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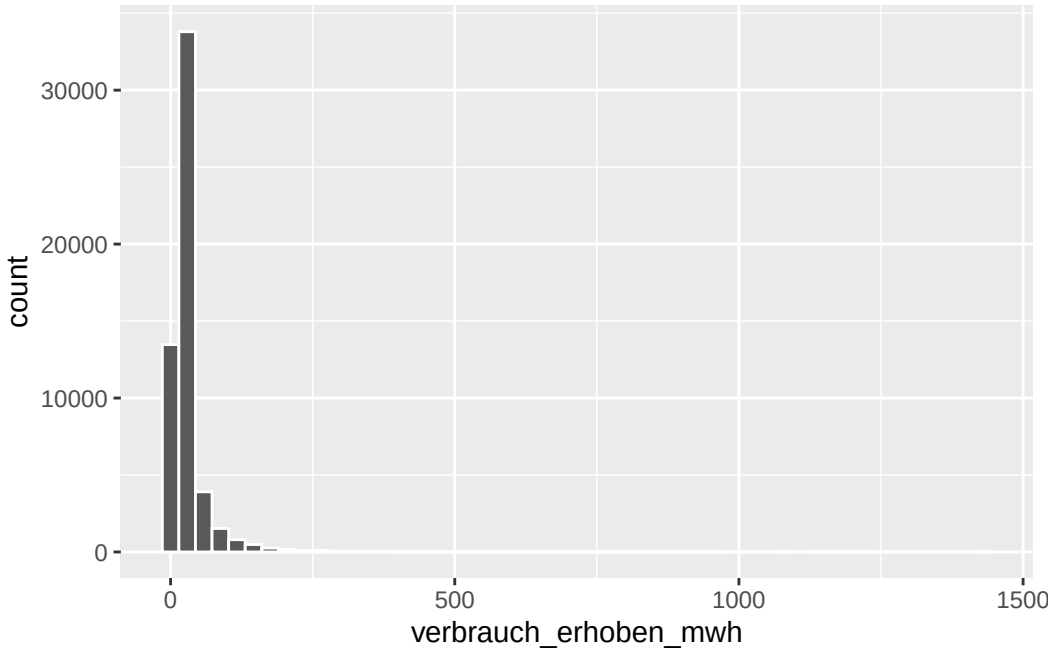
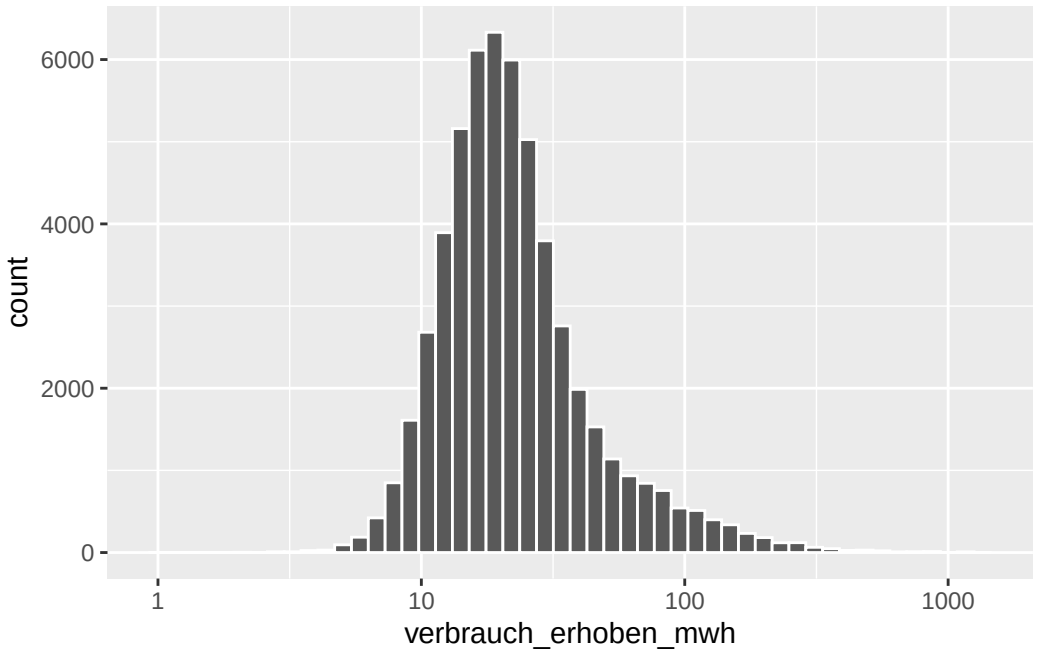
Exploratory Analysis



As the histogram is right-skewed (a few houses with a high energy use), it makes sense to log-transform.

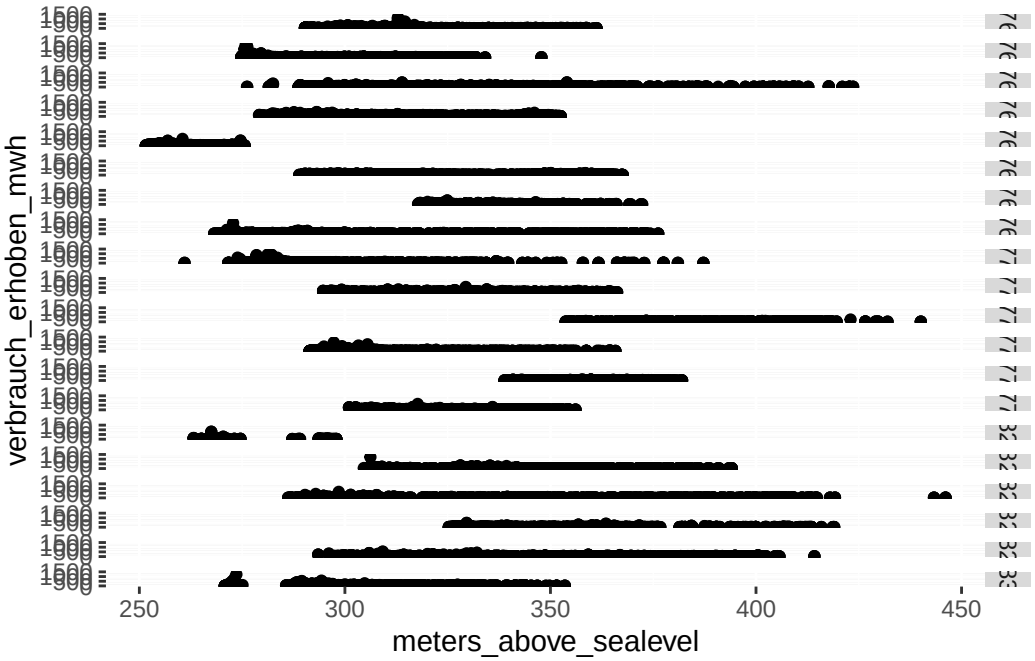



```
correlations <- energy_clean %>%
  select(where(is.numeric)) %>%
  correlations()
#> Warning in stats::cor(x, use = use, method = method): the standard deviation is
#> zero
```

```
energy_clean_log <- energy_clean %>%
  mutate(verbrauch_erhoben_mwh_log = log(verbrauch_erhoben_mwh))
```

Per community

```
community_plot <- energy_clean %>%
  ggplot(aes(x = meters_above_sealevel, y = verbrauch_erhoben_mwh)) +
  geom_point() +
  facet_grid(rows = vars(ggdenr))

community_plot
```


verbrauch_erhoben_mwh
meters_above_sealevel
250
300
350
400
450

Train/test split

```
#> Set the random number stream using `set.seed()` so that the results can be
#> reproduced later.
set.seed(501)

#> Save the split information for an 80/20 split of the data
energy_split <- initial_split(energy_clean_log, prop = 0.80, strata = verbrauch_erhoben_mw
energy_split
#> <Training/Testing/Total>
#> <43885/10973/54858>


#> Creating train and test set
energy_train <- training(energy_split)
energy_test  <-  testing(energy_split)

dim(energy_train)
#> [1] 43885    57

#> Resampling train set
set.seed(123)
folds <- vfold_cv(energy_train, v = 5, strata = verbrauch_erhoben_mwh)
folds
#> #  5-fold cross-validation using stratification
#> # A tibble: 5 x 2
#>   splits               id
#>   <list>               <chr>
#> 1 <split [35106/8779]> Fold1
#> 2 <split [35106/8779]> Fold2
#> 3 <split [35108/8777]> Fold3
#> 4 <split [35110/8775]> Fold4
#> 5 <split [35110/8775]> Fold5
```

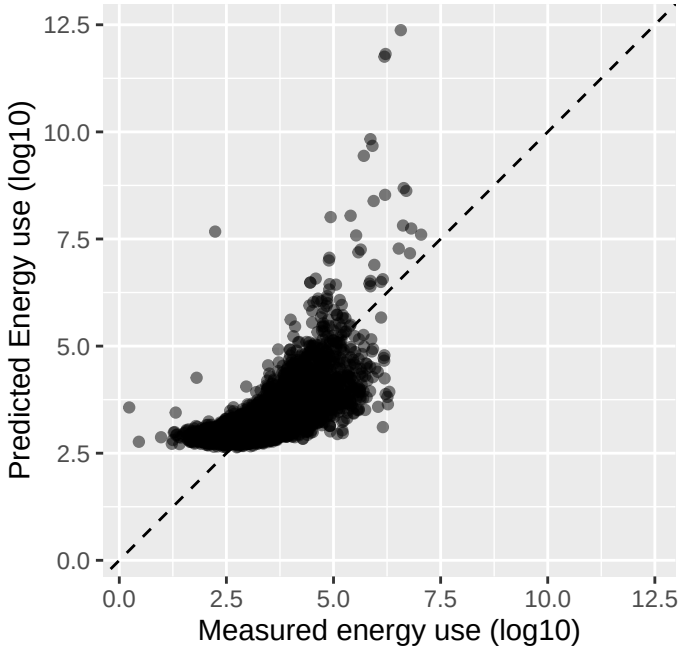
Model fitting

```
lm_model <-
  linear_reg() %>%
  set_engine("lm")

lm_form_fit <-
  lm_model %>%
  fit(verbrauch_erhoben_mwh_log ~ bruttogeschossflaeche + gkode + gkodn + erhebungsjahr, d

lm_form_fit
#> parsnip model object
#>
#>
#> Call:
#> stats::lm(formula = verbrauch_erhoben_mwh_log ~ bruttogeschossflaeche +
#>     gkode + gkodn + erhebungsjahr, data = data)
#>
#> Coefficients:
#>           (Intercept)  bruttogeschossflaeche                 gkode
#>             4.967e+01              1.454e-03              1.496e-08
#>                 gkodn          erhebungsjahr
#>             1.338e-05             -3.167e-02
```

```
tidy(lm_form_fit)
#> # A tibble: 5 x 5
#>   term                        estimate   std.error statistic   p.value
#>   <chr>                          <dbl>       <dbl>     <dbl>     <dbl>
#> 1 (Intercept)           49.7          3.17          15.7    2.57e- 55
#> 2 bruttogeschossflaeche  0.00145      0.00000651   223.     0
#> 3 gkode                  0.0000000150 0.000000465    0.0322 9.74e-  1
#> 4 gkodn                  0.0000134    0.000000818   16.4    4.72e- 60
#> 5 erhebungsjahr         -0.0317       0.00127      -25.0    6.48e-137
```

```
prediction <- predict(lm_form_fit, energy_test)

test_res <- bind_cols(prediction, energy_test %>% select(egid, gbez, verbrauch_erhoben_mwh
```

```
ggplot(test_res, aes(x = verbrauch_erhoben_mwh_log, y = .pred)) +
  #> Create a diagonal line:
  geom_abline(lty = 2) +
  geom_point(alpha = 0.5) +
  labs(y = "Predicted Energy use (log10)", x = "Measured energy use (log10)") +
  #> Scale and size the x- and y-axis uniformly:
  coord_obs_pred()
```




```
ggplot(energy_clean, aes(x = log(verbrauch_erhoben_mwh), y = log(verbrauch_geschaetzt_mwh)
  #> Create a diagonal line:
  geom_abline(lty = 2) +
  geom_point(alpha = 0.5) +
  labs(y = "Predicted Energy use (log10)", x = "Measured energy use (log10)") +
  #> Scale and size the x- and y-axis uniformly:
  coord_obs_pred()
#> Warning in log(verbrauch_geschaetzt_mwh): NaNs produced
```

```
#> Warning in log(verbrauch_geschaetzt_mwh): NaNs produced
#> Warning: Removed 8 rows containing missing values (`geom_point()`).
```