

# Signalbehandling for Computer-ingeniører

**2nd lecture:** Wednesday September 7 at 08:15, Fredrik Bajers Vej 7 in B2-109

## Exercise:

There are many topics and terms involved in today's lecture – all of them important. However, should we point out one specific topic to be considered as the most important one, then it should be "convolution". Looking forward, convolution will be a vital part of all the other topics that we will introduce and discuss in relation to discrete-time systems.

Therefore, today's exercise is all about convolution.

- Make a small strip cartoon (tegne-serie), which graphically illustrates how convolution between two fictitious sequences is conducted.
- Inspired by your cartoon, write a program (Matlab, Python, C,...), which can 1) conduct discrete-time convolution between two sequences  $x_1[n]$  and  $x_2[n]$ , and 2) graphically show the resulting sequence.
- Apply your program to conduct convolution between the following sequences.
  - a)  $x_1[n]=1$  for  $0 \leq n \leq 4$  og  $x_2[n]=1$  for  $0 \leq n \leq 9$
  - b)  $x_1[n]=n$  for  $0 \leq n \leq 4$  og  $x_2[n]=1$  for  $0 \leq n \leq 9$
  - c)  $x_1[n]=e^{-n/2}$  for  $n \geq 0$  og  $x_2[n]=1$  for  $0 \leq n \leq 9$
  - d)  $x_1[n]=e^{-n/2}$  for  $n \geq 0$  og  $x_2[n]=n$  for  $0 \leq n \leq 9$
  - e)  $x_1[n]=\alpha e^{-\alpha n}$  for  $n \geq 0$ ,  $\alpha=0,125$  and  $x_2[n]=\sin(\omega n)$  for  $n \geq 0$ , and  $\omega=0,4$  and  $\omega=1,2$  respectively

OBS..! All sequences are assumed being identical equal to zero outside the give intervals.

*BR Peter Koch*