Unsupervised prediction

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Key ideas

- Sometimes you don't know the labels for prediction
- To build a predictor
  - Create clusters
  - Name clusters `i.e. interprete the clusters`
  - Build predictor for clusters
- In a new data set
  - Predict clusters

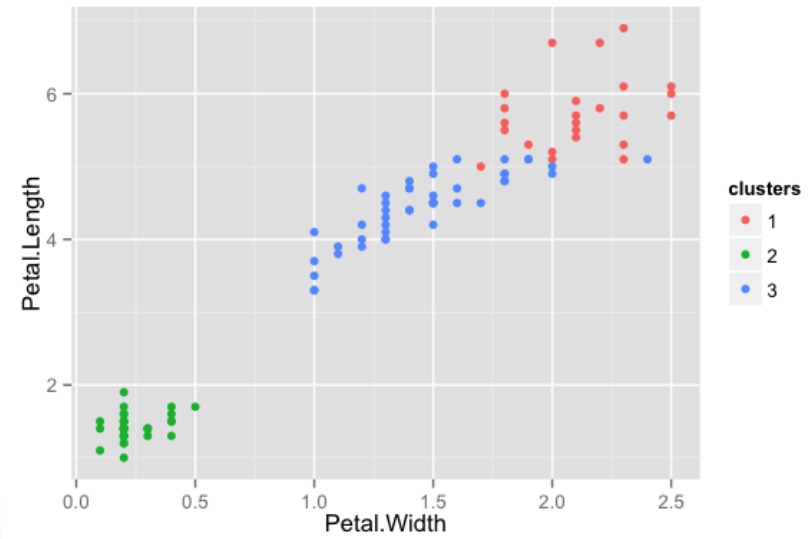
Iris example ignoring species labels

```
data(iris); library(ggplot2)
inTrain <- createDataPartition(y=iris$Species,
                               p=0.7, list=FALSE)
training <- iris[inTrain,]
testing <- iris[-inTrain,]
dim(training); dim(testing)
```

```
[1] 45  5
```

Cluster with k-means

```
kMeans1 <- kmeans(subset(training,select=-c(Species)),centers=3)   well guessed...
training$clusters <- as.factor(kMeans1$cluster)
qplot(Petal.Width,Petal.Length,colour=clusters,data=training)
```



Compare to real labels

```
table(kMeans1$cluster,training$Species)
```

```
   setosa versicolor virginica
1       0          1        23
2      35          0         0
3       0         34        12
```

Build predictor

now train a model to predict 'my' clusters:

```
modFit <- train(clusters ~.,data=subset(training,select=-c(Species)),method="rpart")
table(predict(modFit,training),training$Species)
```

```
   setosa versicolor virginica
1       0          0        21
2      35          0         0
3       0         35        14
```

Some error in third class:
because there is error in both building the clusters and predicting them!

Apply on test

```
testClusterPred <- predict(modFit,testing)
table(testClusterPred ,testing$Species)
```

testClusterPred	setosa	versicolor	virginica
1	0	0	13
2	15	0	0
3	0	15	2

here we happen to now the 'correct' classes, so we can evaluate our classification.

Notes and further reading

- The cl_predict function in the clue package provides similar functionality
- Beware over-interpretation of clusters! `it's an exploratory approach!`
- This is one basic approach to recommendation engines
- Elements of statistical learning
- Introduction to statistical learning