

The background of the slide is a dense field of 3D-rendered numbers (0-9) in various shades of light blue and white. The numbers are scattered across the frame, creating a sense of depth and data. A dark blue rectangular box is overlaid on the right side of the image, containing the title and author information in white text.

Simultaneous fitting of Bayesian penalised quantile splines

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Problem

- ◆ Bayesian Simultaneous estimate of non-parametric quantile curves is challenging
- ◆ Requires a flexible and robust model whilst satisfying the monotonicity or non-crossing constraints on the quantiles.

Quantile pyramids

- ◆ Introduced by Hjort & Walker(2009)*
- ◆ Method for creating random probability measure via the quantile function

X
X X
X X X

- ◆ Growing with 2^{m-1}

Quantile pyramids for penalised splines

- ◆ For a given quantile level, it is considered the use of cubic splines to the model quantile curves
- ◆ Since model is parameterized in terms of quantiles $\rightarrow K + 4$ separate quantile pyramids to represent prior quantile at each location
- ◆ Values Penalized by a submatrix of the penalty matrix. $(K + 4) \times (K + 2) \Rightarrow (k + 4) \times (K + 4)$

Conclusion

- ◆ Method shows robust results at moderate deviations from the centred prior
- ◆ When the deviations are more severe the model produce unreliable results. This is because of the Gaussian distributions lacking flexibility.

Solution

- ◇ Use more flexible centring distributions:
 - ◇ Linear quantile regression
 - ◇ three parameters Student's t-distribution