

Einführung in Matlab

AP/FP-Softwarekurse

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Übersicht

Grundlagen

Plotten

Fitten

Ausprobieren

Wo bekomme ichs her?

Download

- | • > Lizenzen im RHRK:
<https://serviceportal.rhrk.uni-kl.de/>
(Software-Download → Download für Studierende → Anleitung befolgen)
- | • > Es ist notwendig sich einen MathWorks-Account zu erstellen (passiert während der Installation)
- | • > Open Source Alternative: Octave

Matlab ist auf den Rechnern im CIP-Raum vorinstalliert

Matlab starten

The screenshot shows the MATLAB R2018b interface with the following components labeled:

- Datei-verzeichnis**: Points to the 'Current Folder' browser on the left, which shows the file 'beispiel.m'.
- Editor**: Points to the central code editor window containing the MATLAB script:


```
1 - > a="Hello World"
```
- Variablen**: Points to the 'Workspace' browser at the bottom left, which shows a variable 'a' with the value 'Hello World'.

Name	Value
a	'Hello World'
- Konsole**: Points to the 'Command Window' at the bottom right, which shows the execution output:


```
>> beispiel
a =
    "Hello World"
f> >>
```

Weiteres

Informationen

- | • > `de.mathworks.com` (inclusive guter Dokumentation)
- | • > `help` <Befehl>
- | • > Google ist dein Freund!

Sonstiges

- | • > Fast vollständige Programmiersprache (Bedingungen, Schleifen vorhanden)
- | • > `clear` in der Konsole löscht alle gespeicherten Variablen
- | • > `clc` in der Konsole löscht den Inhalt dieser

Matrizen und Vektoren

Vektoren

```
1 >> A=[1,2,3]
2 A =
3     1     2     3
4 >> B=[1;2;3]
5 B =
6     1
7     2
8     3
```

```
1 % Anzahl der Einträge
   festlegen
2 x=linspace(-pi,pi,1000);
3 % Schrittweite festlegen
4 y=1:5;
5 z=1:.2:12;
```

Matrizen und Vektoren

Matrizen

```
1 >> C
   = [1,2;3,4;5,6]
2 C =
3     1     2
4     3     4
5     5     6
```

```
1 % 20x10 Matrix mit 1ern
2 k=ones(20,10);
3 % 10x10 Matrix mit 0ern
4 l=zeros(10);
5 % 20x20 Diagonalmatrix
6 m=eye(20);
```

Skalar und Matrixprodukte

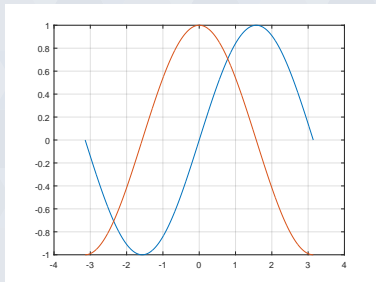
```
1 >> A*B
2 ans = 14
3 >> B*A
4 ans =
5     1     2     3
6     2     4     6
7     3     6     9
8 >> B' .* A
9 ans =
10 1 4 9
```


Skripte

- | ● > Skripte als `Dateiname.m`
- | ● > Ausführen ohne `.m` Dateiendung
- | ● > Integrierter Editor mit Komfortfunktionen

Plotten

```
1 x=linspace(-pi,pi,1000);  
2 y=sin(x);  
3 y2=cos(x);  
4 plot(x,y,x,y2);  
  
6 % alternativ  
7 plot(x,y);  
8 hold on;  
9 plot(x,y2);  
10 hold off;
```

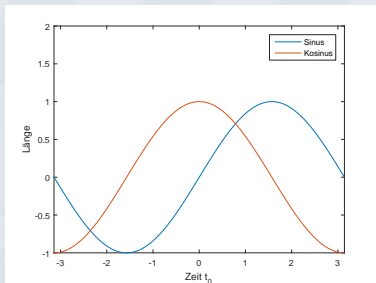


Wertebereich

```

1 plot(x, sin(x), x, cos(x));
2 xlim([-pi, pi]);
3 ylim([-1, 2]);
4 legend('Sinus', 'Kosinus');
5 xlabel('Zeit t_0');
6 ylabel('Länge');

```

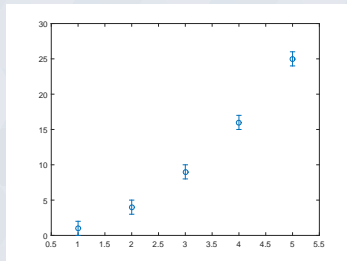


Aussehen

- Grafisches Menü für Linienstil, Legendenposition, etc.

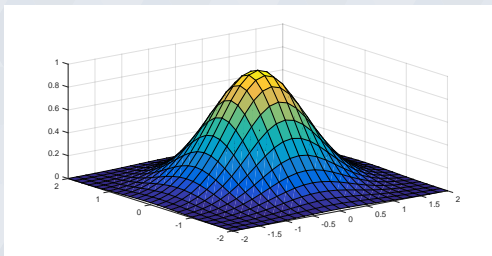
Fehlerbalken

```
1 x=1:5;  
2 y=x.^2;  
3 z=ones(1,5);  
4 errorbar(x,y,z,'o');
```



3D plots

```
1 x=linspace(-2,2,25);  
2 [X,Y]=meshgrid(x,x);  
3 z=exp(-(X.^2+Y.^2));  
4 surf(x,x,z)
```



Fitten grafisch

Curve Fitting Toolbox

MATLAB R2019b - academic use

HOME PLOTS APPS EDITOR PUBLISH VIEW

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erscheint erst später

```

1 - beispiel.m
2 - b=0.025;
3 - errorbar(x, y, b'*y, b'*x, 'o');
4 - legend("Messwerte");
5 - xlabel("x");
6 - ylabel("sinus");
  
```

Command Window

```

>> beispiel
"Hello World"
  
```

Curve Fitting Tool

Fit name: Fit

Custom Equation

$$y = a \sin(b(x-c)+d)$$

Fit Options

Results

Ignoring NaNs in data.

General model

$$f(x) = a \sin(b(x-c)+d)$$

Coefficients (with 95% confidence bounds)

a = 2.3 (2.408, 2.310)
 b = 0.05999 (0.05993, 0.1081)
 c = 3.148 (3.137, 3.153)
 d = -2.1 (2.086, 2.198)

Table of Fits

Fit name	Data	Fit type	SSE	R-square	DFE	Adj R-sq	RMSE	# Coeff	Validation ...	Validation ...	Validation ...
Fit	vs.	a*sin(b*(x-c)+d)	0.17039	0.9989	215	0.9989	0.02977	4			

Fitfunktionen

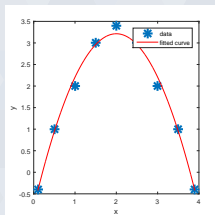
- | • > poly1, poly2, ...
- | • > gauss1, ...
- | • > <http://de.mathworks.com/help/curvefit/list-of-library-models-for-curve-and-surface-fitting.html>

Fitten textbasiert

```

1 >> mess=load('daten.dat');
2 >> fit(mess(:,1),mess(:,2),'poly2')
3 theo =
4   Linear model Poly2:
5   theo(x) = p1*x^2 + p2*x + p3
6   Coefficients (with 95% confidence bounds):
7     p1 =      -1.007   (-1.097, -0.9166)
8     p2 =       4.028   (3.654, 4.401)
9     p3 =      -0.8145  (-1.128, -0.5008)
10 >> plot(theo,mess(:,1),mess(:,2));

```



Alternatives Importieren

The screenshot shows the MATLAB R2015b interface. The 'Import Data' dialog box is open, showing the 'Import' tab. The 'Column delimiters' are set to 'Tab'. The 'Import Selection' button is highlighted. The 'Import' window shows a table with 7 columns labeled 'VarName1' through 'VarName7' and 22 rows of data. The data is as follows:

	A	B	C	D	E	F	G
	uebung1						
	VarName1	VarName2	VarName3	VarName4	VarName5	VarName6	VarName7
	Number	Number	Number	Number	Number	Number	Number
1	0	2,08563593	0,061939578	0,127409582	0,127409582	10,12935555	0,046501482
2	1,00	1,861119423	4,877061805	0,020221604	0,020221604	9,691894204	0,042337703
3	1,5	1,642992357	6,882685751	0,142048717	0,142048717	9,340172591	0,175330319
4	2	1,626486753	8,365783403	0,175334385	0,175334385	9,105097857	0,115053994
5	2,5	1,353086683	9,653031915	0,217208459	0,217208459	8,724821071	0,018595336
6	3,0	1,325294652	9,73363861	0,100685622	0,100685622	8,503106413	0,007238861
7	4,05	1,039898232	8,789650101	0,094623191	0,094623191	8,18817271	0,110124217
8	4,7	1,035782239	6,833005997	0,193091224	0,193091224	8,083022787	0,069942095
9	5,35	0,728231931	4,331889135	0,120845046	0,120845046	7,691936444	0,163011938
10	6,00	0,647993845	1,464259891	0,248604342	0,248604342	7,603096311	0,012577008
11	6,65	0,575931589	-1,627707119	0,088815052	0,088815052	7,326783366	0,14019663
12	7,3	0,461645721	-4,368184676	0,116227091	0,116227091	7,016309171	0,188667965
13	7,95	0,218059384	-6,662106589	0,195501203	0,195501203	6,749511995	0,118787392
14	8,60	0,283401837	-8,257400152	0,153204649	0,153204649	6,544646897	0,158966602
15	9,25	0,108397867	-9,018275055	0,249365015	0,249365015	6,415850271	0,206362206
16	9,9	0,089642071	-8,716823694	0,187448995	0,187448995	6,10284251	0,082542275
17	10,55	-0,115139451	-7,489961966	0,317346171	0,317346171	5,991223424	0,187895408
18	11,20	-0,083946354	-5,570625487	0,326907443	0,326907443	5,770076957	0,15035099
19	11,85	-0,295872269	-2,961709136	0,358583381	0,358583381	5,724392939	0,216381339
20	12,5	-0,347464682	-0,269821924	0,468349294	0,468349294	5,544888989	0,105620423
21	13,15	-0,341660232	2,619409287	0,463124447	0,463124447	5,332583892	0,172285542
22	13,80	-0,315385588	5,078899967	0,539442298	0,539442298	5,183582362	0,229405579

The MATLAB editor window shows the following code in 'beispiel.m':

```

1 - a="Hello World"
2 - b=2;

data(:,0), data(:,1), 0.05.*data(:,0), 0.05.*
    %source");
");
kms");

```

The 'Import Data' dialog box shows the following options:

- Import Selection (checked)
- Column delimiters: Tab
- Fixed Width (unchecked)
- Delimiter Options (checked)

The 'Import' window shows the following options:

- Import Selection (checked)
- Column delimiters: Tab
- Fixed Width (unchecked)
- Delimiter Options (checked)

The 'Import' window also shows the following options:

- Import Selection (checked)
- Column delimiters: Tab
- Fixed Width (unchecked)
- Delimiter Options (checked)

The 'Import' window also shows the following options:

- Import Selection (checked)
- Column delimiters: Tab
- Fixed Width (unchecked)
- Delimiter Options (checked)

Alternatives Importieren

Import - C:\Users\Markus\Documents\MATLAB\Test\uebung1.txt

IMPORT VIEW

Column delimiters: Tab Range: A1:B220 Delimit Type: Column vectors

Replace unimportable cells with NaN

Import Selection

uebung1.txt

	x	y	VarName3	VarName4	VarName5	VarName6	VarName7
1	2,08563593	0,061939578	0,127409582	0,127409582	10,12935555	0,046501482	
2	1,00	1,861119423	4,877061805	0,029221604	0,029221604	8,691894204	0,042337703
3	1,5	1,642992357	6,882685751	0,142048717	0,142048717	9,340172591	0,175330319
4	2	1,626486753	8,365783403	0,175334385	0,175334385	9,105097857	0,115053994
5	2,75	1,353086683	9,653031915	0,217208459	0,217208459	8,724921071	0,018595336
6	3,40	1,329294652	8,73363861	0,100985622	0,100985622	8,503106413	0,007238861
7	4,05	1,039898232	8,789650101	0,094623191	0,094623191	8,188172721	0,110124217
8	4,7	1,035782239	6,833805997	0,193091224	0,193091224	8,083022787	0,069942095
9	5,35	0,728231931	4,331889135	0,120945046	0,120945046	7,691936444	0,163011938
10	6,00	0,647993845	1,464235989	0,248604342	0,248604342	7,603309631	0,01257708
11	6,65	0,575931589	-1,627707119	0,088815052	0,088815052	7,326783366	0,14019663
12	7,3	0,461645721	-4,368184676	0,116227091	0,116227091	7,016309171	0,188667965
13	7,95	0,218059384	-6,662108589	0,195501203	0,195501203	6,749511995	0,118787392
14	8,60	0,283401437	-8,257400152	0,153204649	0,153204649	6,544648997	0,158968602
15	9,25	0,108397867	-9,018275055	0,249365015	0,249365015	6,415850271	0,206362206
16	9,9	0,086942071	-8,716923694	0,187444895	0,187444895	6,10284251	0,082542275
17	10,55	-0,115139451	-7,489861966	0,317346171	0,317346171	5,991223424	0,187685408
18	11,20	-0,083946354	-5,570625487	0,326907443	0,326907443	5,770076957	0,15035099
19	11,85	-0,295872269	-2,961709136	0,358583381	0,358583381	5,724309299	0,216381339
20	12,5	-0,347464682	-0,269821924	0,468349294	0,468349294	5,544889889	0,105620423
21	13,15	-0,341602352	2,619409287	0,463124447	0,463124447	5,332583892	0,172285542
22	13,80	-0,315385588	5,078999367	0,539442298	0,539442298	5,183582362	0,229405579
23	14,45	-0,430994698	7,050074576	0,522152271	0,522152271	4,954795125	0,242467299
24	15,1	-0,390209941	8,268773274	0,642878262	0,642878262	4,716044203	0,275470352

Übung

- |•> Tue das, was du gerne tun möchtest
- |•> Inspiration unter
<http://www.fs.physik.uni-kl.de/softwarekurse.html>

Installparty

- |•> Wenn du Probleme bei der Installation hast, frage!