Lab 7

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Validation sample seems fairly representative of the larger data set, as it has about the same mean and distribution shape. However, the most salient outliers are not captured by the validation data set.

According to the sum of squared errors across the two variogram model fits, the exponential fit is more suited to our data. According to Figure 6 and Tables 4 and 5, spherical model seems to have lower overall variance across the spatial grid. However, between validation (Table 2) and cross-validation (Table 3), it becomes less clear which model is better overall.

Looking at Figures 4 and 5, we can see that both exponential and spherical models predict the data with similar accuracy, interpolating values similar to the nearest locational equivalents obtained by sampling nickel (Ni) for the geochemical data set. Both models seem to produce the same geochemical pattern across space.

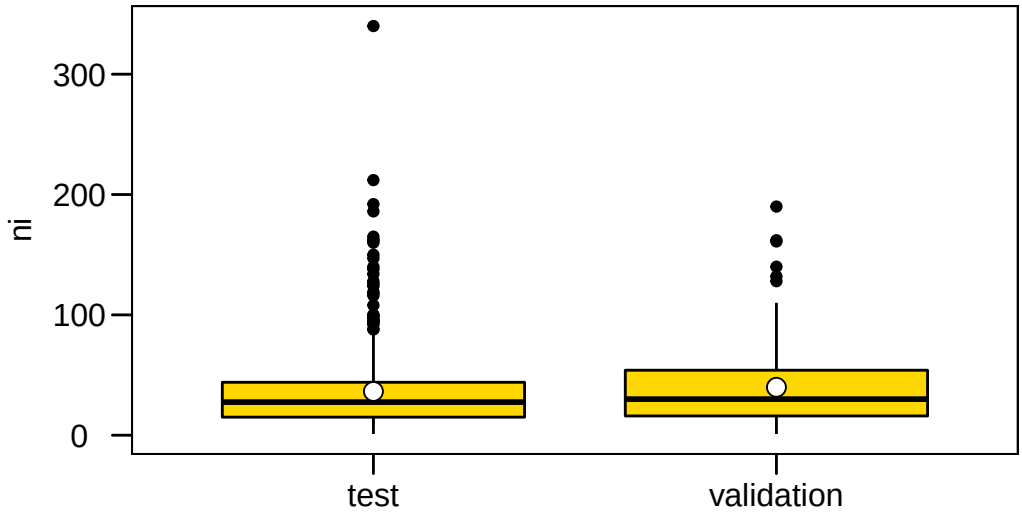

Figure 1: Boxplot (test vs. validation samples)

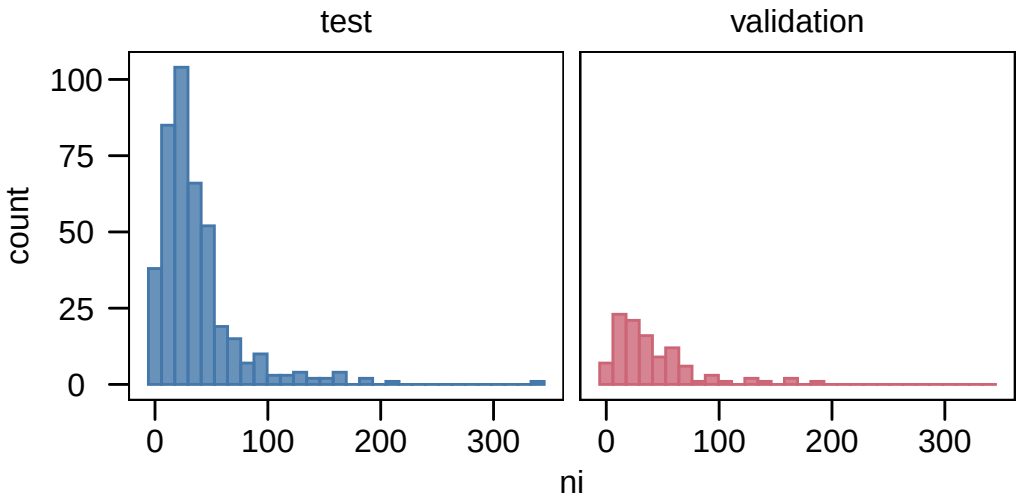

Figure 2: Histogram (test vs. validation samples)

Table 1: Sum of squared errors for 2 variogram model fits

SSE	variogram fit
1.00769	spherical
0.79644	exponential

Table 2: Validation

RMSE	ME	variogram fit
30.09668	0.46293	spherical
32.37127	-0.01077	exponential

Table 3: Cross-validation

RMSE	ME	MSDR	variogram fit
26.49496	-0.04714	1.15183	spherical
26.15775	-0.09076	1.16540	exponential

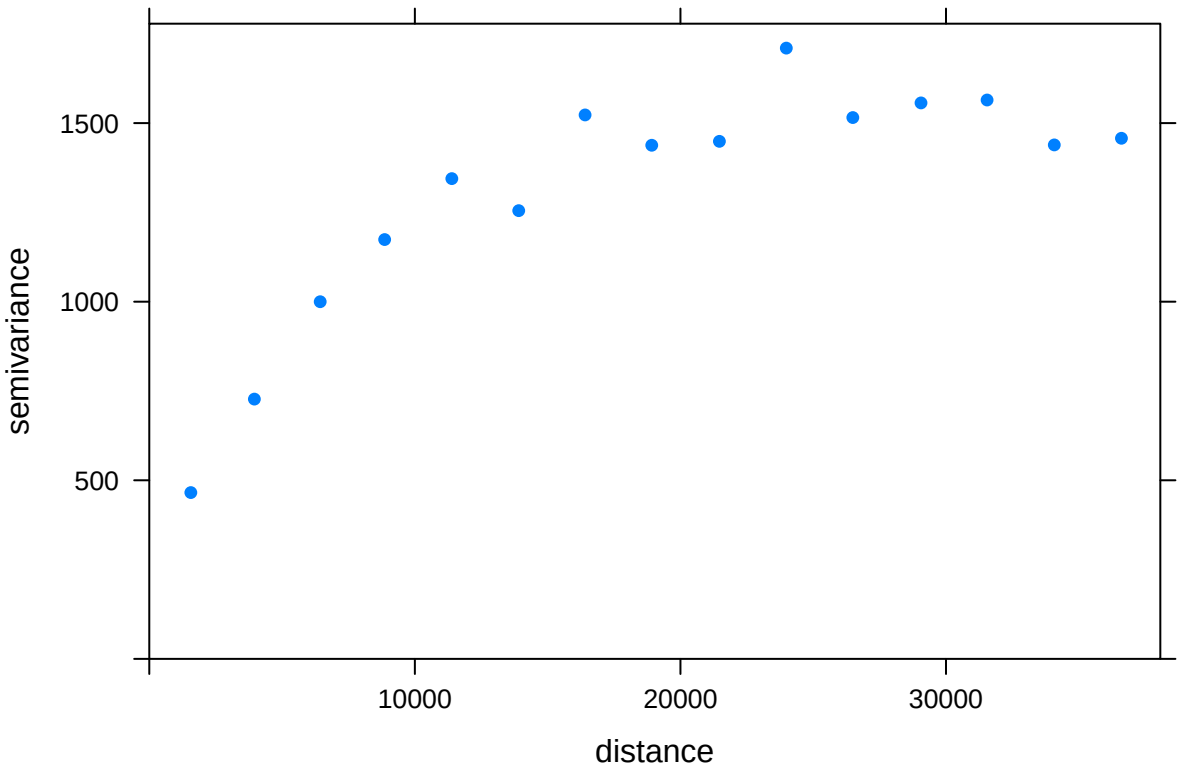

Figure 3: Variogram

Table 4: Spherical kriging predicted values and variances

var1.pred	var1.var
Min. : 2.214	Min. : 427.4
1st Qu.: 22.502	1st Qu.: 565.7
Median : 32.465	Median : 628.1
Mean : 39.174	Mean : 697.7
3rd Qu.: 48.081	3rd Qu.: 713.0
Max. :201.728	Max. :1826.1

Table 5: Exponential kriging predicted values and variances

var1.pred	var1.var
Min. : 1.662	Min. : 302.8
1st Qu.: 22.343	1st Qu.: 544.1
Median : 32.225	Median : 648.5
Mean : 38.998	Mean : 705.3
3rd Qu.: 48.586	3rd Qu.: 772.1
Max. :227.887	Max. :1788.2

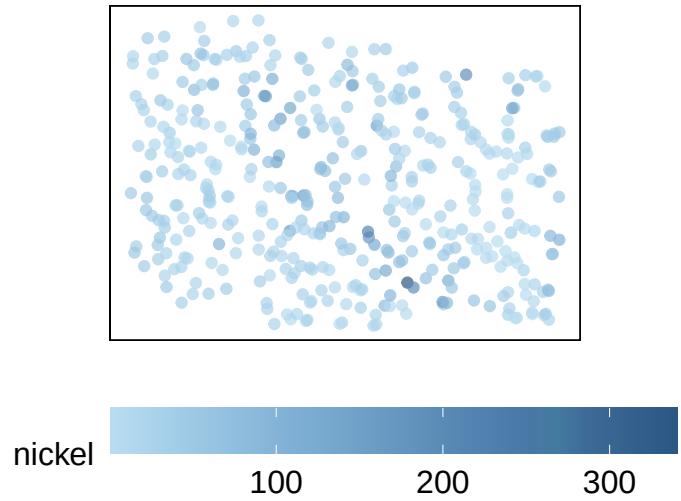

Figure 4: Actual data

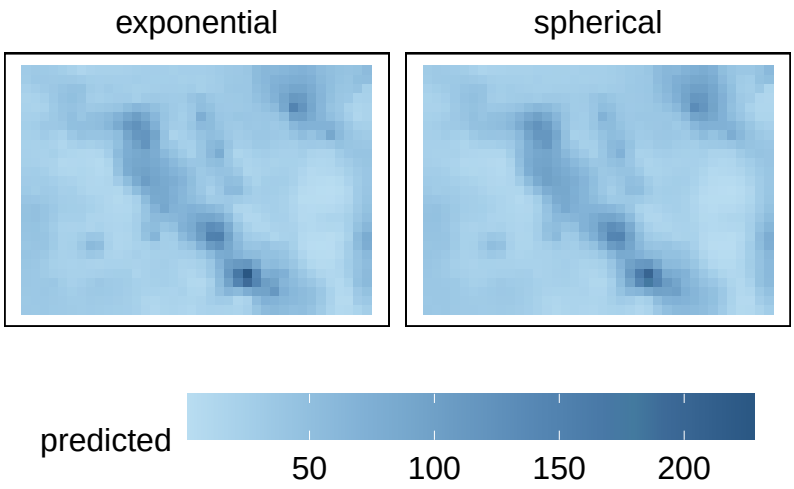

Figure 5: Kriging predictions

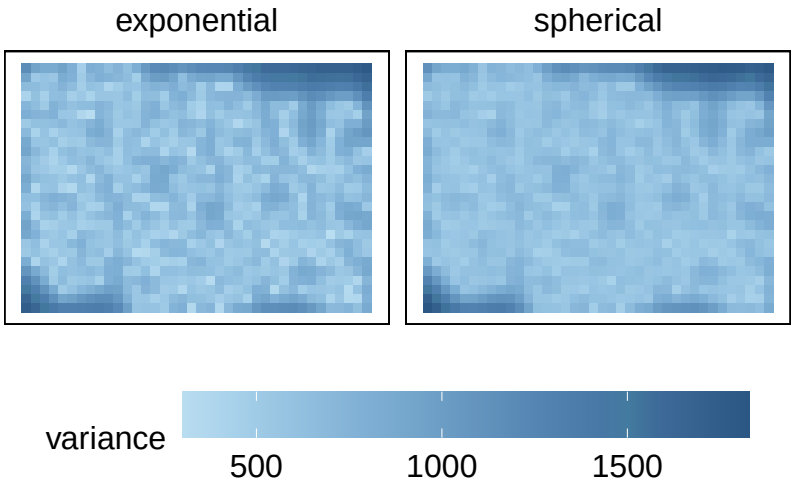

Figure 6: Kriging variance

```
## R version 3.6.2 (2019-12-12)
## Platform: x86_64-apple-darwin15.6.0 (64-bit)
## Running under: macOS Sierra 10.12.6
##
## Matrix products: default
## BLAS:   /Library/Frameworks/R.framework/Versions/3.6/Resources/lib/libRblas.0.dylib
## LAPACK: /Library/Frameworks/R.framework/Versions/3.6/Resources/lib/libRlapack.dylib
##
## locale:
## [1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8
##
## attached base packages:
## [1] stats     graphics  grDevices utils     datasets  methods   base
##
## other attached packages:
##  [1] knitr_1.29      nlme_3.1-149    broom_0.7.0     gstat_2.0-6
##  [5] ggthemes_4.2.0  rgdal_1.5-16    rebus_0.1-3     sf_0.9-5
##  [9] sp_1.4-2        forcats_0.5.0   stringr_1.4.0   dplyr_1.0.2
## [13] purrr_0.3.4     readr_1.3.1     tidyr_1.1.2     tibble_3.0.3
## [17] ggplot2_3.3.2   tidyverse_1.3.0
##
## loaded via a namespace (and not attached):
##  [1] httr_1.4.2           jsonlite_1.7.0       here_0.1
##  [4] modelr_0.1.8         assertthat_0.2.1     highr_0.8
##  [7] blob_1.2.1           cellranger_1.1.0     yaml_2.2.1
## [10] pillar_1.4.6         backports_1.1.9      lattice_0.20-41
## [13] glue_1.4.2           digest_0.6.25        rvest_0.3.6
## [16] colorspace_1.4-1     htmltools_0.5.0      pkgconfig_2.0.3
## [19] rebus.unicode_0.0-2  haven_2.3.1          rebus.numbers_0.0-1
## [22] scales_1.1.1         intervals_0.15.2     farver_2.0.3
## [25] generics_0.0.2       ellipsis_0.3.1       withr_2.2.0
## [28] cli_2.0.2            magrittr_1.5         crayon_1.3.4
## [31] readxl_1.3.1         evaluate_0.14        fs_1.5.0
## [34] fansi_0.4.1          rebus.base_0.0-3     xts_0.12-0
## [37] xml2_1.3.2           class_7.3-17         FNN_1.1.3
## [40] tools_3.6.2          hms_0.5.3            lifecycle_0.2.0
## [43] munsell_0.5.0        reprex_0.3.0         compiler_3.6.2
## [46] e1071_1.7-3          spacetime_1.2-3      rlang_0.4.7
## [49] classInt_0.4-3       units_0.6-7          grid_3.6.2
## [52] rstudioapi_0.11      labeling_0.3         rmarkdown_2.3
## [55] gtable_0.3.0         DBI_1.1.0            R6_2.4.1
## [58] zoo_1.8-8            lubridate_1.7.9      rprojroot_1.3-2
## [61] KernSmooth_2.23-17   rebus.datetimes_0.0-1 stringi_1.4.6
## [64] Rcpp_1.0.5           vctrs_0.3.4          dbplyr_1.4.4
## [67] tidyselect_1.1.0     xfun_0.16
```