

Description of the Bayesian framework

How to define prior distributions for the parameters of the POD model?

Interpretation of the parameters α and β

α and β are not easily interpretable in physical terms \Rightarrow How to evaluate prior knowledge?

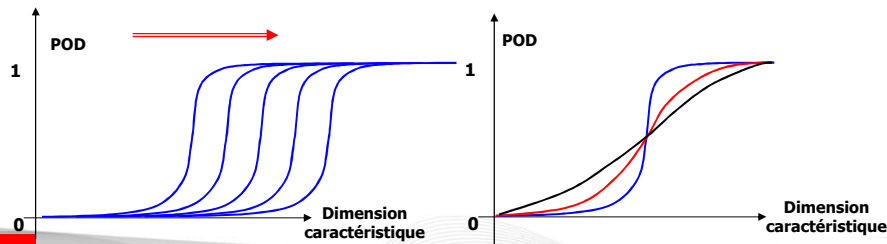
An equivalent form of the logit model is:
$$POD(a) = \left\{ 1 + \exp\left(-\frac{\pi}{\sqrt{3}} \left(\frac{\ln a - \mu}{\sigma}\right)\right) \right\}^{-1}$$

$$\text{With: } \begin{cases} \mu = -\alpha/\beta \\ \sigma = \pi/(\beta \cdot \sqrt{3}) \end{cases}$$

In this form:

$\mu = \ln(a_{0.5})$ where $a_{0.5}$ is the flaw size which is detected with a probability of 50%

σ is the steepness of the POD(a) function. The smaller the value of σ , the steeper the POD(a) function



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Merging of Experimental and Simulated Data Sets with a Bayesian Technique in the Context of POD Curves Determination

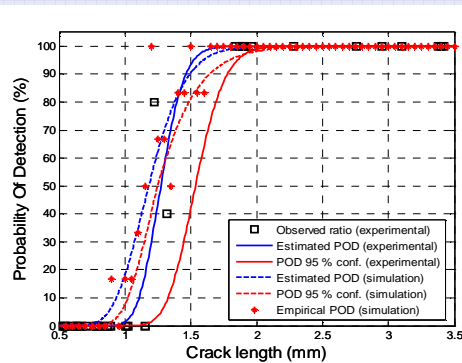
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Bayesian approach to data merging

Simulated vs. Experimental POD curves

- 600 simulated data
- 4 uncertain parameters (start position, crack height, probe angle, elec. contacts)



POD curves very similar

- Slope corrected but still the effect of the number of data

- Confidence band smaller for simulation dataset because more data than in the experimental dataset

Values of interest very similar

$$\begin{cases} a_{90}^{\text{exp}} = 1.5 \text{ mm} \\ a_{90/95}^{\text{exp}} = 1.8 \text{ mm} \end{cases} \quad \begin{cases} a_{90}^{\text{simu}, EC} = 1.5 \text{ mm} \\ a_{90/95}^{\text{simu}, EC} = 1.7 \text{ mm} \end{cases}$$

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