

# A formulation of the new paradigm for the evaluation of forensic evidence

## CONCERNS:

- ▶ Logically correct framework for evaluation of forensic evidence (ENFSI Guideline for Evaluative Reporting 2015)
- ▶ But what is the warrant for the opinion expressed? Where do the numbers come from? (Risinger at ICFIS 2011)
- ▶ Demonstrate validity and reliability (Daubert 1993; National Research Council 2009; Forensic Science Regulator Codes of Practice 2014)
- ▶ Transparency (*R v T* 2010)
- ▶ Reduce potential for cognitive bias (NIST/NIJ Human Factors in Latent Fingerprint Analysis 2012)

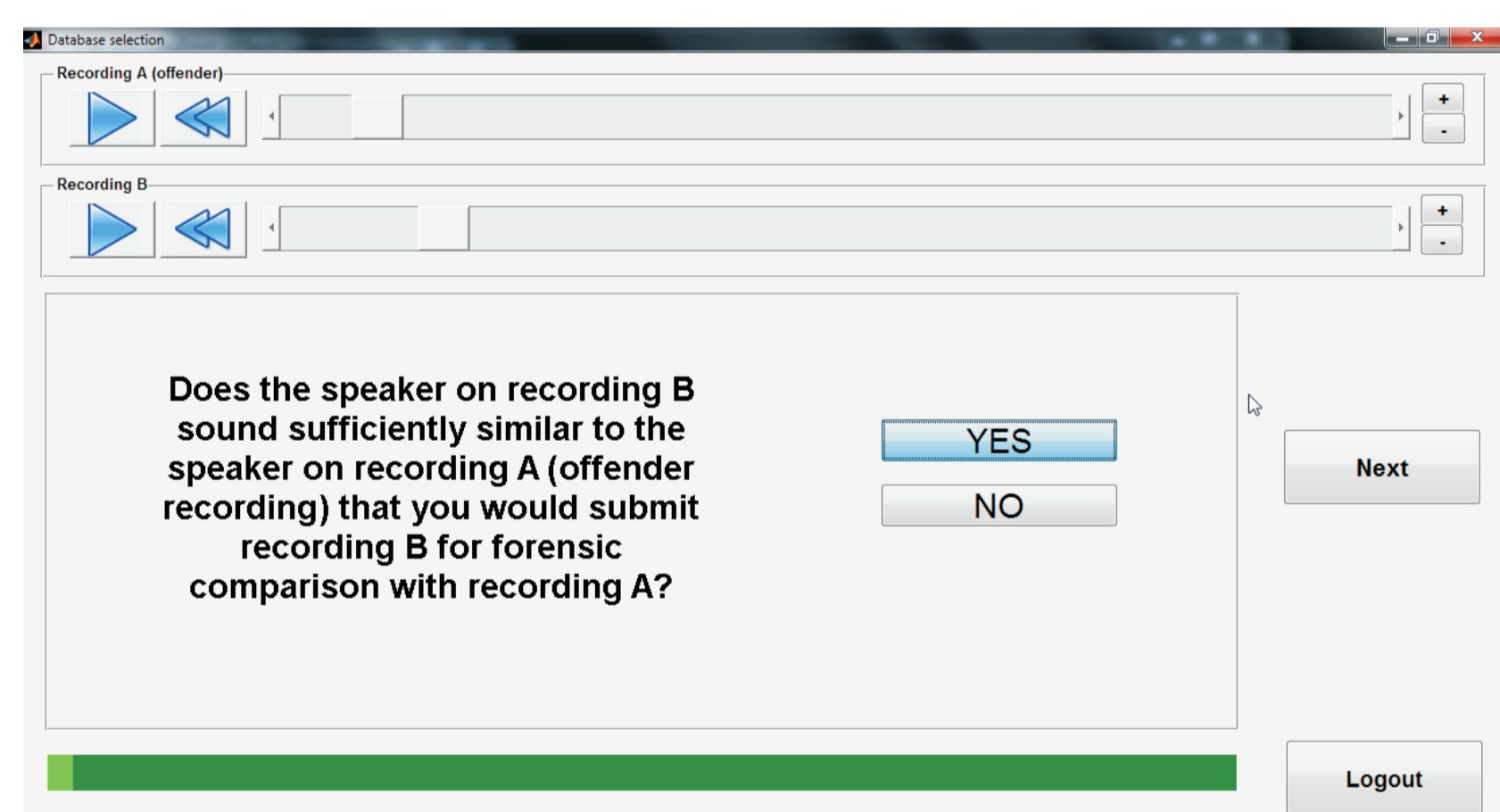
## PARADIGM:

- ▶ Use of likelihood ratio framework
  - ▶ Logically correct framework for evaluation of evidence.
  - ▶ Specific prosecution and defence hypotheses adopted by forensic scientist must be explained to judge at admissibility hearing / trier of fact at trial. Is the question appropriate? Question must be understood in order to understand answer.
- ▶ Calculation of numeric likelihood ratios using relevant data, quantitative measurements, and statistical models
  - ▶ Sample from the relevant population specified in the defence hypothesis. Sufficiently representative?
  - ▶ Data reflective of conditions of suspect and offender samples. Sufficiently reflective?
  - ▶ Report output of statistical model, keep subjective elements far from the conclusion. Do not report conclusions which are primarily or directly based on subjective judgement.
- ▶ Empirical testing of validity and reliability under conditions reflecting those of the case under investigation
  - ▶ Performance under different conditions may be very different.
  - ▶ Sample from the relevant population specified in the defence hypothesis. Sufficiently representative?
  - ▶ Data reflective of conditions of suspect and offender samples. Sufficiently reflective?
  - ▶ Test the system actually employed, including human operator.

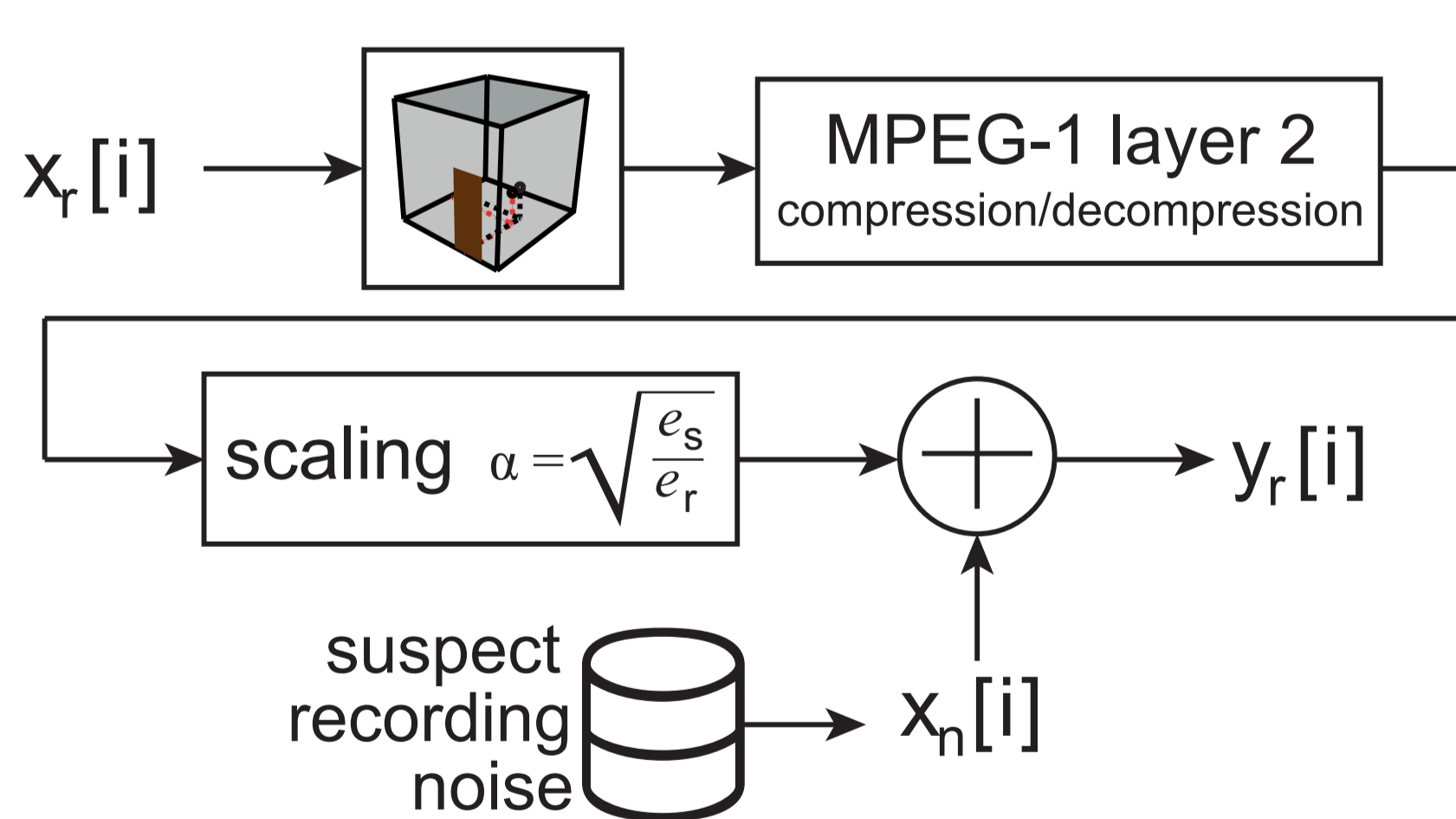
## and an example of its implementation

forensic voice comparison under conditions reflecting those of a real case

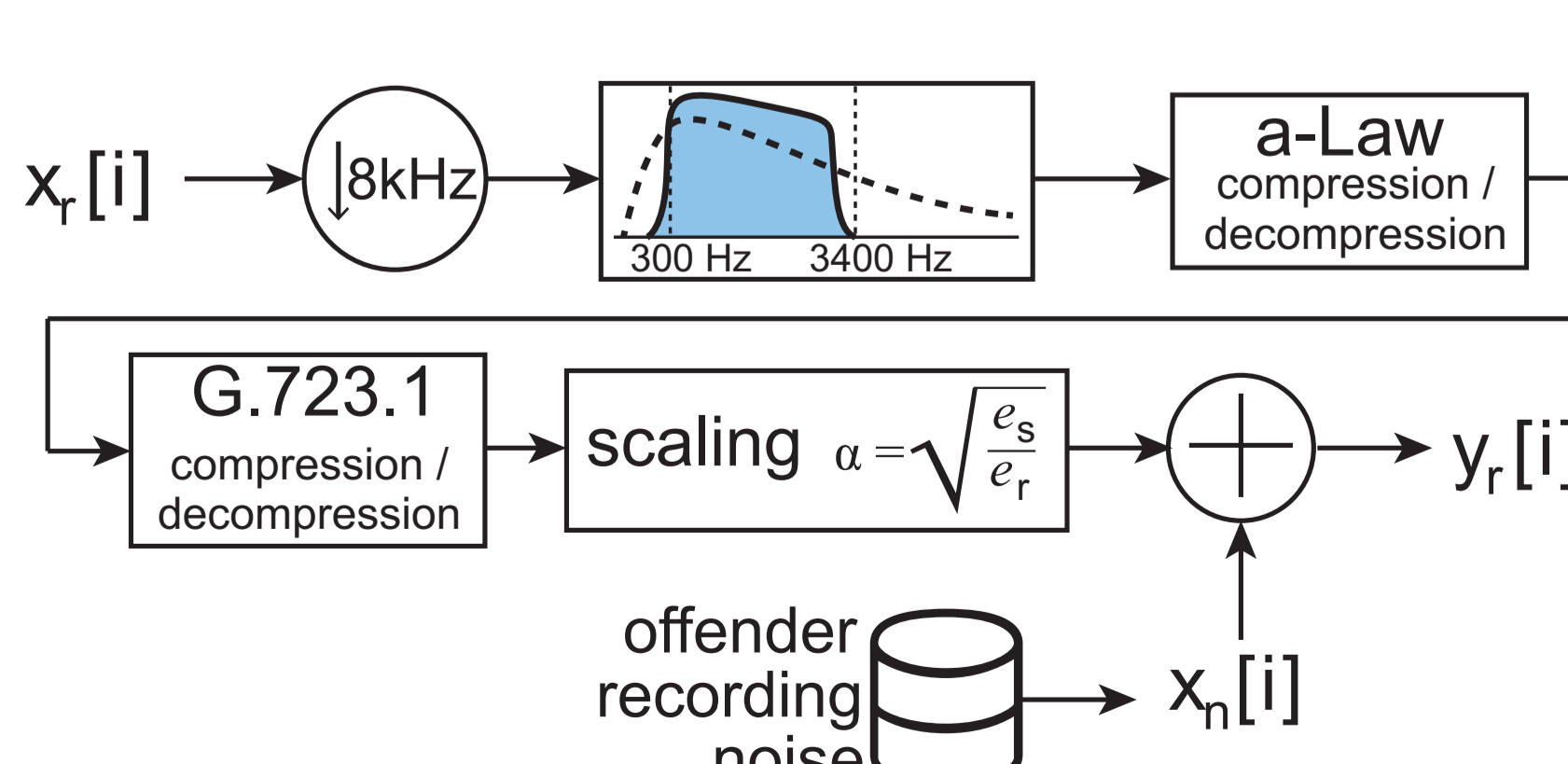
### Selection from database:



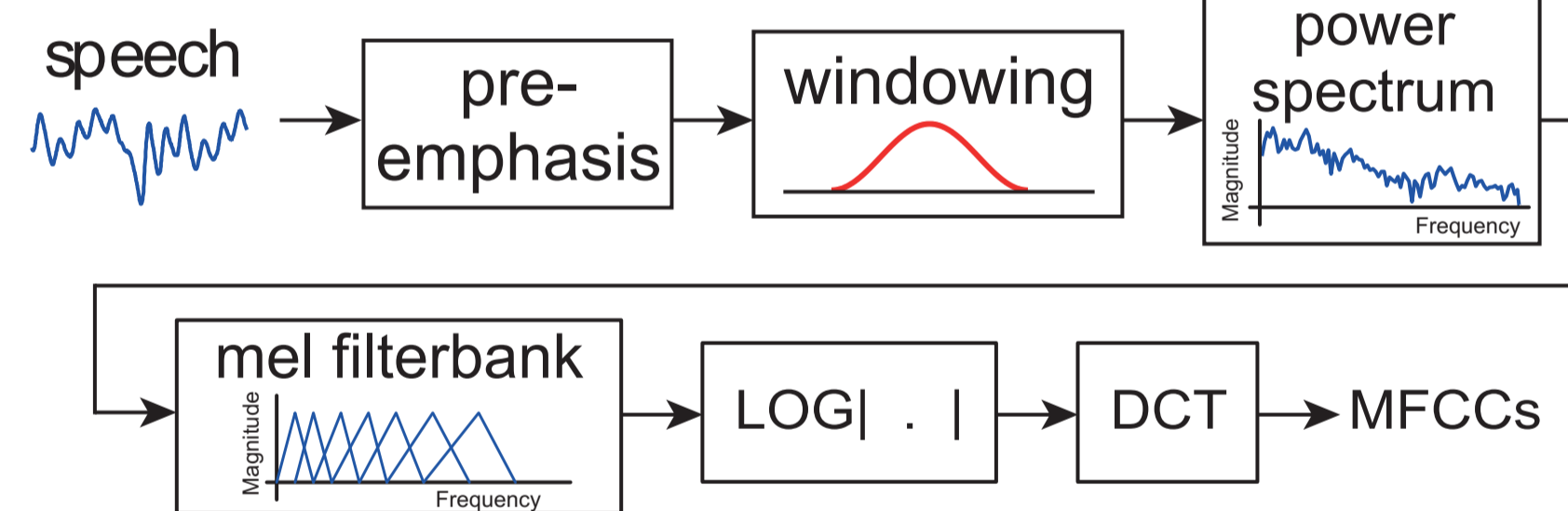
### Simulation of suspect condition:



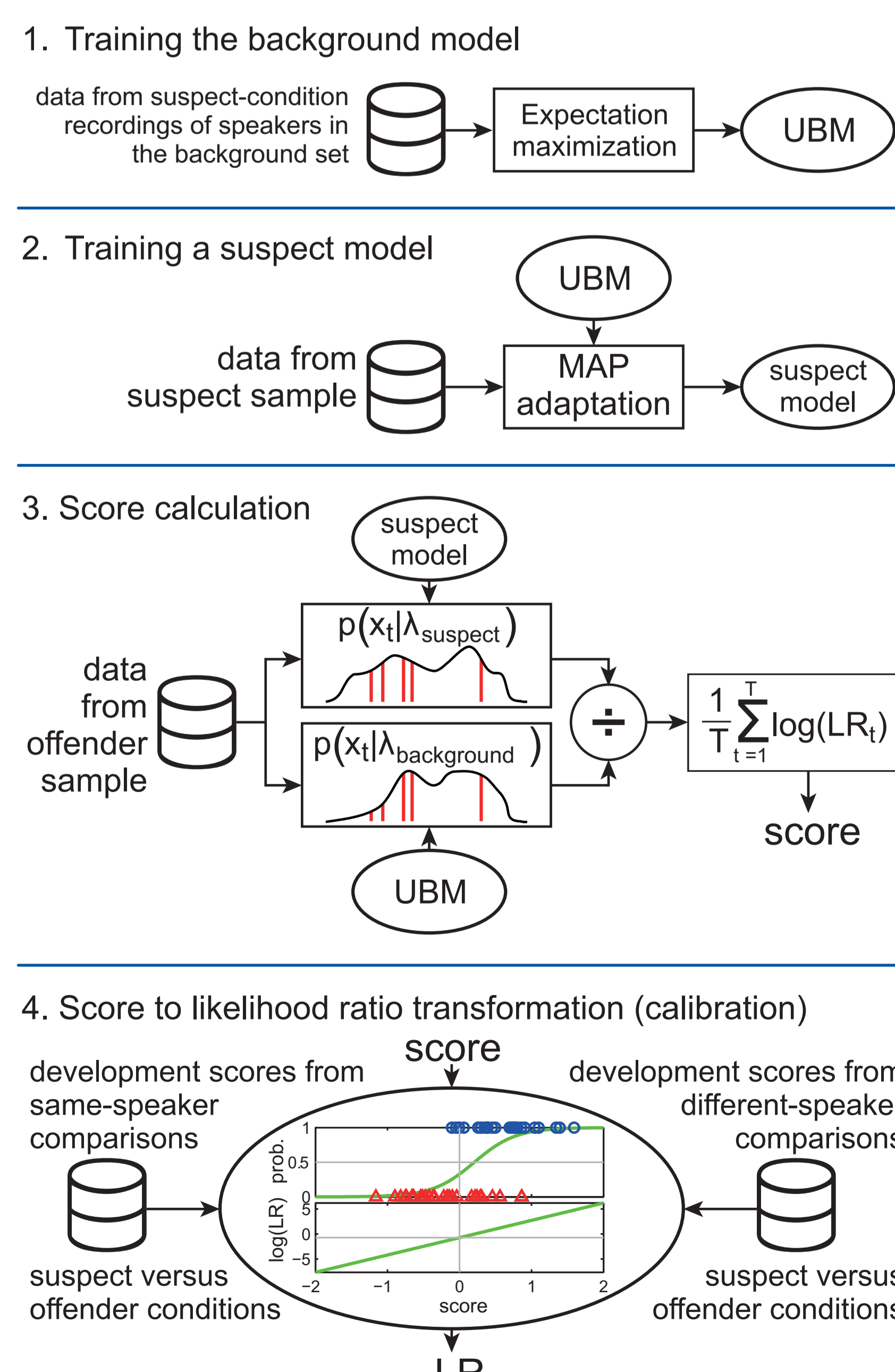
### Simulation of offender condition:



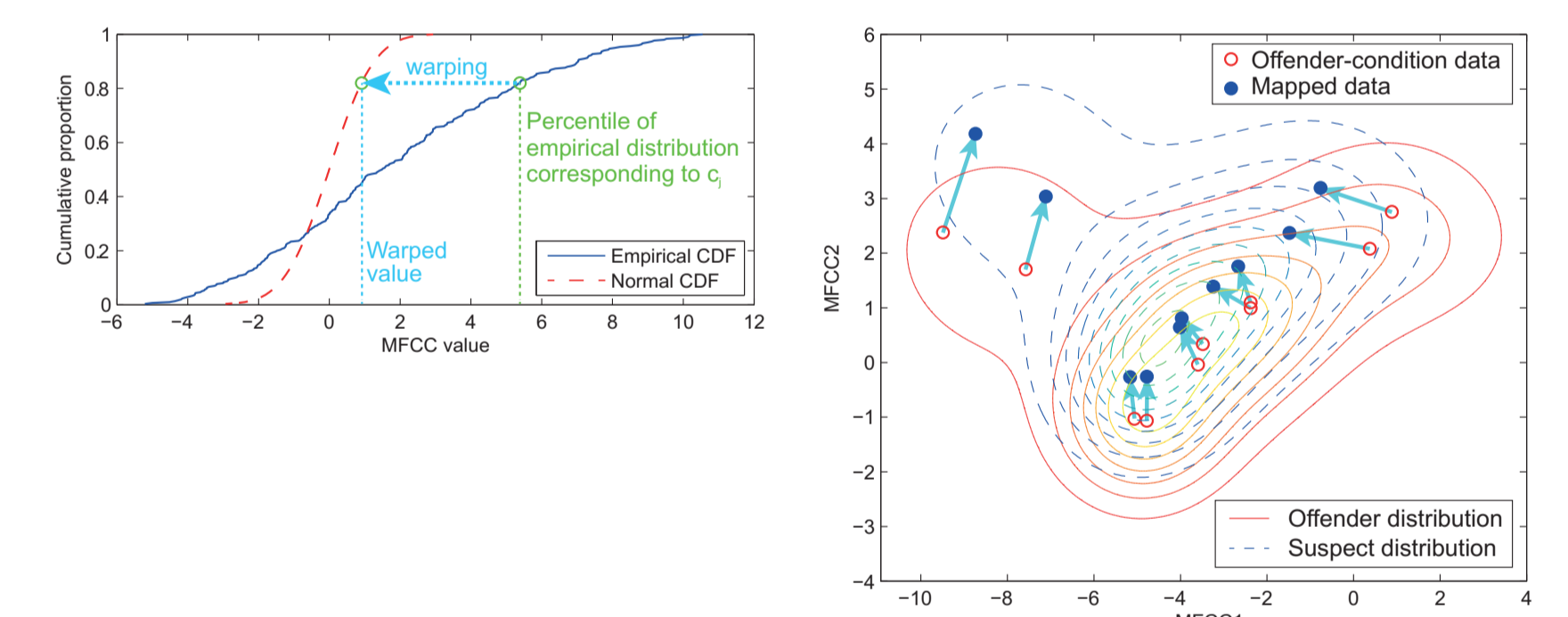
### Acoustic measurement:



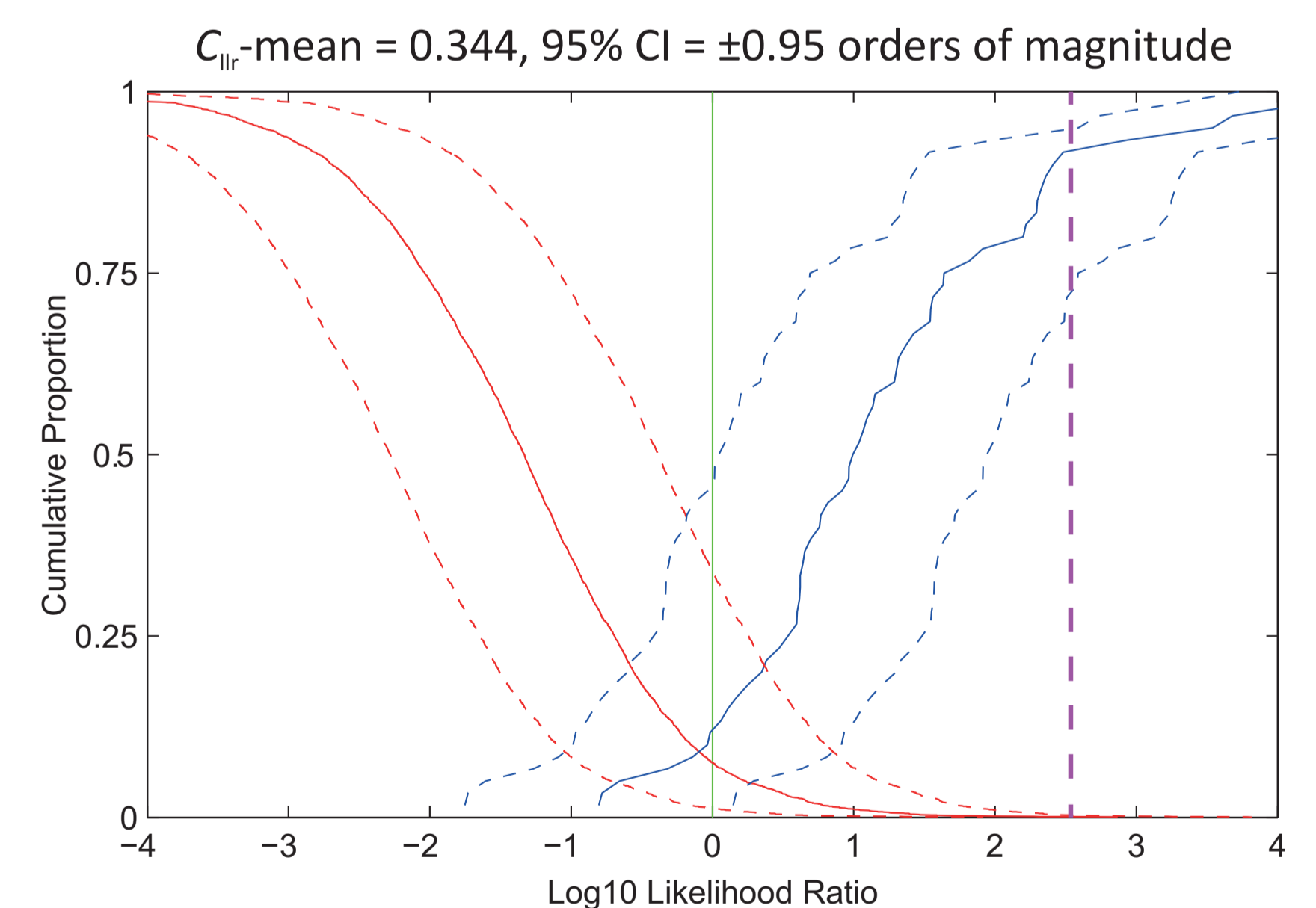
### Statistical modelling:



### Mismatch compensation:



### Testing of validity and reliability:



### Conclusion:

On the basis of our calculations, we estimate that the probability of obtaining the acoustic properties of the offender sample is approximately 300 times higher had it been produced by the suspect than had it been produced by some other speaker randomly selected from the relevant population.

Our best estimate for the strength of the evidence is a likelihood ratio of 343. We are 99% certain that the probability of obtaining the acoustic properties of the offender sample is at least 25 times higher had it been produced by the suspect than had it been produced by some other speaker randomly selected from the relevant population.