

IPCV: Filter - Übung 1

Patrick Bucher

Aufgabe 1: Faltung

$$f = \{0, 0, 0, 1, 1, 1, 1, 0, 0, 0\}$$

$$w = \{1, 2, 2, 2, 1\}$$

1. multiplizieren

2. diagonal addieren

$f \backslash w$	1	2	2	2	1
0	0	0	0	0	0
0	0	0	0	0	0
0	0	0	0	0	0
0	1	2	2	2	1
1	1	2	2	2	1
3	1	2	2	2	1
5	1	2	2	2	1
7	0	0	0	0	0
7	0	0	0	0	0
5	0	0	0	0	0
3					
1					
0					
0					
0					

$$f * w = \{0, 0, 0, 1, 3, 5, 7, 7, 5, 3, 1, 0, 0, 0\}$$

GNU Octave: $f = [0, 0, 0, 1, 1, 1, 1, 0, 0, 0]$

$$w = [1, 2, 2, 2, 1]$$

$$\text{conv}(f, w)$$

Aufgabe 2: Faltung und Barin-Codes)

$$x_1 = \{1, 1, -1, 1\}$$

$$x_2 = \{1, -1, 1, 1\}$$

$x_1 \backslash x_2$	1	-1	1	1
1	1	-1	1	1
1	1	-1	1	1
0	1	1	-1	-1
-1	1	-1	1	1
4				
-1				
0				
1				

$$x_1 * x_2 = \{1, 0, -1, \underline{4}, -1, 0, 1\}, \text{ Maximum bei } \underline{4}$$

GNU Octave:

$$x_1 = [1, +1, -1, 1]$$

$$x_2 = [1, -1, 1, 1]$$

$$\text{conv}(x_1, x_2)$$

Aufgabe 3: Korrelation

Patrik Buch-

$$f = \{1, 1, 0, 0, 1, 1, 0, 0\}$$

1. multiplizieren

$$g = \{0, 1, 1, 0\}$$

2. diagonal addieren

$f \backslash g$	0	1	1	0
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1 ~~0~~ ~~1~~ ~~1~~ ~~0~~

1 ~~0~~ ~~1~~ ~~1~~ ~~0~~

0 ~~0~~ ~~0~~ ~~0~~ ~~0~~

0 ~~0~~ ~~0~~ ~~0~~ ~~0~~

1 ~~0~~ ~~1~~ ~~1~~ ~~0~~

1 ~~0~~ ~~1~~ ~~1~~ ~~0~~

0 ~~0~~ ~~0~~ ~~0~~ ~~0~~

0 ~~0~~ ~~0~~ ~~0~~ ~~0~~

$f \otimes g$

0 -3

1 -2

2 -1 ←

1 0

0 1

1 2

2 3 ←

1 4

0 5

0 6

0 7

mit Python/NumPy:

```
import numpy as np
```

```
f = [1, 1, 0, 0, 1, 1, 0, 0]
```

```
g = [0, 1, 1, 0]
```

```
np.correlate(f, g)
```

→ 1, 0, 1, 2, 1 (ohne Padding)