# Scene-aware and Social-aware Motion Prediction for Autonomous Driving

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# Agenda

1. Introduction
2. Method Description
   - The Dataset Collection
   - Stage 1 - Filtering process
   - Stage 2 - Integration Model
3. Results
   - Filtering Process
   - Integration Method
4. Future Work

# Introduction

**Autonomous Driving Promise**

- Efficiency and Safety

**Challenges in Motion Prediction**

- Multimodality
- Scene Dependence
- Social Acceptability

**Crucial Understanding**

- Human-Driven Behavior Key

**Limitations of Current AI Tools**

- Control Perspective Absent
- Intent Interpretation Challenge

# Overview of Our Approach

**Testing and Evaluating State-of-the-Art Tools**

- Understanding the real-world applicability and limitations of these tools

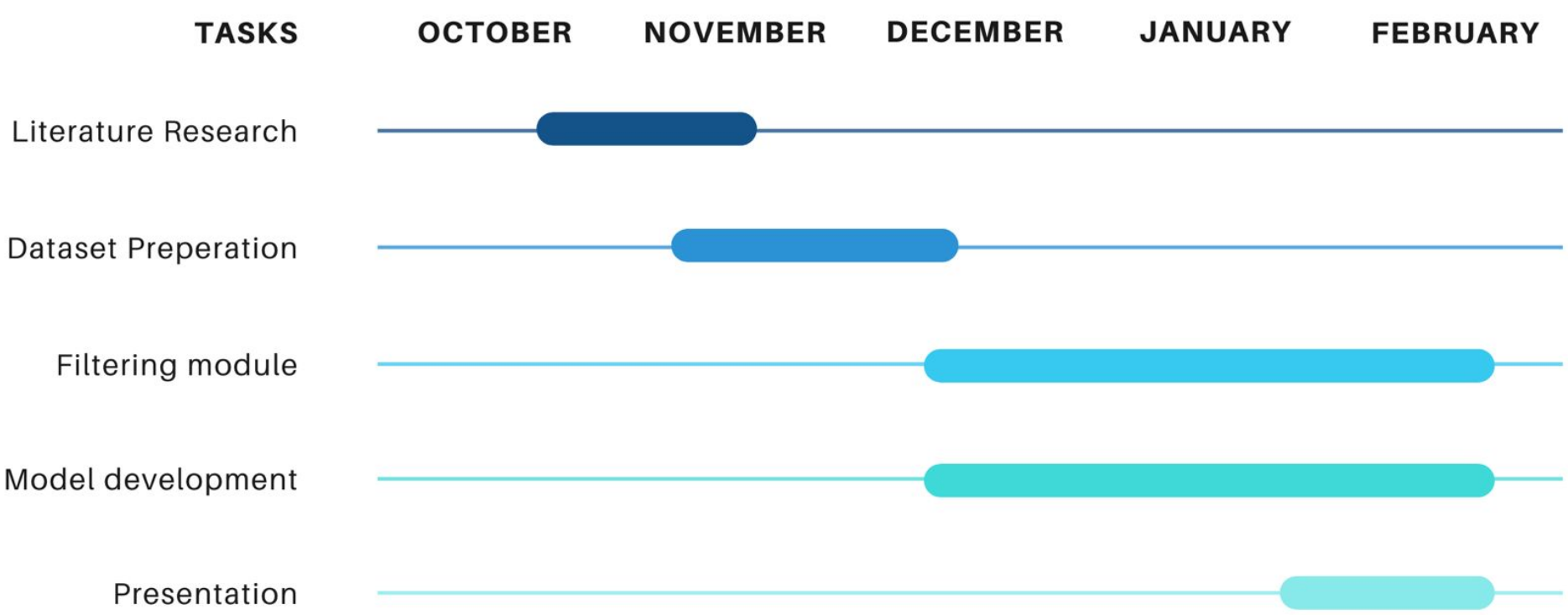
**Developing Control-Oriented Tools**

- Introduce virtual forces between vehicles to improve the accuracy of movement predictions

**Specific Focus on Vehicle Interactions**

- Formulate more accurate and socially-aware predictive models based on these analyses.

# Timeline




**Alfred**

Literature Research
Dataset Preperation
Model development

**Baris**

Literature Research
Dataset Preperation
Filtering module

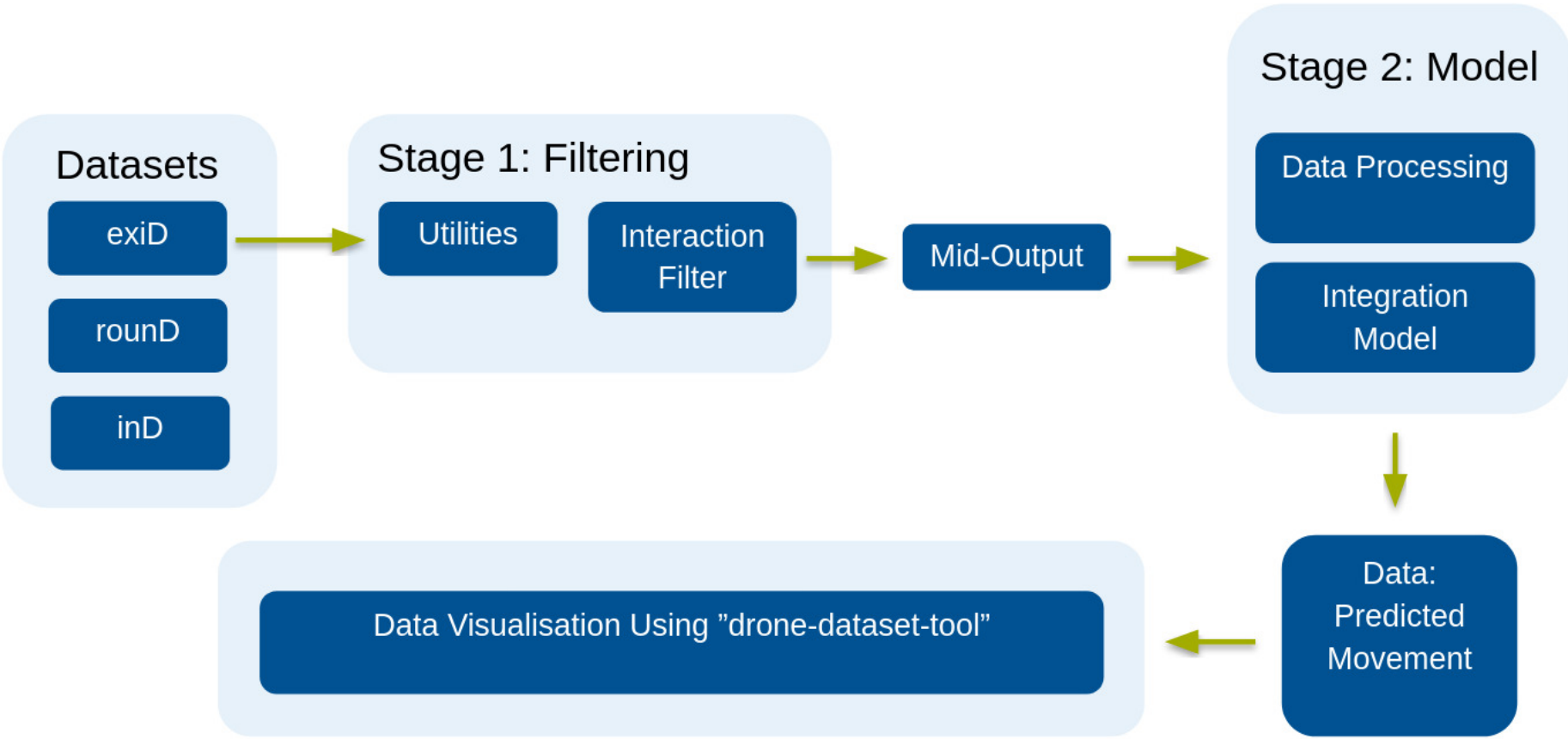
# Dataset Collection

## exiD

## rounD

## inD

# Method Description - Overview



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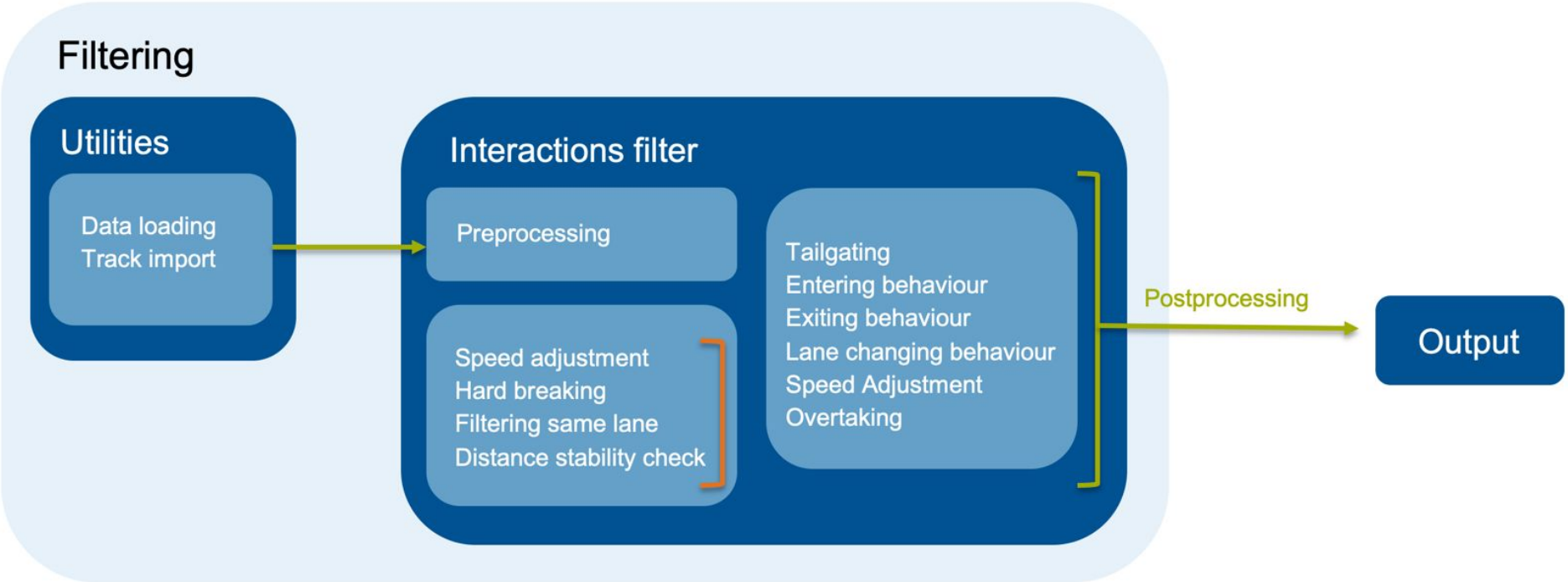

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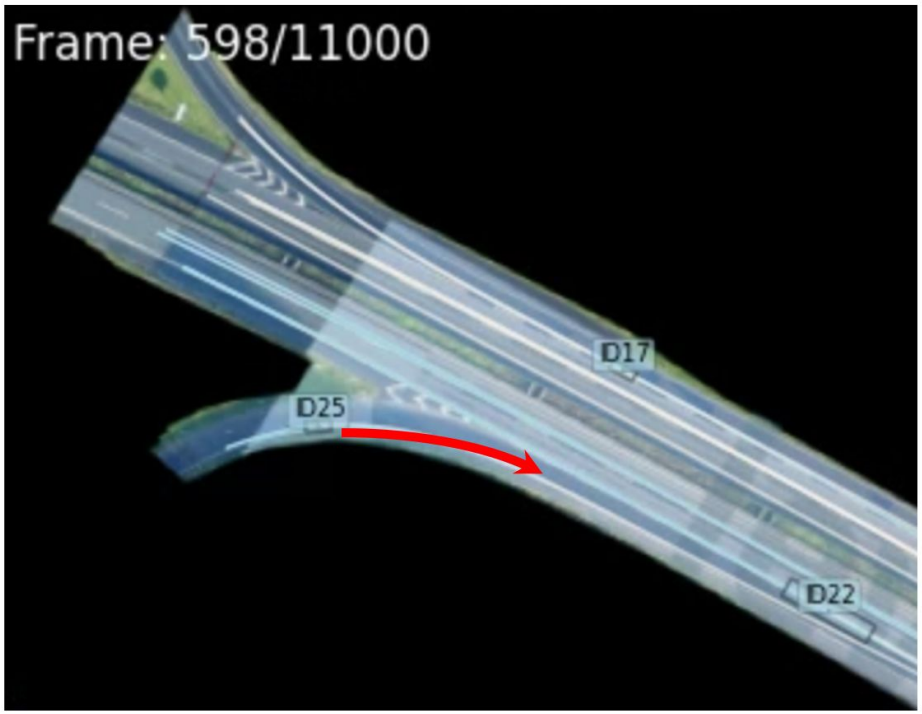
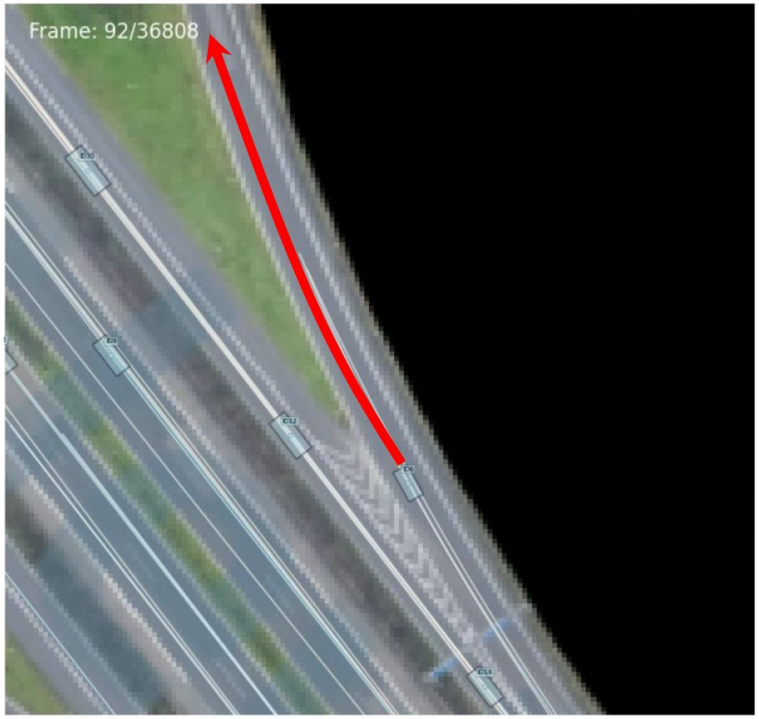



Merging Lane Entering Scenario

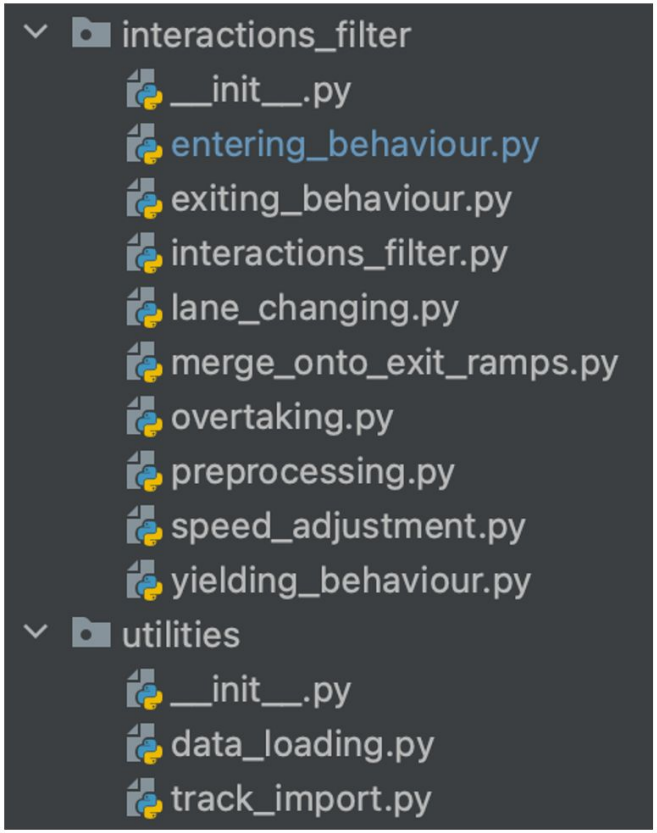



Merging Lane Exiting Scenario

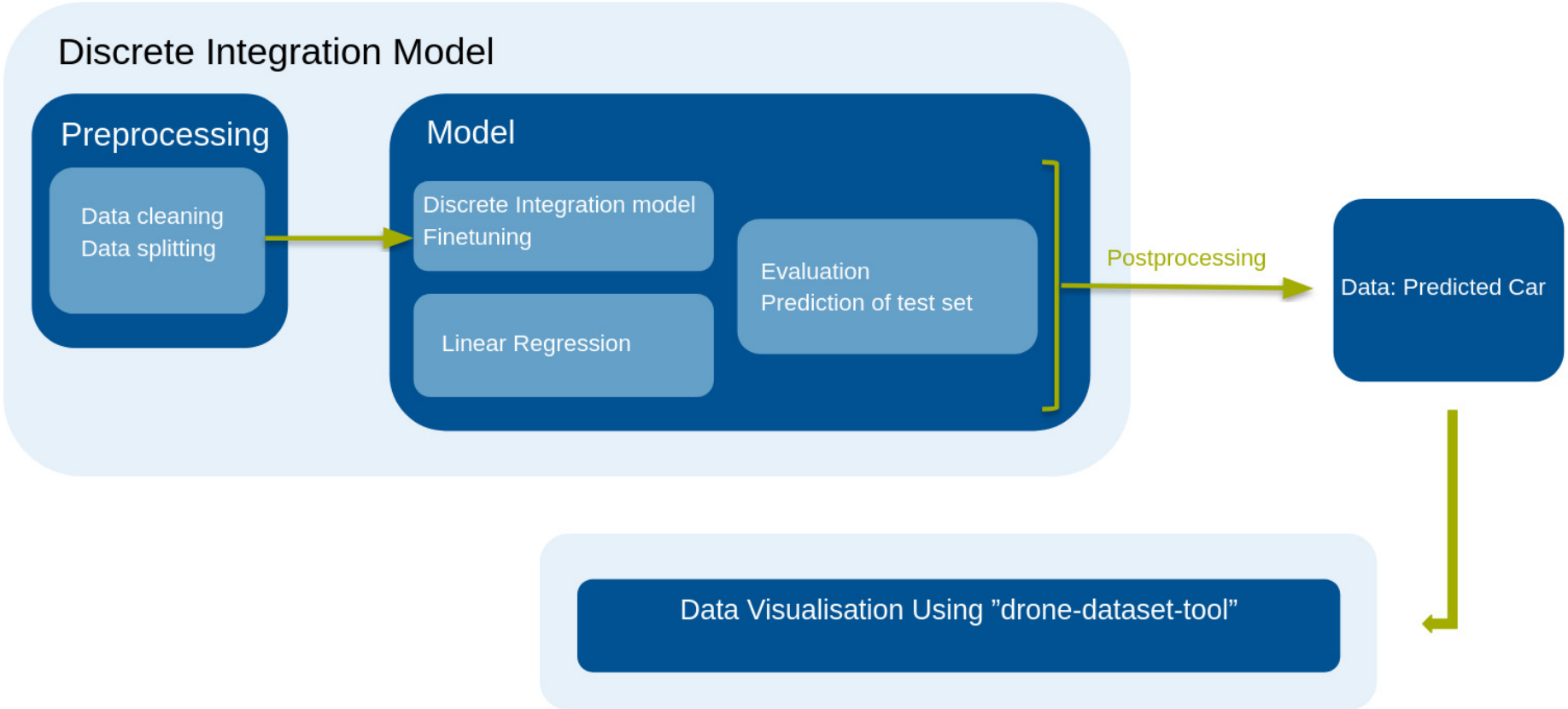
# Method Description - Stage 1

**Filtering Stage: Identifying Vehicle Behaviors**

- Preprocessing
- Behavior Detection
  - Entering/Exiting Behavior
- Interaction Analysis
- Lane Change Detection
- Thresholds and Conditions
- Data Grouping and Sorting



# Method Description - Stage 2



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$$s(k+1) = s(k) + dt \cdot v(k) + c_1 a(k) + c_2 a(k-1)$$
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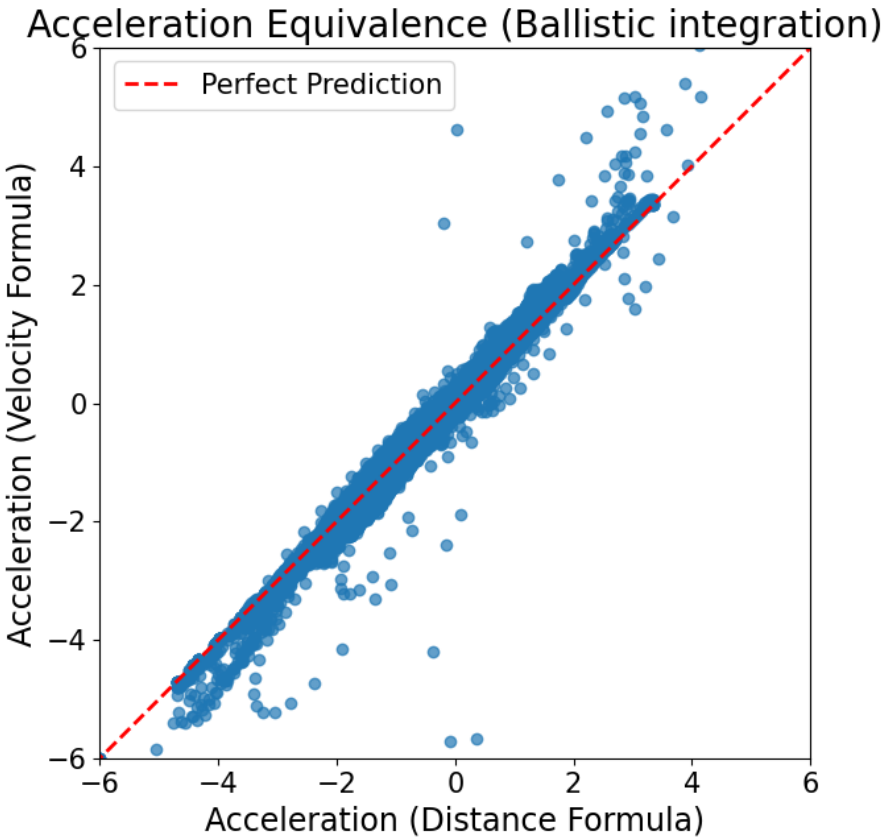
Note:

- The acceleration resulting from both formulas should be equal
- Model can be solved using linear regression.

# Result - Scenario filtering

Video demo of the some filtered scenarios

# Result - Discrete Integration Model

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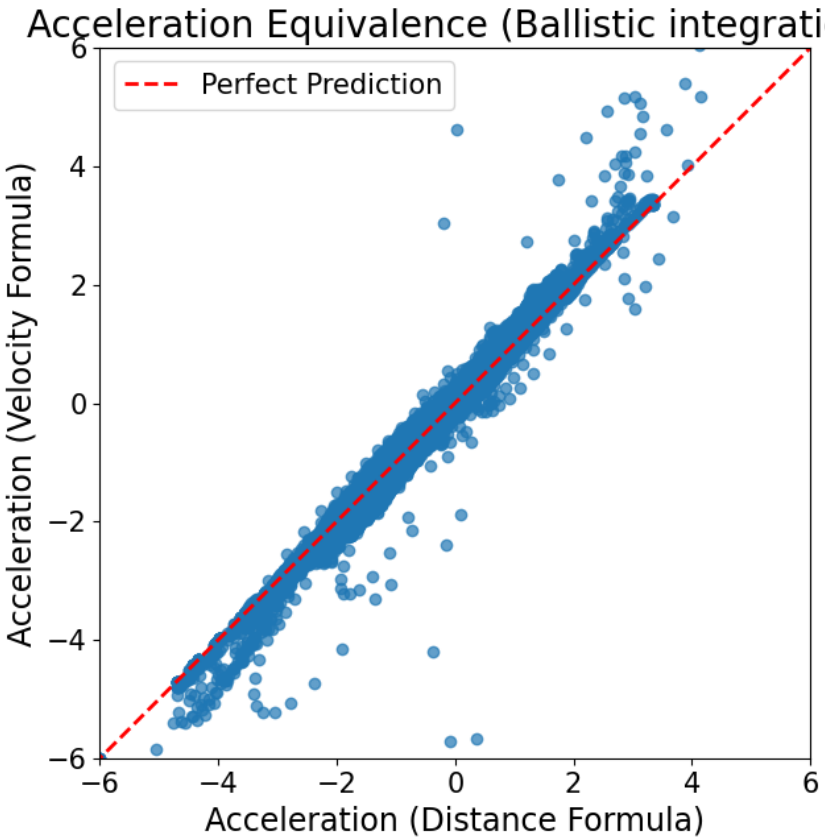


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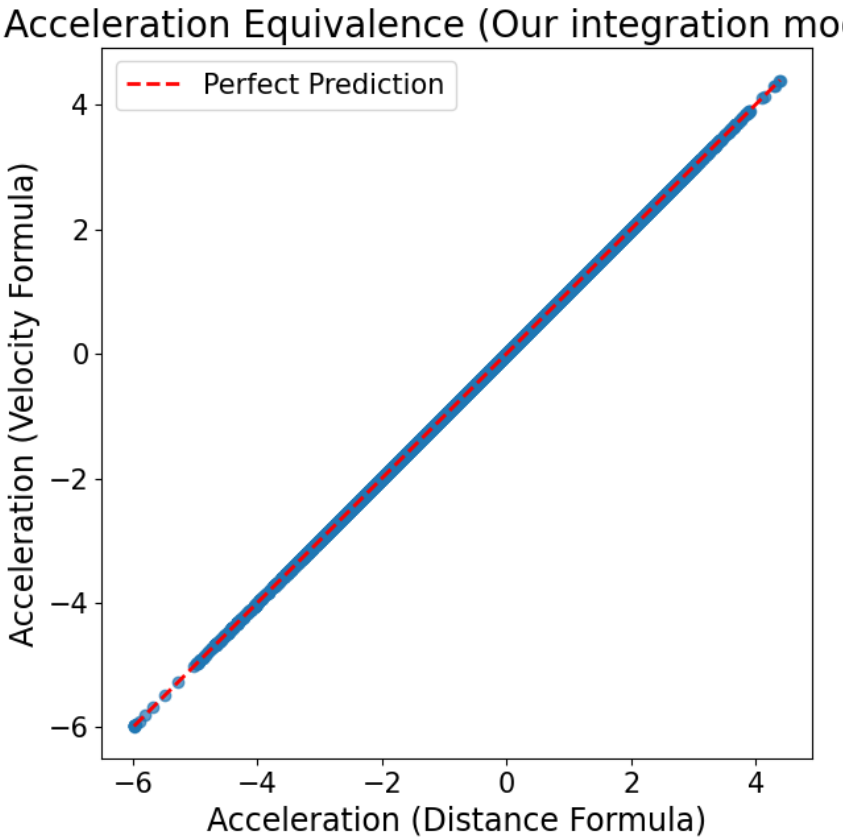


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# Result - Discrete Integration Model

Rearranging the formula to the distance and velocity gives us these results:

*Video demo of predicted car*

# Future Work

Scenario Filtering:

- Specify even more scenarios for a broader range of use cases.

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Scenario Filtering:

- Specify even more scenarios for a broader range of use cases.
- Explore other datasets

Integration Model:

- Finetune the integration model (adding other parameteres)
- Test the results of the integration model with the neural network (task for the next team)

Q&A