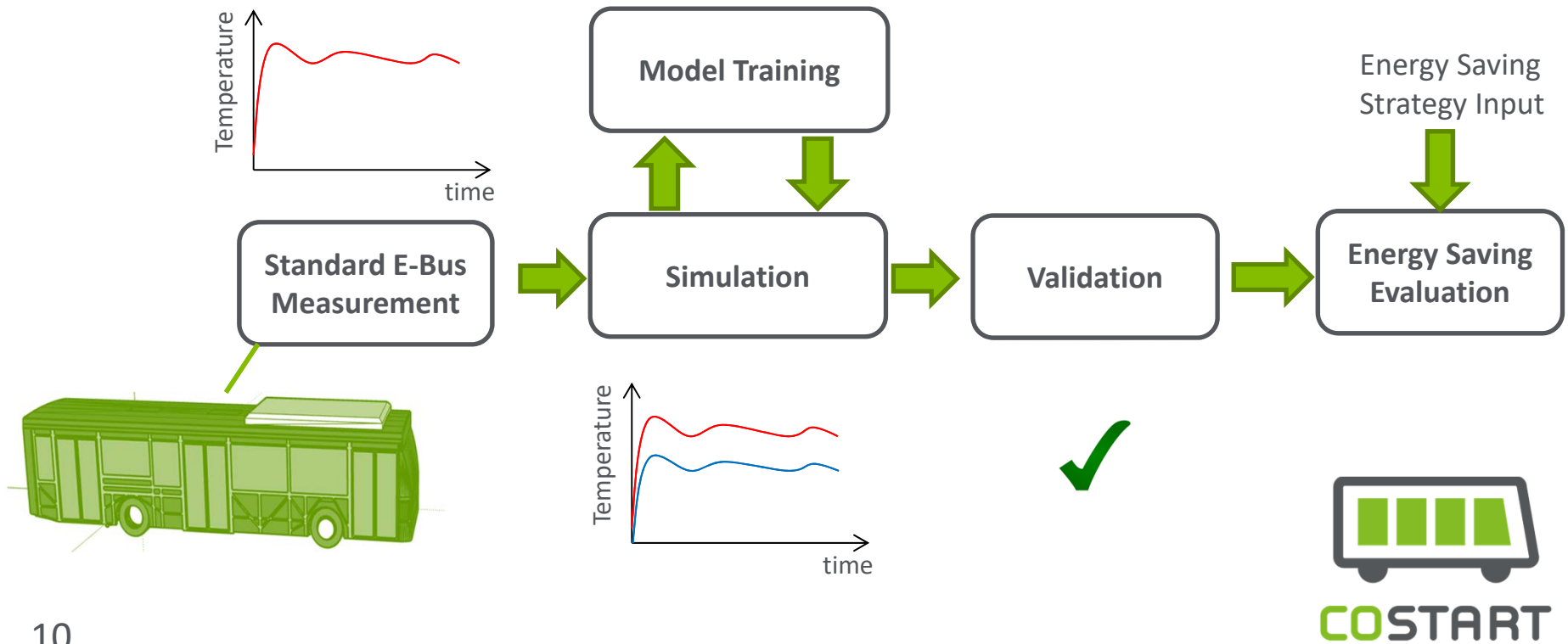


1. *Design an E-bus Thermal Management System*
2. *Model the thermal & air quality dynamics of the VDL e-bus Citea SLF 120*





# Project Overview



# Validation Results



Model	Accuracy	Speed
Thermal	++	++
CO <sub>2</sub>	+	++
Humidity	++	++



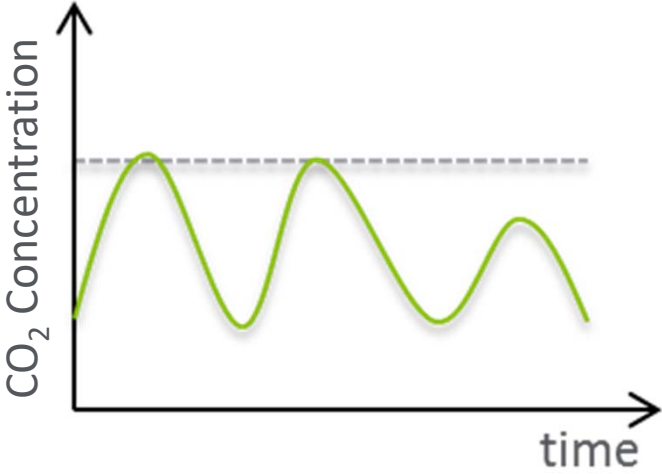
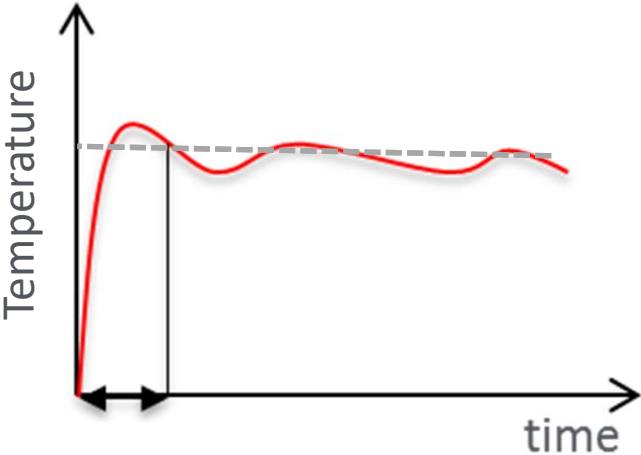
# Conclusions



- ***Thermal Management System***
  - System Structure
  - Fundamental Requirements (Functional, Hardware, Software)
- ***Thermal Management Model***
  - General purpose cabin model (bus domain)
  - Trainable
  - User friendly (GUI)
  - Good accuracy
  - Extremely fast
  - Energy Savings match well with previous data

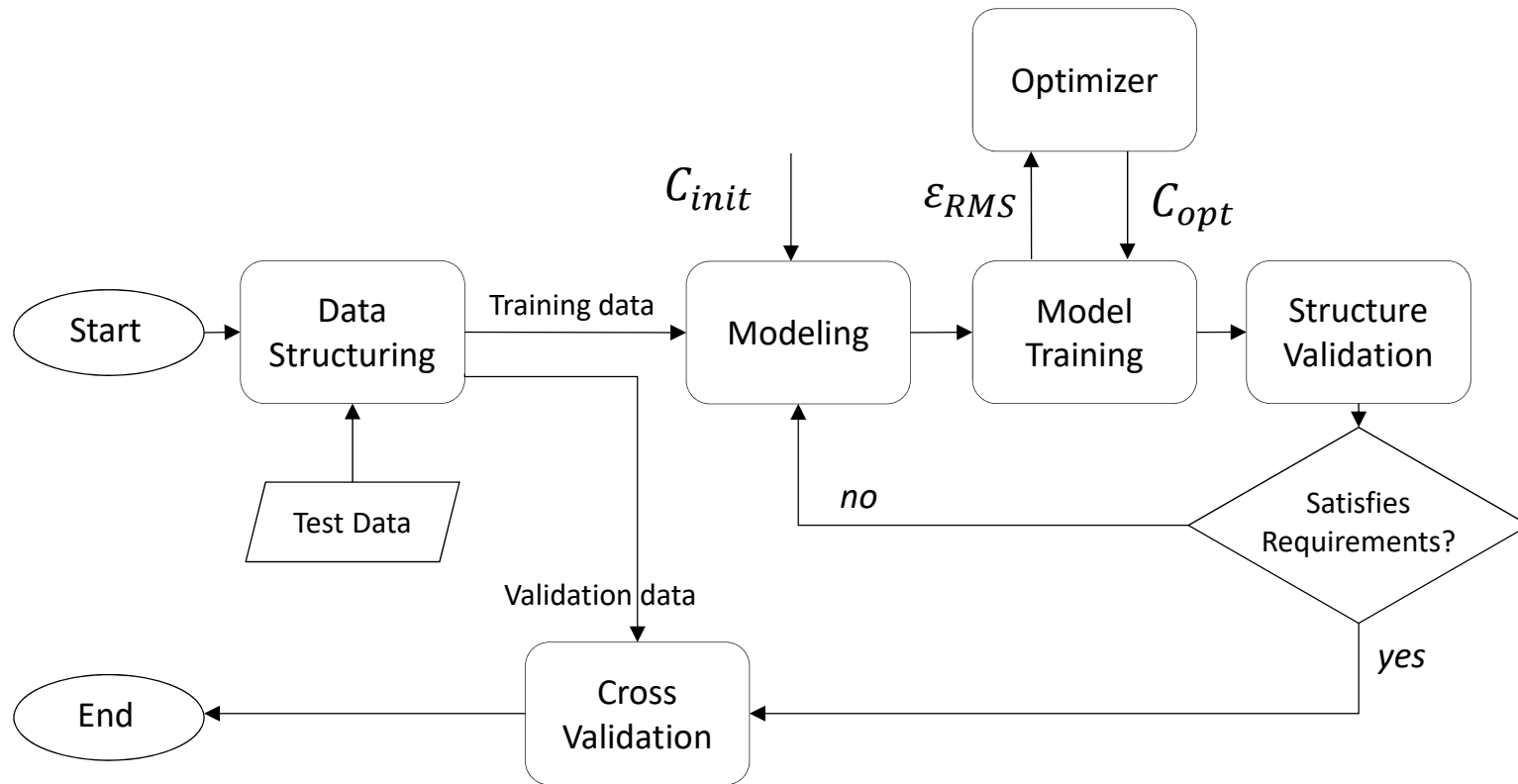


# Baseline situation



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# Grey Box Model Development, Training & Validation





Thank you!

