# 1 Software group: visualization

Some of the major discussion points:

1. Data format to start working (type of object) for explanatory analysis

2. Visualization: see other group and visualization group discussion.

3. Output and common framework for the data

- **What format to put the data**: either `geoR`, `sp` or `spacetime` for spatio-temporal data, while `ggplot` can be used for plotting; it requires data frame objects, which could be extracted from the previous packages. Building tools to switch between formats.

- Ways to explore the data easily for **explanatory analysis**: Possible representation would be to overlay on spatial domain a field for covariate with symbols or blops of different size representing the response or even better shades of grey as overlay. If the object is space time, animation with slices, possibly with `animate`: problems with portability (gif file for example) with image magic (see web). Can use `fields` or `ggplot` with `RColorBrewer`.

- Covariate density/histograms, data gridded according to the covariates, overlay plots, summary both in space (and time).

- Start with easy methods: static plots, locator, toward interactive or animation (we need to explore the capacities of these packages as to not reinvent the wheel). Starting with the basis and possibly extending the methods.

- Note: `geoR` has an extra slot for an extra realization, so we can do sequential plotting running through the columns.

**Objects to display**

- Debate for other groups: how to visualize the uncertainty: bootstrap or posterior draws to get envelope for the covariance function? It may be very dependent on influential values. Correlation matrix are also meaningful mostly for elliptical models.

- Need to know what people want to see displayed and what are the common results they usually consider, as well as the popular ways of plotting.

- Do not want yet to make a distinction between the frequentist and Bayesian approaches, need to find things common to packages and methods. Priority should be on general output common.

## Output

- End result of covariance matrix and marginal covariance: pick a point and get field representation with dependence. Standard tools for matrix display or for other general functions.

- Blanket function which allows sample for space or time (which can be fixed) for predictions, predictive uncertainty, spatially varying parameters, and plot sequentially in order with space or time. Storage output of model pointwise or a grid (in a data frame), and get images from them.

- For multivariate display, use of the ellipse (principal axis (major and minor axis), or scale and rotation), L diagram, an extension to 2d of the vector field (length or width); these are usually less crowded than ellipsis. Develop arguments to control the subset and helper files for the function. Having standard output format for plotting from the different functions.

- Note: ellipsis or static approach with `locator` (interactive two plots) `rgl` - Reinhard has some code to synchronize code between two windows.

There was a discussion two days ago about having different between output for (1) a paper and (2) explanatory post-inference analysis with interactive plots or program with slider to change different parameters (more complicated).

**Post discussion comments**

None of the discussion revolved around large scale or global data. It may be complicated for a given point to get covariance between a location and nearby (Johan's comment) as we then need to invert the precision matrix. If the data is irregularly spaced or the sampling in time is different for each points, then plotting may get more complicated. The image function will have to compromise between simplicity and feasibility. 3 dimensional data can be obtained via 3d-plots with rotation.