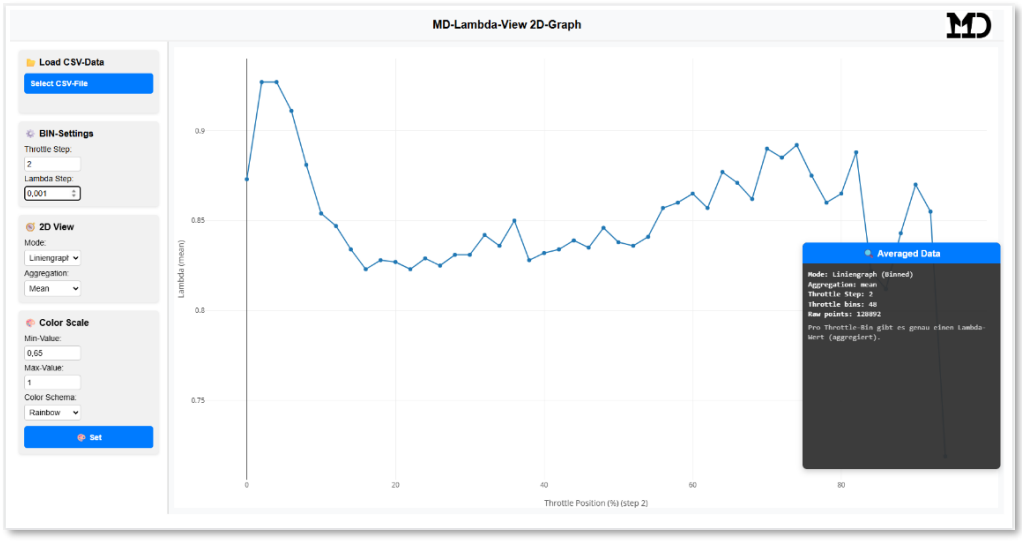
Manual

„2D-Graph“

english

V 1.0



MD-Lambda-View UG (haftungsbeschränkt)
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Inhalt

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1. Purpose of the Application

The **MD-Lambda-View 2D Graph** is used for graphical analysis of CSV measurement data (e.g., from the MD-Lambda-View data logger).

It visualizes the relationship between throttle position (or carburetor slide position) (%) and the lambda value.

2. System Requirements

- Modern web browser (Chrome, Edge, Firefox)

- No installation required

- Local execution of the HTML file possible

3. CSV-Date format

The CSV file must be in the following format:

Time; RPM; Throttle; Voltage; Lambda

Requirements:

• Separator: Semicolon (;)

• Decimal separator: , or .

• At least 5 columns

• Throttle (column 3) and lambda (column 5) must contain valid numbers

Automatic plausibility check:

• Throttle: -1% to 105%

• Lambda: 0.5 to 2.5

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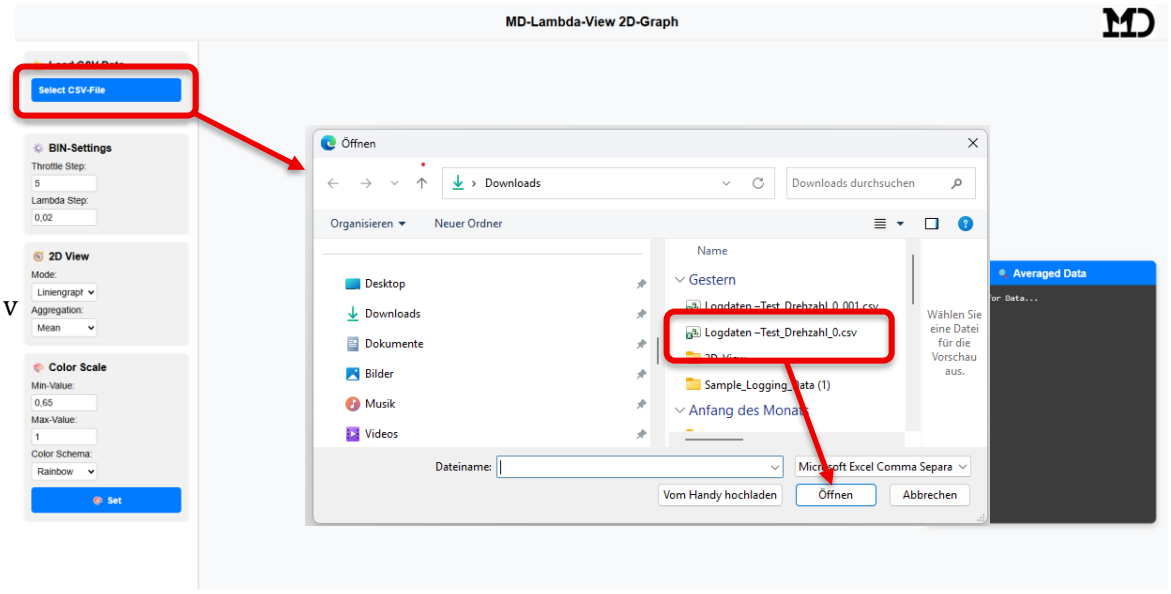
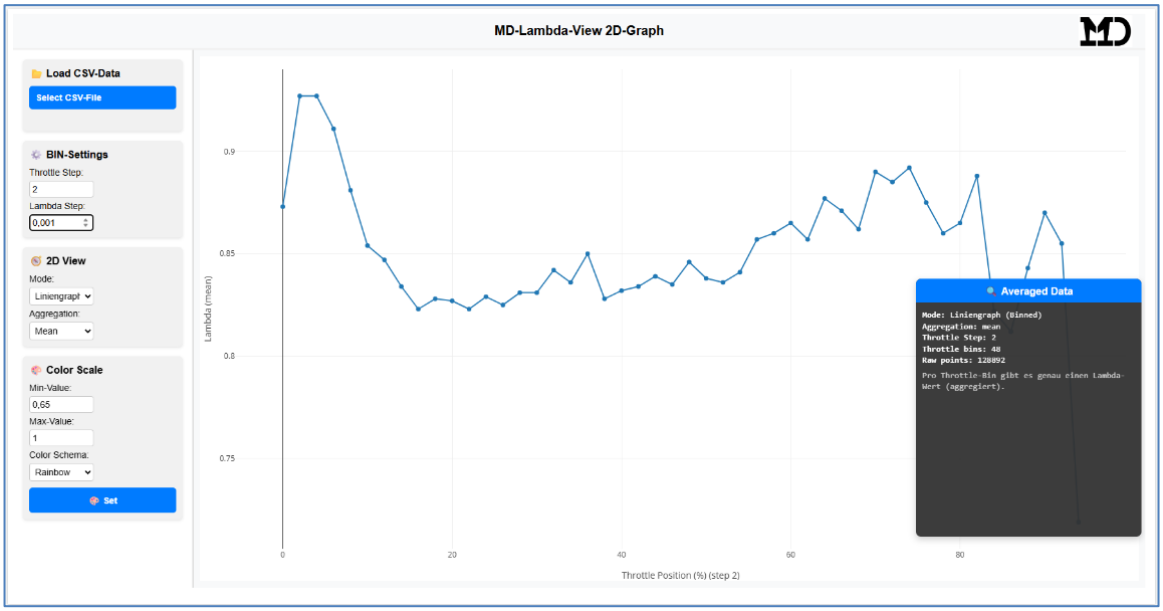
4. Operation

1. Click on 'Select CSV-File'
2. Select CSV file
3. Data is processed and displayed automatically





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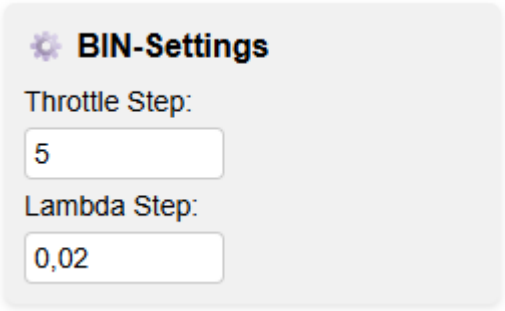
5. BIN-Settings

Throttle Step:

Defines the step size of the throttle bins. Example: 5 → 0%, 5%, 10%, 15% ...

Lambda Step:

Defines the quantization (rounding) of the calculated lambda value. Example: 0.02 → rounding in 0.02 increments.

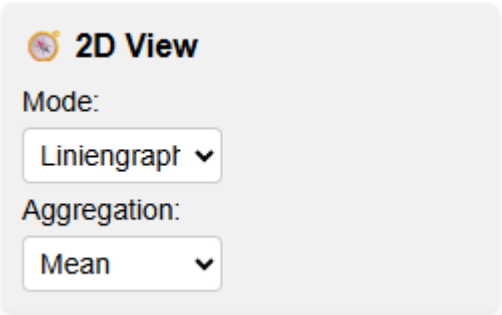


6. 2D View Settings

Fashion:

• Line Graph (Binned): An aggregated lambda value per throttle bin.

• Bar (color-coded): Bar height = lambda value, color according to color scale.



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Aggregation:

- Mean – Durchschnitt
- Median – Robuster Mittelwert
- Min – Kleinster Wert
- Max – Größter Wert
- Count – Anzahl Messpunkte

6.1 Why is aggregation done?

When the CSV file is imported, there are many individual measurement points:

```
Code

Throttle (%)     Lambda
12.3             0.91
12.7             0.94
13.1             0.89
12.9             1.02
...
```

Since real measurement data:

Fluctuate
Noise
have different sampling rates
do not fall exactly to "round" throttle valve values

they are first grouped into **throttle bins**. Example for Throttle Step = 5:

Rohwert	Zugeordneter Bin
12.3	10 %
12.7	15 %
13.1	15 %
12.9	15 %

All lambda values of a bin are then combined into a representative value. This process is called aggregation.

6.1.1 The Available Aggregation Methods

Mean (Arithmetic Mean)

Features:

- Smoothes out measurement noise
- Very good for general trend analysis
- Sensitive to outliers

Example:

```
Code

0.90, 0.91, 0.92, 1.20
→ Mean = 0.98
```

A single outlier (1.20) shifts the result significantly.
Recommendation: Good for clean, stable datasets.

Median

Definition:
Sort all values
Choose the middle value

Example:

```
Code

0.90, 0.91, 0.92, 1.20
→ Median = 0.915
```

Features:

- Very robust against runaways
- Ideal for restless measurement signals
- Particularly useful for driving data with load changes

Recommendation: Best choice for real-world driving measurements.

Min

Shows the leanest or fattest extreme value in the bin.

Application:

- Detection of dangerously lean areas
- Worst-case analysis

Max

Displays the highest measured value in the bin.

Application:

- Identification of extremely fat states
- Troubleshooting

Count

n=Number of measuring points

Not a lambda value, but the number of raw data in the bin.

Application:

- Data Quality Assessment
- Detecting poorly filled areas
- Validation of test bench or road measurements

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6.1.3 Influence on engine tuning

Aggregation largely determines how you interpret your mixture.

Example:

Raw data at 20% throttle body:

```
Code

0.88
0.90
0.91
1.05
```

Method	Result	Interpretation
Mean	0.935	A bit fat
Median	0.905	Stable fat
Min	0.88	very fat
Max	1.05	Short time lean

Depending on the objective, the same database can be evaluated differently.

After aggregation, quantization can also be performed:

```
Code

quantized_value = round(Λ / step) * step
```

Example:

```
Code

Aggregierter Wert = 0.913
Lambda Step = 0.02
→ Ergebnis = 0.92
```

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This ensures:

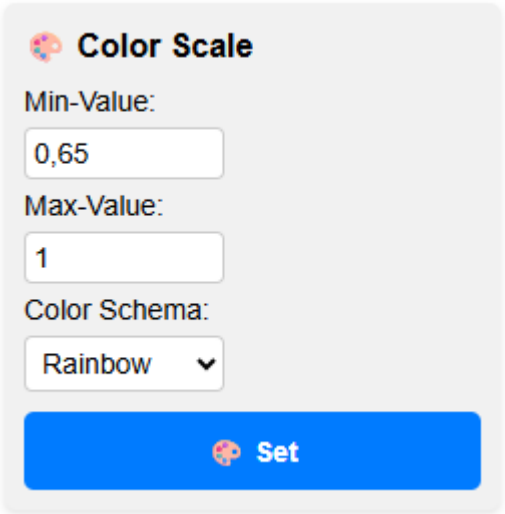
- quieter charts
- Better comparability
- defined raster values

Recommendations for practice

For carburetor tuning on the road:	→ median
For test bench runs with stable load:	→ Mean
For security analysis (too lean?):	→ min
For extreme value diagnosis:	→ Max

7. Color Scale

• Min-Value: Lower limit of the color scale
• Max-Value: Upper limit of the color scale
• Color Scheme: Selection of color representation
• 'Set' to apply the settings



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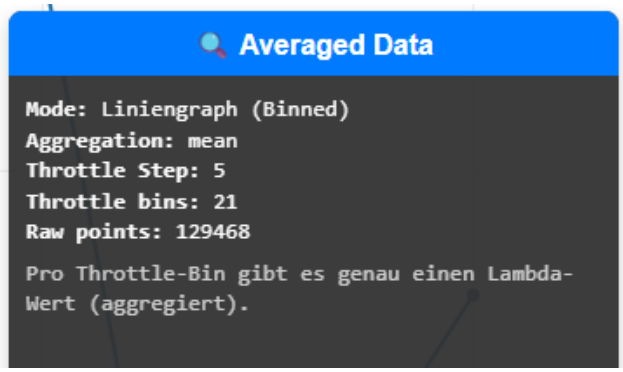
8. Debug-Fenster

Ad from:
- Current mode
- Aggregation
- Throttle Step
- Number of Bins
- Number of raw data points



The debug window can be moved freely.

9. Technical functionality

1. CSV is read in
2. Plausibility check
3. Binning of throttle valve values
4. Aggregation of lambda values
5. Representation in the diagram

10. Typical Application

Analysis of mixture formation at different throttle positions. Support for carburetor or TPS tuning.

11. Troubleshooting

- Do not check any ad → CSV format
- Check error message → plausibility of the data
- Activate color scale without effect → bar mode

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