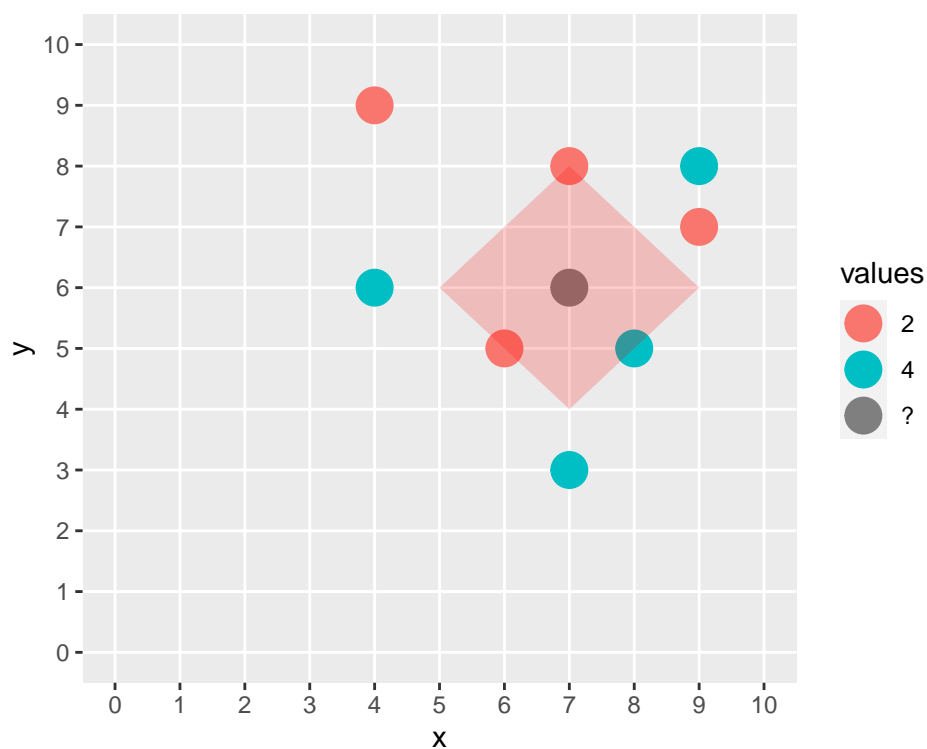


Solution 1:

a) $k = 3$

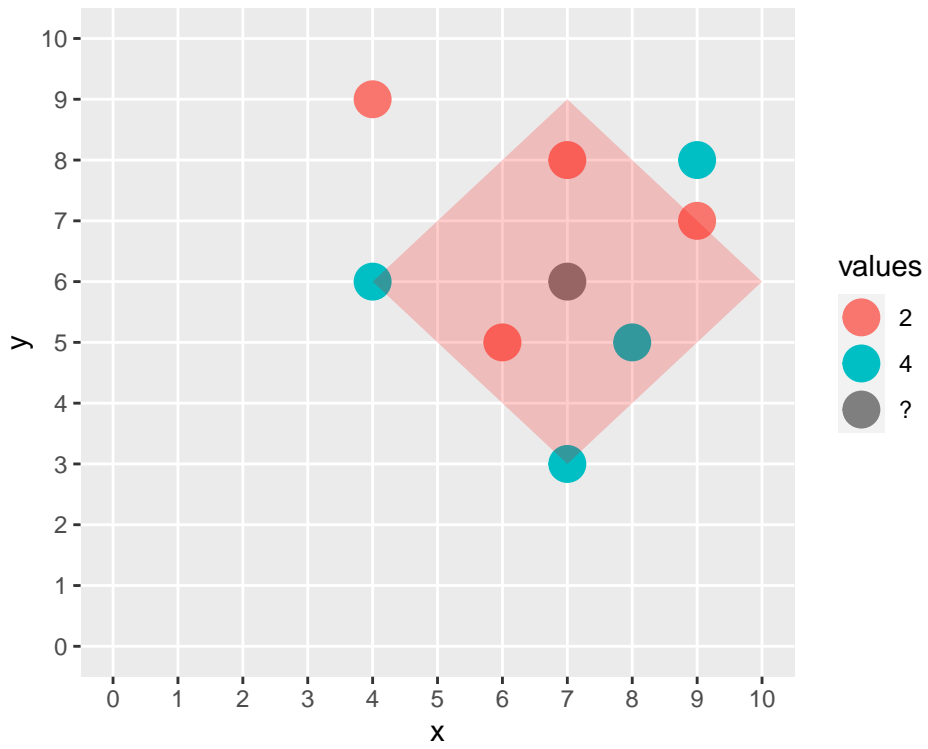
$$\hat{y} = \frac{2 + 2 + 4}{3} = \frac{8}{3} \approx 2.67$$

$$\hat{y}_{\text{weighted}} = \frac{\frac{1}{2} \cdot 2 + \frac{1}{2} \cdot 2 + \frac{1}{2} \cdot 4}{\frac{3}{2}} = \frac{8}{3} \approx 2.67$$

b) $k = 5$

$$\hat{y} = \frac{2 + 2 + 2 + 4 + 4 + 4}{6} = 3$$

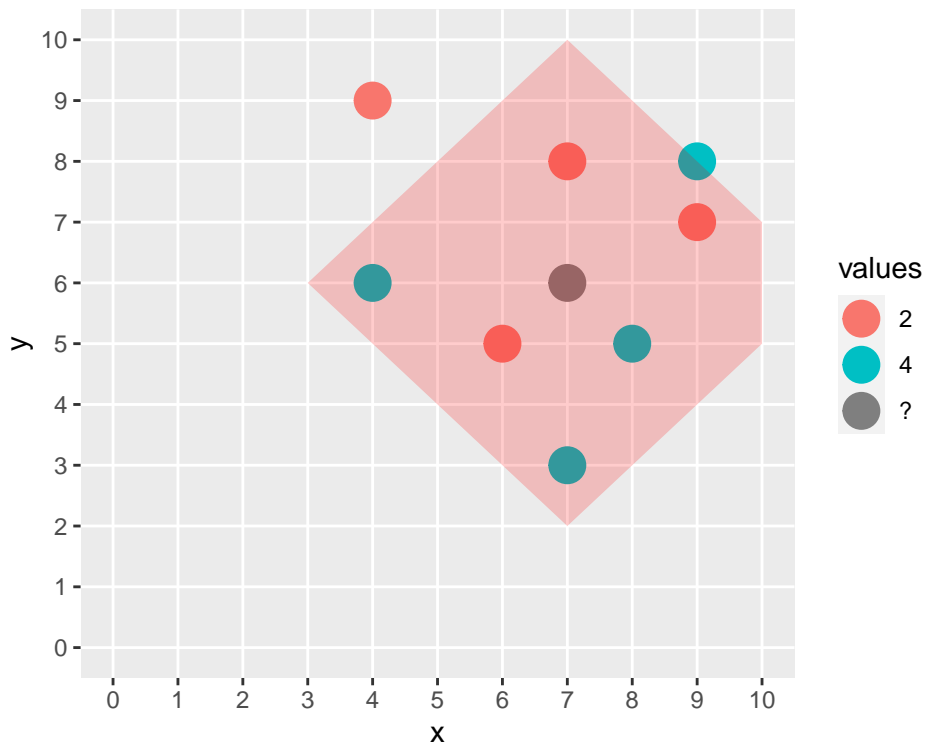
$$\hat{y}_{\text{weighted}} = \frac{\frac{1}{2} \cdot 2 + \frac{1}{2} \cdot 2 + \frac{1}{3} \cdot 2 + \frac{1}{2} \cdot 4 + \frac{1}{3} \cdot 4 + \frac{1}{3} \cdot 4}{\frac{5}{2}} = \frac{44}{15} \approx 2.93$$



c) $k = 7$

$$\hat{y} = \frac{2 + 2 + 2 + 4 + 4 + 4 + 4}{7} = \frac{22}{7} \approx 3.14$$

$$\hat{y}_{\text{weighted}} = \frac{\frac{1}{2} \cdot 2 + \frac{1}{2} \cdot 2 + \frac{1}{3} \cdot 2 + \frac{1}{2} \cdot 4 + \frac{1}{3} \cdot 4 + \frac{1}{3} \cdot 4 + \frac{1}{4} \cdot 4}{\frac{11}{4}} = \frac{100}{33} \approx 3.03$$



Solution 2:

a) Learning consists of *representation* (hypothesis space), *evaluation* (risk) and *optimization*.

A learner in mlr3 can be thought of as the implementation of these components, since

- a representation of the associated model learnt from the data by using the implemented optimization is stored in such a learner object,
- its performance measures can be accessed afterwards.

b) `library(mlr3)`

`library(mlr3learners)`

show all available learners

`mlr_learners$keys()`

```
## [1] "classif.cv_glmnet" "classif.debug" "classif.featureless"
## [4] "classif.glmnet" "classif.kknn" "classif.lda"
## [7] "classif.log_reg" "classif.multinom" "classif.naive_bayes"
## [10] "classif.nnet" "classif.qda" "classif.ranger"
## [13] "classif.rpart" "classif.svm" "classif.xgboost"
## [16] "regr.cv_glmnet" "regr.featureless" "regr.glmnet"
## [19] "regr.kknn" "regr.km" "regr.lm"
## [22] "regr.ranger" "regr.rpart" "regr.svm"
## [25] "regr.xgboost" "surv.cv_glmnet" "surv.glmnet"
## [28] "surv.ranger" "surv.xgboost"
```

see settings for a specific learner, e.g., for a regression tree

`rpart_learner <- lrn("regr.rpart")`

`print(rpart_learner)`

```
## <LearnerRegrRpart:regr.rpart>
```

```
## * Model: -
```

```
## * Parameters: xval=0
```

```
## * Packages: rpart
```

```
## * Predict Type: response
```

```
## * Feature types: logical, integer, numeric, factor, ordered
```

```
## * Properties: importance, missings, selected_features, weights
```

Solution 3:

See R code