**EXAM:** Spatial statistics and image analysis (TMS016/MSA301)
Wednesday, June 2, 2021, at 14:00-18:00
Teacher: Aila Särkkä, phone 031 772 3542
Allowed material: Any literature and notes and all types of pocket calculators
and computers are allowed. However, you are not allowed to communicate with
any individual in any way.

1. (15p) A one minute video of swetting is recorded. The images below
   represent snapshots of the video, after 15 (left) and 30 (right) seconds.
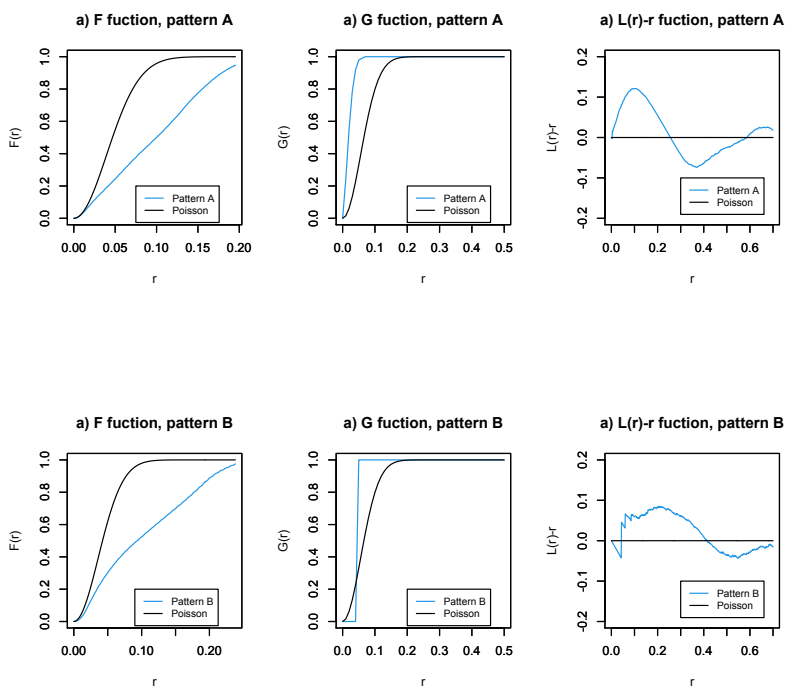   The darker areas are covered by sweat and the lighter areas are dry.
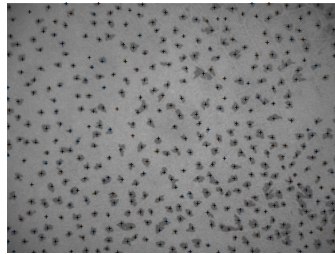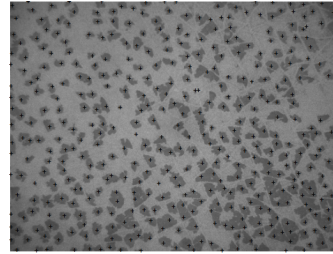
   15s   30s

   a) Suggest and give an outline of at least two methods to detect the wet
      areas in the image on the left (15s). Discuss the advantages/disadvantages
      of the methods.

   b) Propose a method to estimate the locations of the sweat glands.
      Discuss possible drawbacks of your approach.

   c) Describe how size and shape features for the sweat spot areas can be
      estimated from the image on the left (15s). Give at least two size
      and two shape related features.

   d) As seen in the image on the right (30s), neighboring sweat spots tend
      to merge together as sweating continues. Suggest and give an outline
      of a method to detect the merged areas.

2. (15p) We have two point patterns, pattern A and pattern B and we have
   estimated the summary statistics F, G, and a transformed and centered
   version of K, see below. The blue curves are estimated from the data
   (either pattern A or pattern B) and the black curves are the theoretical
   functions corresponding to a Poisson process with the same intensity.

a) F fuction, pattern A   a) G fuction, pattern A   a) L(r)-r fuction, pattern A

a) F fuction, pattern B   a) G fuction, pattern B   a) L(r)-r fuction, pattern B

a) Describe the patterns A and B based on the F and G functions and
   explain your reasoning.

b) Describe the patterns based on the $L(r) - r$ (centered L) function
   and explain your reasoning.

c) Did you draw the same conclusions in a) and b) when comparing F
   and the centered L, G and the centered L, and both F and G and
   the centered L? Why/why not? Explain.

d) Draw two point patterns that would give rise to the summary func-
   tions above concerning pattern A and pattern B, respectively.

e) Sketch a model for pattern A and pattern B, respectively.

Good luck!