
Korrelation am Beispiel

[illegible]

-1	0	1
-2	0	2
-1	0	1

0	0	0	0	0	0	0	0	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	0	0	0	0	0	0	0	0



-1	0	1
-2	0	2
-1	0	1

NR:
 $0*(-1)+0*0+0*1+...$

0	0	0	0	0	0	0	0	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	0	0	0	0	0	0	0	0



-1	0	1
-2	0	2
-1	0	1

NR:
 $0*(-1)+0*0+0*1+...$

0	0	0	0	0	0	0	0	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	0	0	0	0	0	0	0	0



-1	0	1
-2	0	2
-1	0	1

NR:

$$0*(-1)+0*0+0*1+...$$

$$0*(-2)+3*0+3*2+...$$

0	0	0	0	0	0	0	0	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	0	0	0	0	0	0	0	0



-1	0	1
-2	0	2
-1	0	1

NR:

$$0*(-1)+0*0+0*1+...$$

$$0*(-2)+3*0+3*2+...$$

0	0	0	0	0	0	0	0	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	0	0	0	0	0	0	0	0



-1	0	1
-2	0	2
-1	0	1

NR:

$$0*(-1)+0*0+0*1+...$$

$$0*(-2)+3*0+3*2+...$$

$$0*(-1)+3*0+3*1$$

0	0	0	0	0	0	0	0	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	0	0	0	0	0	0	0	0



-1	0	1
-2	0	2
-1	0	1

NR:
 $[0*(-1)+0*0+0*1+...$
 $0*(-2)+3*0+3*2+...$
 $0*(-1)+3*0+3*1]...$
 $*1/9$

0	0	0	0	0	0	0	0	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	0	0	0	0	0	0	0	0



-1	0	1
-2	0	2
-1	0	1

1						

NR:
 $[0*(-1)+0*0+0*1+...$
 $0*(-2)+3*0+3*2+...$
 $0*(-1)+3*0+3*1]...$
 $*1/9$

0	0	0	0	0	0	0	0	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	0	0	0	0	0	0	0	0



-1	0	1
-2	0	2
-1	0	1

[illegible]

0	0	0	0	0	0	0	0	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	0	0	0	0	0	0	0	0



-1	0	1
-2	0	2
-1	0	1

[illegible]

0	0	0	0	0	0	0	0	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	0	0	0	0	0	0	0	0



-1	0	1
-2	0	2
-1	0	1

1	0	2	2	0	0	-3
1.3	0	2.7	2.7	0	0	-4
1.3	0	2.7	2.7	0	0	-4
1.3	0	2.7	2.7	0	0	-4
1.3	0	2.7	2.7	0	0	-4
1.3	0	2.7	2.7	0	0	-4
1	0	2	2	0	0	-3

0	0	0	0	0	0	0	0	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	0	0	0	0	0	0	0	0



-1	0	1
-2	0	2
-1	0	1

1	0	2	2	0	0	-3
1.3	0	2.7	2.7	0	0	-4
1.3	0	2.7	2.7	0	0	-4
1.3	0	2.7	2.7	0	0	-4
1.3	0	2.7	2.7	0	0	-4
1.3	0	2.7	2.7	0	0	-4
1	0	2	2	0	0	-3

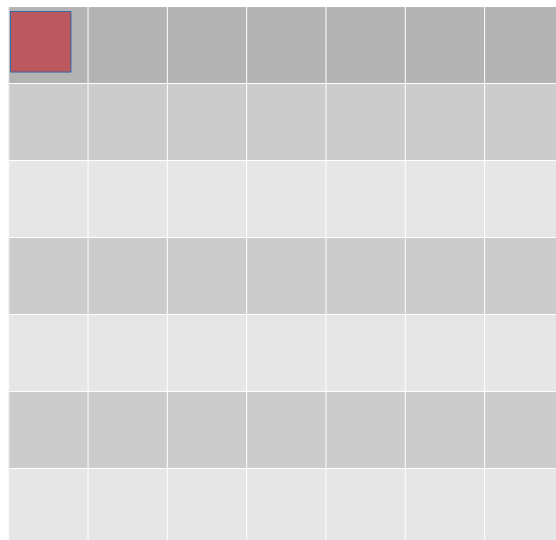
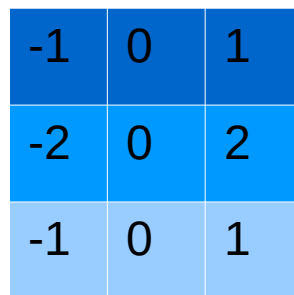
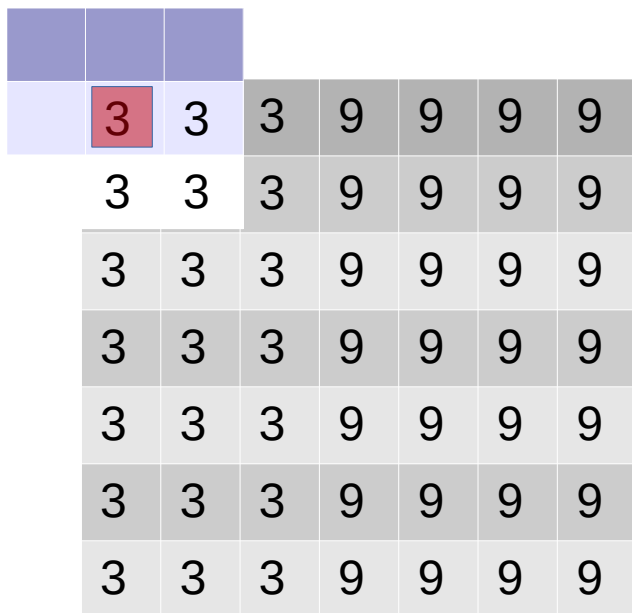
Faltung am Beispiel

[illegible]

-1	0	1
-2	0	2
-1	0	1

[illegible]

-1	0	1
-2	0	2
-1	0	1



?	?	?					
?	3	3	3	9	9	9	9
?	3	3	3	9	9	9	9
	3	3	3	9	9	9	9
	3	3	3	9	9	9	9
	3	3	3	9	9	9	9
	3	3	3	9	9	9	9



-1	0	1
-2	0	2
-1	0	1

0	0	0	0	0	0	0	0	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	0	0	0	0	0	0	0	0



-1	0	1
-2	0	2
-1	0	1

NR:
 $0 \cdot 1 + 0 \cdot 0 + 0 \cdot (-1) + \dots$

0	0	0	0	0	0	0	0	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	0	0	0	0	0	0	0	0



-1	0	1
-2	0	2
-1	0	1

NR:
 $0*1+0*0+0*(-1)+\dots$

0	0	0	0	0	0	0	0	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	0	0	0	0	0	0	0	0



-1	0	1
-2	0	2
-1	0	1

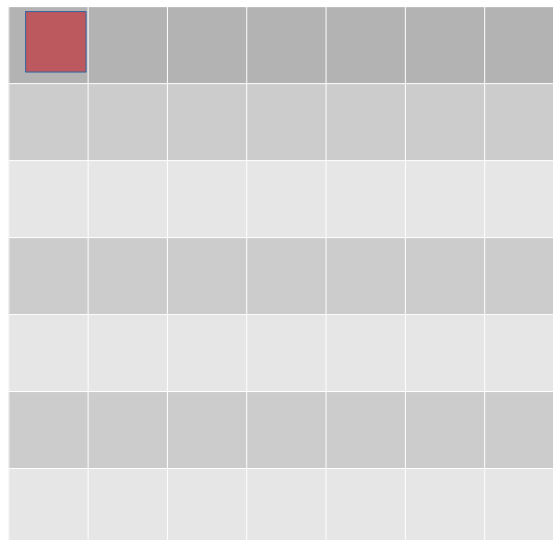
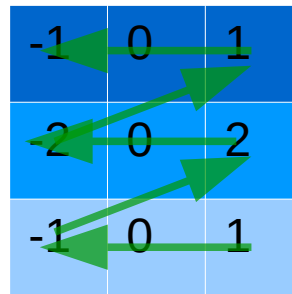
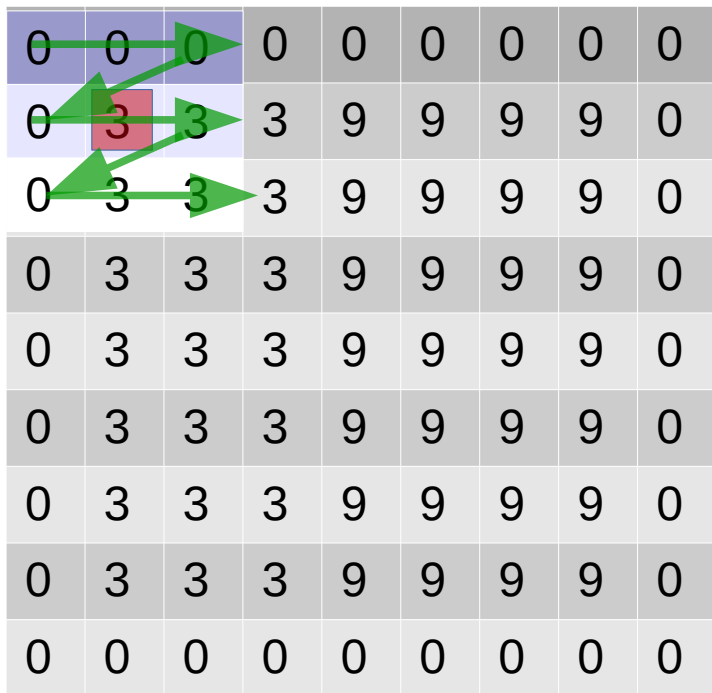
NR:
 $0*1+0*0+0*(-1)+...$
 $0*2+3*0+3*(-2)+...$

0	0	0	0	0	0	0	0	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	0	0	0	0	0	0	0	0

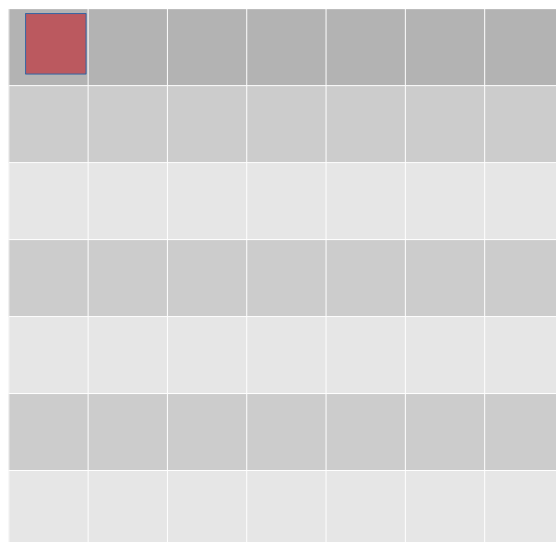
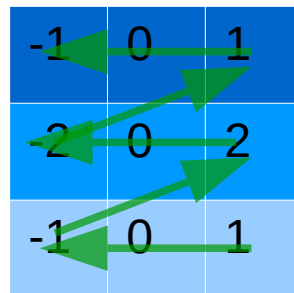
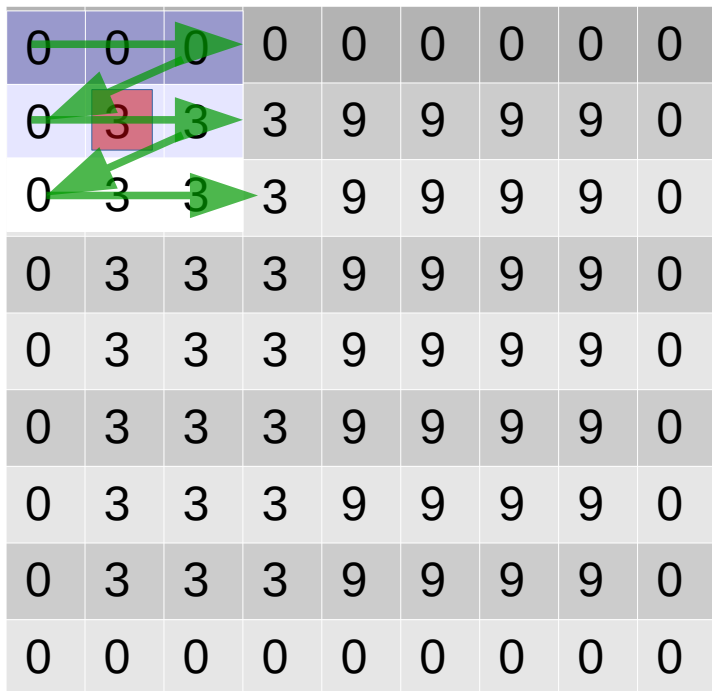


-1	0	1
2	0	2
-1	0	1

NR:
 $0*1+0*0+0*(-1)+\dots$
 $0*2+3*0+3*(-2)+\dots$



NR:
 $0*1+0*0+0*(-1)+...$
 $0*2+3*0+3*(-2)+...$
 $0*1+3*0+3*(-1)$



NR:
 $[0*1+0*0+0*(-1)+...$
 $0*2+3*0+3*(-2)+...$
 $0*1+3*0+3*(-1)]$
 $*1/9$

0	0	0	0	0	0	0	0	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	0	0	0	0	0	0	0	0



-1	0	1
2	0	2
-1	0	1

-1						

NR:
 $[0*1+0*0+0*(-1)+\dots$
 $0*2+3*0+3*(-2)+\dots$
 $0*1+3*0+3*(-1)]$
 $*1/9$

0	0	0	0	0	0	0	0	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	0	0	0	0	0	0	0	0



-1	0	1
-2	0	2
-1	0	1

-1	0	-2	-2	0	0	3
-1.3	0	-2.7	-2.7	0	0	4
-1.3	0	-2.7	-2.7	0	0	4
-1.3	0	-2.7	-2.7	0	0	4
-1.3	0	-2.7	-2.7	0	0	4
-1.3	0	-2.7	-2.7	0	0	4
-1	0	-2	-2	0	0	3

0	0	0	0	0	0	0	0	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	0	0	0	0	0	0	0	0



-1	0	1
-2	0	2
-1	0	1

-1	0	-2	-2	0	0	3
-1.3	0	-2.7	-2.7	0	0	4
-1.3	0	-2.7	-2.7	0	0	4
-1.3	0	-2.7	-2.7	0	0	4
-1.3	0	-2.7	-2.7	0	0	4
-1.3	0	-2.7	-2.7	0	0	4
-1	0	-2	-2	0	0	3

Weitere Bemerkungen

0	0	0	0	0	0	0	0	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	0	0	0	0	0	0	0	0

0	0	0	0	0	0	0	0	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	0	0	0	0	0	0	0	0



-1	0	1
-2	0	2
-1	0	1



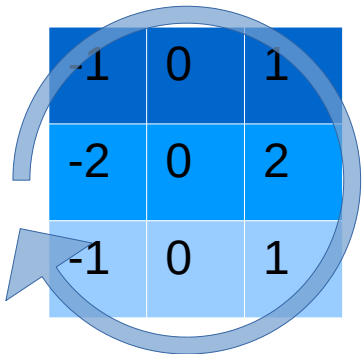
-1	0	1
-2	0	2
-1	0	1

180°

-1	0	-2	-2	0	0	3
-1.3	0	-2.7	-2.7	0	0	4
-1.3	0	-2.7	-2.7	0	0	4
-1.3	0	-2.7	-2.7	0	0	4
-1.3	0	-2.7	-2.7	0	0	4
-1.3	0	-2.7	-2.7	0	0	4
-1	0	-2	-2	0	0	3

0	0	0	0	0	0	0	0	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	0	0	0	0	0	0	0	0

0	0	0	0	0	0	0	0	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	3	3	3	9	9	9	9	0
0	0	0	0	0	0	0	0	0



180°

1	0	2	2	0	0	-3
1.3	0	2.7	2.7	0	0	-4
1.3	0	2.7	2.7	0	0	-4
1.3	0	2.7	2.7	0	0	-4
1.3	0	2.7	2.7	0	0	-4
1	0	2	2	0	0	-3



-1	0	1
-2	0	2
-1	0	1

Beziehung der Operationen

- Wir folgen der Konvention aus der VL:
 - Eine Korrelation/Faltung erfolgt *von links* auch wenn wir in den Beispielen, den Kernel immer rechts dargestellt haben, d.h.
 - $o_m \otimes f^{im}$
für eine Korrelation vom Bild f^{im} mit dem Kernel o_m
 - $o_m \odot f^{im}$
für eine Faltung vom Bild f^{im} mit dem Kernel o_m

Beziehung der Operationen

- Die Beziehung zwischen Korrelation und Faltung können wir damit formal festhalten als:

$$o_m \otimes f^{im}(x_i, y_j) = o_p \odot f^{im}(x_i, y_j)$$

↑
Operatormuster

↑
Impulsantwort vom
Operatormuster