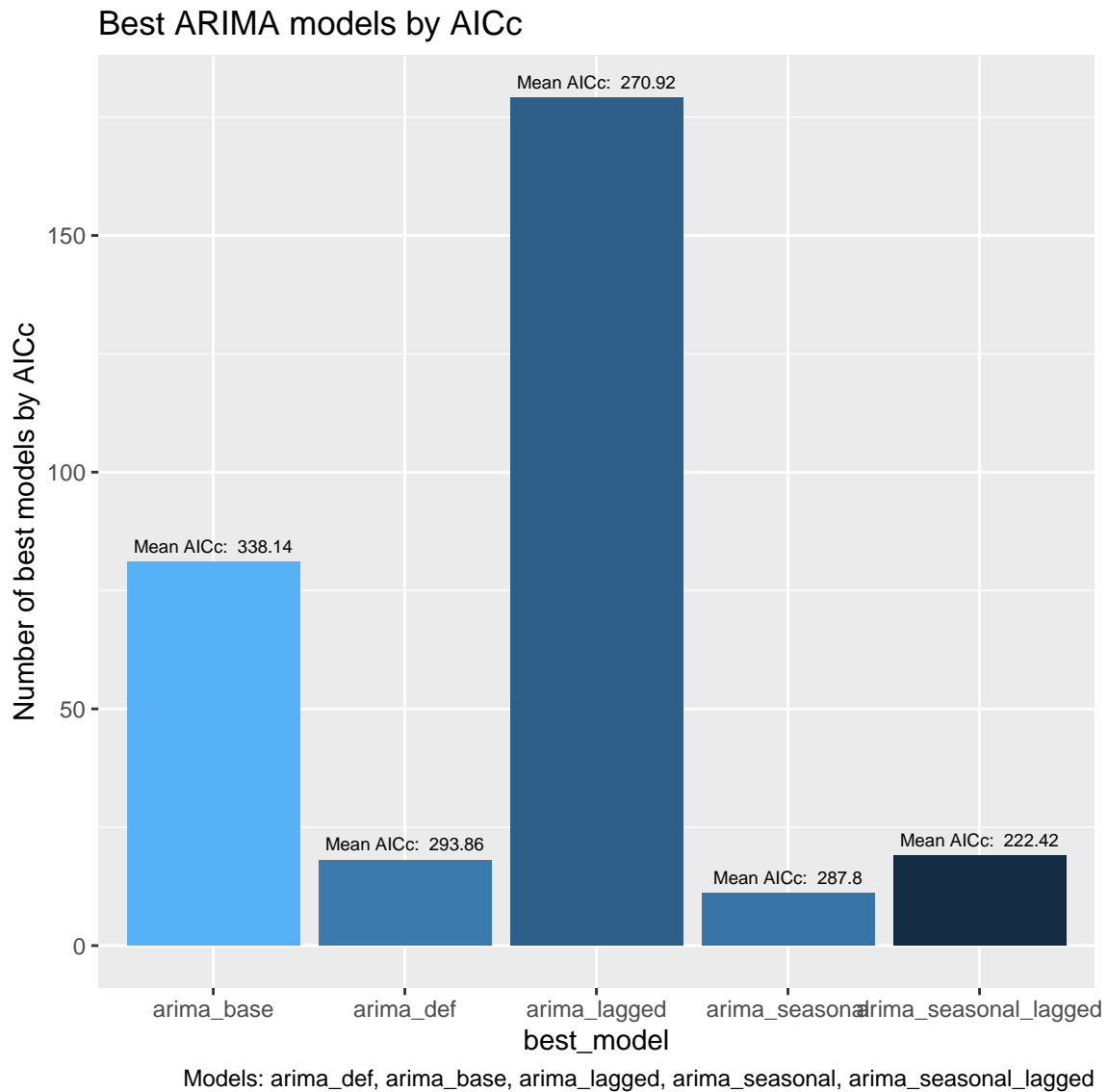# Model Validation

Models

```r
models <- list(
    # ARIMA default
    arima_def = fable::ARIMA(sqrt(units)),
    # ARIMA default with predictors
    arima_base = fable::ARIMA(sqrt(units) ~ feature + display + tpr_only),
    # ARIMA with lagged predictors
    arima_lagged = fable::ARIMA(
        sqrt(units) ~ feature + display + tpr_only +
            dplyr::lag(feature) + dplyr::lag(display) + dplyr::lag(tpr_only)
    ),
    # ARIMA with seasonal predictors
    arima_seasonal = fable::ARIMA(
        sqrt(units) ~ PDQ(0, 0, 0) + fourier(K = 6) +
            feature + display + tpr_only
    ),
    # ARIMA with seasonal and lagged predictors
    arima_seasonal_lagged = fable::ARIMA(
        sqrt(units) ~ PDQ(0, 0, 0) + pdq(d = 0) +
            fourier(K = 6) + feature + display + tpr_only +
            dplyr::lag(feature) + dplyr::lag(display) + dplyr::lag(tpr_only)
    ),
    # Seasonal decomposition model with ETS errors.
    stl = fabletools::decomposition_model(
        feasts::STL(sqrt(units)),
        fable::ETS(season_adjust ~ season("N"))
    ),
    # Default Neural Network Model with predictors.
    nnetar = fable::NNETAR(sqrt(units) ~ feature + display + tpr_only),
    # Default prophet model with predictors.
    prophet = fable.prophet::prophet(
        sqrt(units) ~ feature + display + tpr_only
    )
)
```

Evaluation

AICc

Best ARIMA models by AICc

Models: arima_def, arima_base, arima_lagged, arima_seasonal, arima_seasonal_lagged

- The best model among arima variations is the lagged version of ARIMA.
- Prophet model has more than 60% of null models so I will remove it from the mable.
- Because NNETAR is very slow at predicting, I will remove it from the mable. Also, is not performing well in the validation set due to lack of historic data.

RMSE

Plot best models count by minimum RMSE among models with their median.

Models performance in validation set
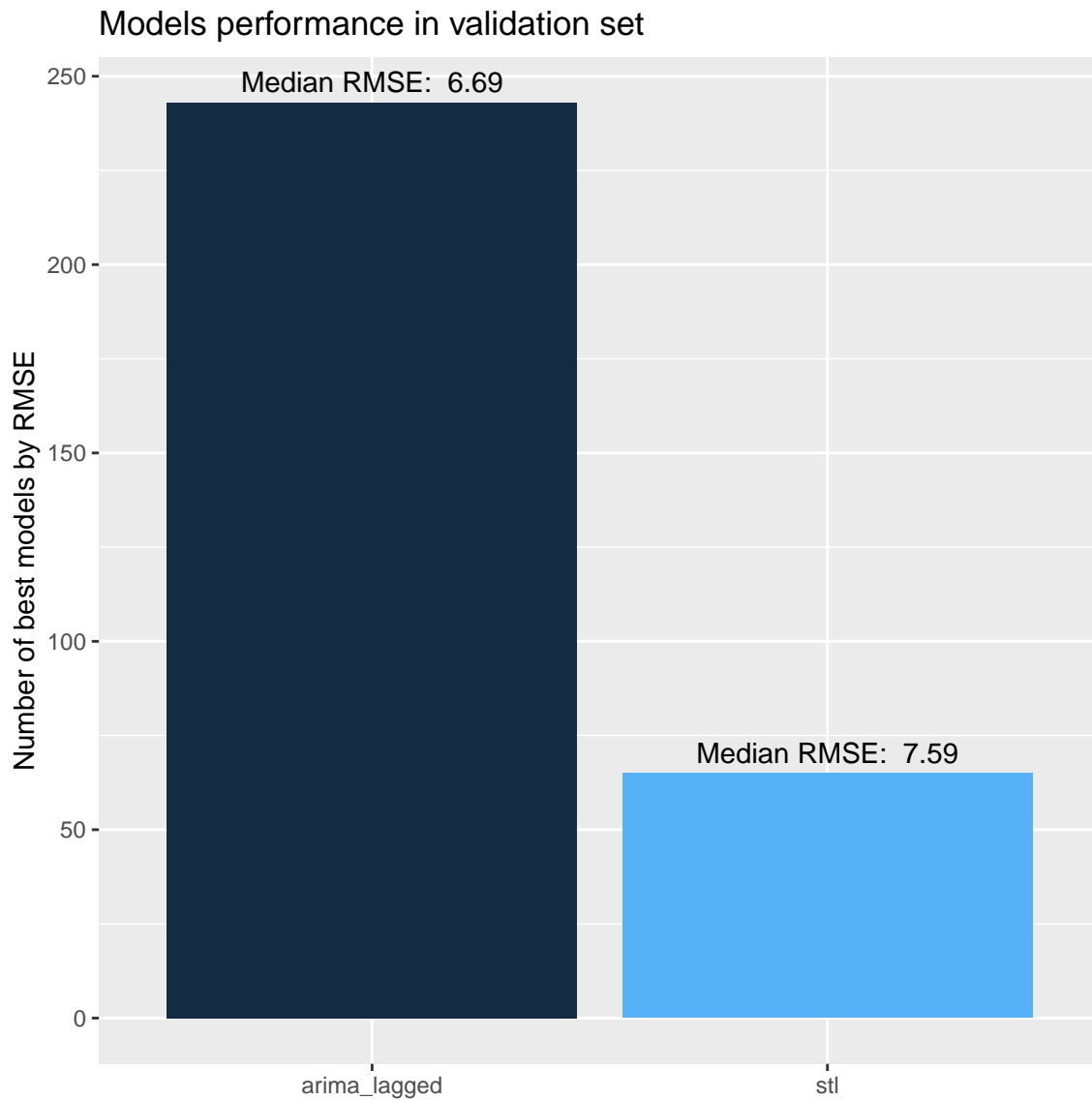
Based on RMSE, ARIMA lagged model with predictors performs better than STL decomposition model with ETS errors in the majority of the validation set. Anyway, both perform well in the validation set, so I will consider apply both models.