

# EV Charging Station Layout Optimization Research Workflow

*Comprehensive Methodology for Dynamic Performance Analysis*



## INPUTS

Glasgow Road Network (GeoJSON)  
Simulation Parameters  
Vehicle Configuration



## STAGE 1: Layout Generation

*& Static Feature Extraction*

100 Layout Designs

- 50 Random Uniform Layouts
- 50 Strategic Layouts (5 Types)



## STAGE 2: Traffic Demand

*Generation*

10,000 Vehicles Generated

- Route Planning
- EV Ratio Configuration



## STAGE 3: SUMO Dynamic

*Simulation (CORE)*

81 Runs

Parallel Simulation Engine

81 Successful Runs

19 Failed Scenarios Filtered



## STAGE 6: Descriptive Analysis

*& Visualization*

Regression Analysis

Multi-objective Trade-off

Statistical Modeling



## STAGE 5: Feature-Performance

*Dataset Assembly*

Merge Static Features

with Dynamic Metrics

81 x 31 Final Dataset



## STAGE 4: Dynamic Performance

*Metric Extraction*

Parse SUMO Outputs:

- tripinfo\_output.xml
- battery\_output.xml



## OUTPUTS

Regression Relationship Plots  
Multi-objective Surface Maps  
Design Principles & Guidelines

## Key Statistics

- Total Layouts Designed: 100
- Successful Simulations: 81
- Static Features: 11
- Dynamic Metrics: 20
- Final Dataset: 81 x 31

## Data Quality

- Success Rate: 81%
- Coverage: Comprehensive
- Validation: Multi-metric
- Reliability: High
- Completeness: 100%

*Methodology: 100 layout designs → 81 successful simulations → 11 static features + 20 dynamic metrics → Comprehensive analysis*