Although it may be difficult to formulate all the problems in image analysis in terms of random fields and kernel smoothing, it can be done nonetheless. I put references that I am familiar with so these are not the complete list of bibliography. Most references are cross-listed.

3. Gaussian mixture. This is widely used statistical model for image segmentation. Most methods combines EM algorithm with a Bayesian prior.

2. Robert and Casella’s Monte Carlo Statistical Methods for the introduction to EM.
3. Flury’s A First Course in Multivariate Statistics.

4 and 5 Non mixture-based segmentation. Neural-network based segmentations are often used. Deformable surface tend to segment geometrically complex boundaries nicely.


6. Similarity measure This is an interesting concept.

8. Image Registration. Most interesting image registration algorithms find applications in medical imaging.


9. Random Fields. It is natural to model image as continuous functional data due to extremely high sampling density. Average brain image consists of $200 \times 200 \times 100 = 2$ million voxels or more.

1. Adler, Geometry of Random Fields. 1980
10. Courant and Hilbert. 1953
11. F. Riesz and B. Sz.-Nagy’s Functional Analysis (1955)

10. **Linear additive model and other statistical models** Most references are on fMRI time series analysis but should be applicable on other imaging modalities.


11. **Curve modeling** It could mean many things. Since a curve can be characterized by curvature, it includes the estimation of curvature and stochastic modeling on curvature function.

5. Taubin’s seminal paper on the shrinkage effect
8. Osher, Level set.

12. **Surface modeling** Surface modeling is much harder than curve modeling due to the non Euclidean nature of most surfaces


14. H. Edelsbrunner’s Geometry and Topology for Mesh Generation,


### 13. Kernel smoothing

Due to simplicity and speed, it is most widely used method for reducing noise. It is a form of integral transform.


6. Nadaraya, 1964

14. Diffusion smoothing. There are a lot of diffusion smoothing paper in computer vision but none of them use it as a way to improve Gaussianity.


15. Heat kernel smoothing. This is a differential geometry problem.

2. I Chavel’s Eigenvalues in Riemannian geometry (Academic Press, 1984)
6. Ekholm, T., 2004

9. Chen et al., 2001, CVPR.

10. Chu et al. (1998. JASA)

11. Huber in Robust statistics 1981


16 Directional Smoothing and other smoothing techniques

Smoothing vector and tensor fields


2. Grace Wahba, Spline Models for Observational Data.


17 False discovery rate (FDR) and Permutation test

This is a somewhat new method for performing multiple comparisons. It is not as popular as the random field theory in neuroimaging.


18. Random Fields Theory (RFT) (Corrected P-value)

It usually refers to random fields based multiple comparison correction methodology in neuroimaging. P-value that takes care of multiple comparison is called the corrected P-value.


