Statistical Computing - Exercises 11 - Spatial Modeling of Ames Housing Data

```
ames <- read.csv( "../datasets/ames_housing.csv")
```

Exercises

1. Make two informative spatial plots of the data. One of them should visualize the sale prices of the data. Use plotting symbols, colors, etc. to get as much important information about the houses into the plot, without being overwhelming visually. For a challenge, try to get the spatial aspect ratio close to correct (recall how spherical coordinates work). Indicate on your plot where the outliers mentioned in the video are.
2. Remove the outliers from all of your model fits below.
3. Fit two models to the sale prices. One should not include neighborhood effects, and one should. Include at least one important variable not discussed in the video. Display the non-neighborhood model coefficients side by side.
4. Make two new spatial plots of the *residuals* of the sale prices from the two models, side by side. Be careful here because residuals can be negative. Make sure to distinguish between positive and negative residuals in the plot. Describe the differences between the two plots.
5. Use the `fit_model` function from the GpGp R package to fit a spatial model to the data. You will have to read some documentation, but here are a couple of hints: use the `matern_sphere` covariance function, and use the `model.matrix` function to construct the design matrix. Display the coefficients from your fitted model in comparison to your previous models. (make sure you set `silent = TRUE` to avoid printing optimization information).
6. Use `expand.grid` to create a 50 by 50 spatial grid of locations that covers the locations in the dataset. Make a spatial plot showing the locations of the houses and the grid points.
7. Use the `predictions` function from the GpGp R package to predict the price of a typical home located at all of the grid locations. "Typical home" means that you have to select values of all of the covariates in your model. For numeric covariates, select the average value, and for factors, select the most common factor level.
8. Make a spatial map of the predicted values. To make a really nice one, consider using the `image` function or the `image.plot` function from the fields package.