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Estimation of fibre length distribution from CT Data using fibre endpoints

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Fibre reinforced polymers are of great import for many modern applications. The mechanical properties of fibre reinforced polymers is governed by the length and orientation of the fibres embedded in the polymer matrix. The usual method to estimate the length distribution of fibres is to ash the sample and measure the length of the fibres by optical means. Our goal is to estimate the length distribution from CT data alone.

A full fibre segmentation from CT images is still a challenge due to poor image quality. Recent work gave us the ability to segment the fibre endpoints using Gaussian curvature. We will use this fibre endpoint process to estimate the length distribution using summary statistics.

We will first model the end points as a Neymann Scott process, this implies overlapping fibres. With this model we can derive a formula for the reduced second moment measure and use it to estimate the length distribution. We will evaluate this estimator in respect to its usability on real life data. We will then present a further parametric approach using minimum contrast estimation. We will again look at a Neymann Scott model first to study the feasibility of this approach. We will then generalise the approach to get a method to estimate on non overlapping fibres.