survex : : CHEAT SHEET

Explore, Explain, and Examine Survival Models with the survex package

Survival analysis models are commonly used in medicine and other areas. Many of them are too complex to be interpreted by human. Exploration and explanation is needed, but standard methods do not give a broad enough picture.
survex provides easy-to-apply methods for explaining survival models, both complex black-boxes and simpler statistical models.

Explainer

The **survex** package operates on the **explainer** objects. They can be used for calculating explanations, measuring model performance, and making predictions.

model → **explain()** → **explainer**

```
library(survex)
library(survival)
library(randomForestSRC)
rsf_model <- rfsrc(
              Surv(time, status)~.,
              data = veteran)
explainer <- explain(rsf_model)
```

For some models explainers are created automatically with the **explain()** function (only **model** argument is required).
However, an explainer can be created for **any survival model** using the **explain_survival()** function.

Remember to:
- provide **data** as a data.frame without target columns,
- provide **y** as a survival::Surv object,
- provide **predict_survival_function** as a function of (model, newdata, times).

This is all you need for a fully functional explainer but you can also set:
- **predict_function**,
- **predict_cumulative_hazard_function**,
- **times** (for making functional predictions)

on your own.

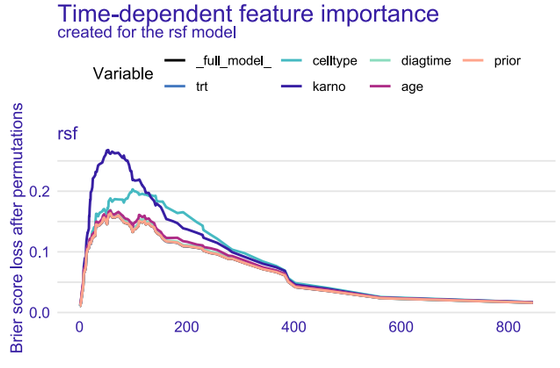
Global explanations

explain model's predictions for an entire dataset

VARIABLE IMPORTANCE

Which variables are important to the model?

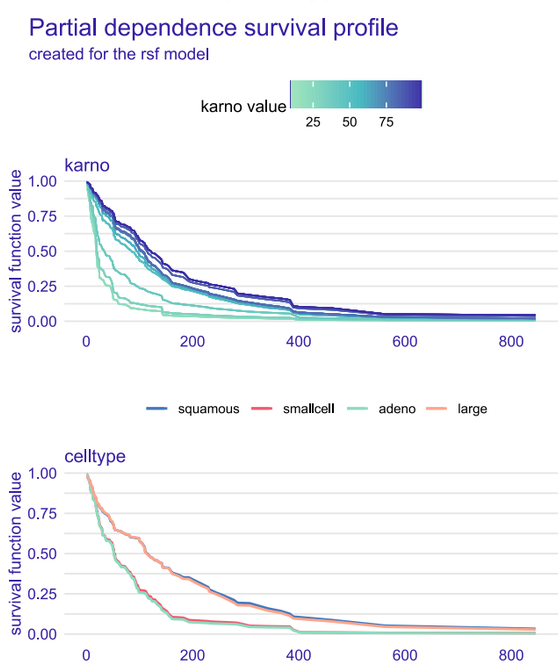
```
m_parts <- model_parts(explainer)
                loss_function, type, output_type
plot(m_parts)
```



PARTIAL DEPENDENCE

How does a variable affect the average prediction?

```
m_profile <- model_profile(explainer)
                variables, categorical_variables,
                groups, N
plot(m_profile,
     numerical_plot_type='lines')
```



Local explanations

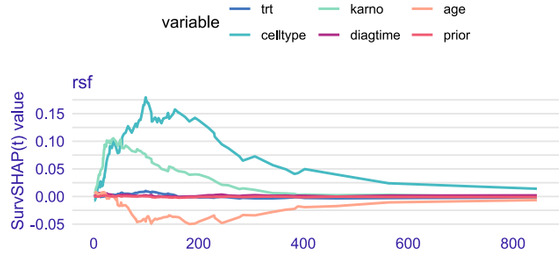
explain model's prediction for a single observation

VARIABLE ATTRIBUTIONS

Which variables contribute to the prediction?

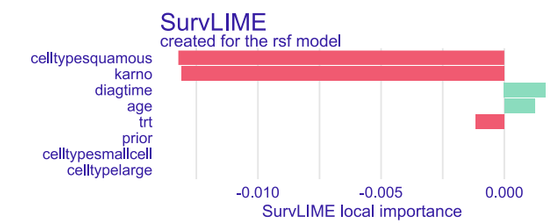
SurvSHAP(t)

```
survshap <- predict_parts(explainer,
              patient, type='survshap')
              aggregation_method, B
plot(survshap)
```



SurvLIME

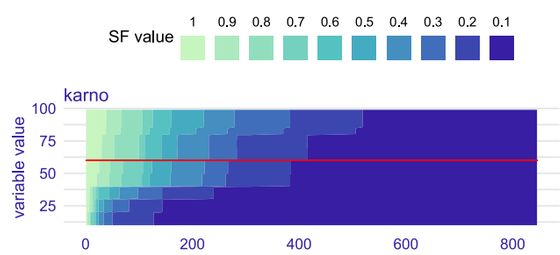
```
survlime <- predict_parts(explainer,
              patient, type='survlime')
              kernel_width, N
plot(survlime)
```



CETERIS PARIBUS

How does a variable affect the prediction?

```
p_profile <- predict_profile(explainer,
                patient)
                variable_splits_type
plot(p_profile,
     numerical_plot_type='contours')
```



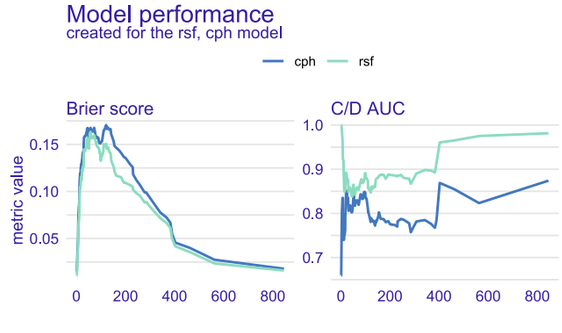
Performance

examine model's quality

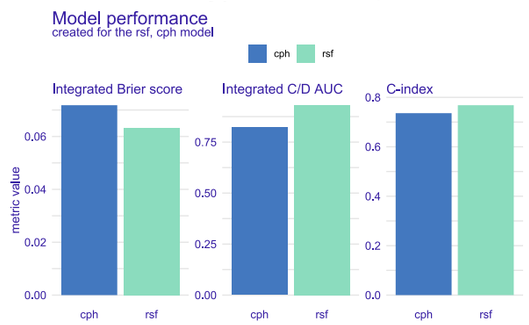
MODEL PERFORMANCE

How good is the model?

```
m_perf <- model_performance(explainer)
cph_perf <- model_performance(cph_exp)
                type, times
plot(m_perf, cph_perf)
```




```
plot(m_perf, cph_perf,
     metrics_type='scalar')
```



Prediction

explore model's predictions

MAKING PREDICTIONS

What is the model's prediction?

Survival function

```
predict(explainer, veteran,
        output_type='survival')
```

Cumulative hazard function

```
predict(explainer, veteran,
        output_type='chf')
```

Risk score/prognostic index

```
predict(explainer, veteran,
        output_type='risk')
```