



# Statistical methods in forensic genetics

## Train the trainers Workshop

April 20-23 2015

Copenhagen, Denmark

[niels.morling@sund.ku.dk](mailto:niels.morling@sund.ku.dk)

[thore.egeland@nmbu.no](mailto:thore.egeland@nmbu.no)

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### Purpose and audience

The course introduces statistical methods in forensic genetics with applications to relationship inference and mixture interpretation. In addition some more advanced topics, including continuous models for mixtures, familial searching and interpretation of haplotype evidence, will be discussed. The hands on exercises are based on freely available windows - and R software. The course is aimed both for case workers in forensic labs and scientists. Compared to previous Copenhagen train the trainers workshops (<http://arken.umb.no/~theg/Copenhagen2014/>) there is overlap but the software has been updated and so will the teaching material.

### Practical Information

There will be a separate document giving practical information. Please send inquiries by e-mail to Niels Morling – [niels.morling@sund.ku.dk](mailto:niels.morling@sund.ku.dk). Handouts and teaching material are available following links below. This material will be updated and supplemented during the course and you are advised not to print on paper but rather work with the electronic versions.

### Preparations for the course

Participants must bring a reasonably fast laptop with the below applications installed. Assistance for installation will be provided at the workshop, if needed. Note that installation is typically only possible if you are administrator on your laptop.

- LRmix Studio, the successor to the R program LRmix, free of charge and open-source. Please visit <http://lrmixstudio.org/> for more information and download. Please know that you can ask for help by emailing [help@lrmixstudio.org](mailto:help@lrmixstudio.org).
- Familias 3 <http://www.familias.no/>, FamLink and FamLinkX <http://www.famlink.se>.



- R: If you are new to R, you may want to use RStudio that is an IDE (integrated development environment) for R. It makes some tasks easier than using R on its own (saving scripts, saving plots, viewing command history, installing packages etc.). You can download RStudio from <http://www.rstudio.com/products/rstudio/download/>. R and R-packages <http://cran.r-project.org/> including `disclap`, `disclapmix`, `DNAprofiles`, `strvalidator`, and `Familias` will be exemplified.
- Selected [videos](#) and [exercises](#) introducing the software ([Familias 3](#), [FamLink](#), [FamLinkX](#) and [R Familias](#)) are available. Some videos made during the course are also [available](#)

## Programme

### Day 1: Monday April 20, 2015

Until 14:00: arrival of participants

14:00-14:15 Practicalities. Likelihood ratio (Niels Morling, Thore Egeland).

14:15-15:30 [Basic methods and principles](#). (Thore).

15:45-16:15 [Relationship inference with Familias 3](#). (Thore).

16:15-17:00 [Exercises](#) 2.1 and 2.9 and possibly more from Ch 2 (numbered 2.x).

### Day 2: Tuesday April 21, 2015

09:00-10:30 Exercise 2.9 discussed. Advanced topics in relationship inference introduced by [exercises](#): Simulation (2.17). [DVI](#) (3.1 [Solution3\\_1.fam](#)), linked autosomal markers (4.1), and X-chromosomal markers (4.12). (Thore)

10:45-12:30 Exercises above and 3.2.

13:30-15:00 [Introduction to R with hands-on exercises](#) (Mikkel Meyer Andersen).

15:15-16:00 [Haplotype evidence](#) (Mikkel Meyer Andersen).

16:15-17:00 Exercises. [Haplotype exercise](#). Files: [helper\\_functions.R](#), [denmark.csv](#) (data), [haplotype-evidence.Rmd \(notes to exercises\)](#)

### Day 3: Wednesday April 22, 2015



- 09:00-10:30 [Mixtures](#) (45 min, Thore). [Introduction to LRmix Studio](#). (45 min Oskar Hansson).
- 10:45-12:00 [Exercises](#) 1 and 2. Input files for Exercise 2: [Rape2.zip](#).  
Files for [all exercises](#) ( 7.4 Mb, not needed now).
- 12:00-12:30 [Viper project](#). Laurent Pene
- 13:30-15:30 Advanced methods for mixture interpretation.  
Discussion of exercises. [Major-minor-example](#) (30 min, Oskar).  
[Continuous models](#) (45 min, Thore), validation, estimation of parameters.  
[Introduction to strvalidator](#) (45 min Oskar).
- 15:45-17:00 [Exercises strvalidator](#). Input files [strvalidator](#) (zipped)

#### Day 4: Thursday, April 23, 2015

- 09:00-10:30 [Familial searching](#) (Maarten Kruijver). [Exercises](#). [R commands](#)
- 10:45-12:00 [Communicating DNA evidence](#). Fallacies (Hans Jakob Larsen/ Niels).
- 12:00-12:30 Summary

**Lunch:** 12:30 – 13:30.

**Coffe/tea breaks:** 10:30-10:45 and 15:30-15:45.