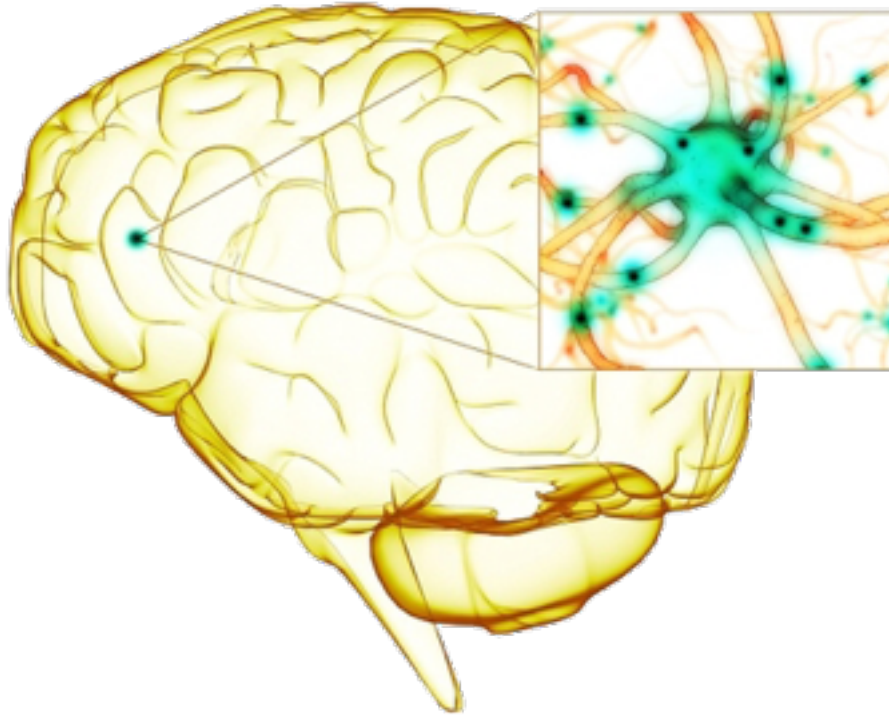
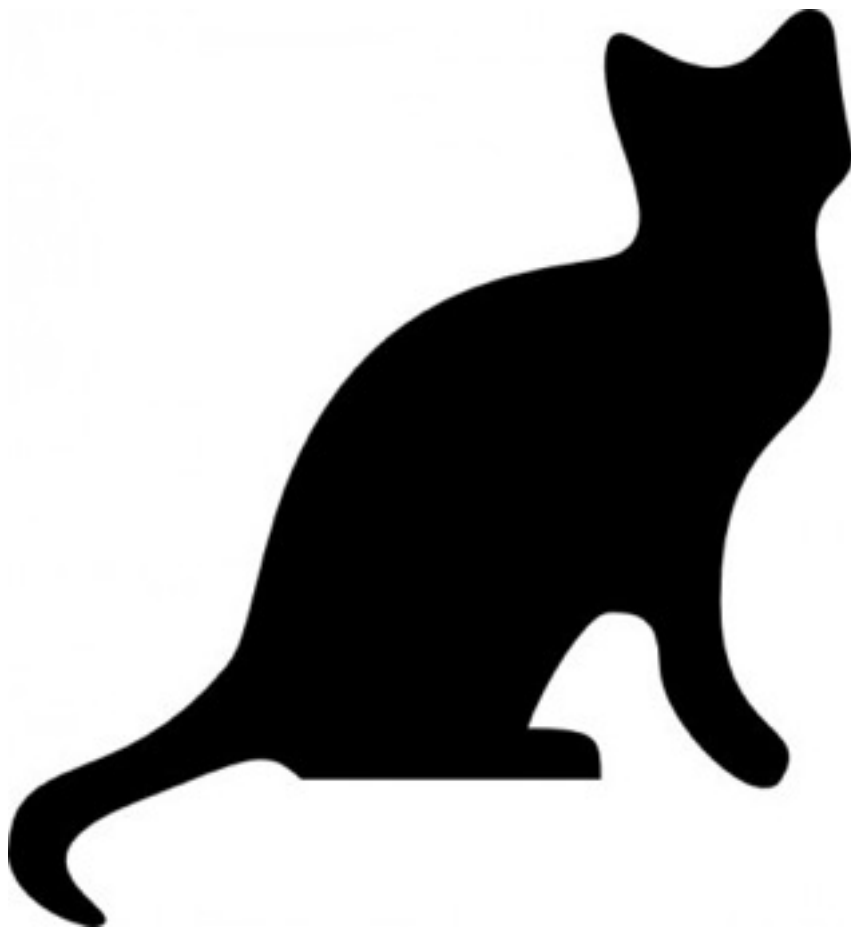


Introduction to Machine Learning



Introduction to Machine Learning



Introduction to Machine Learning



We need to know if this cat is **male** or **female**

Introduction to Machine Learning

Machine Learning algorithm learns from examples,



set of sample objects (samples) is called **training set**

Introduction to Machine Learning

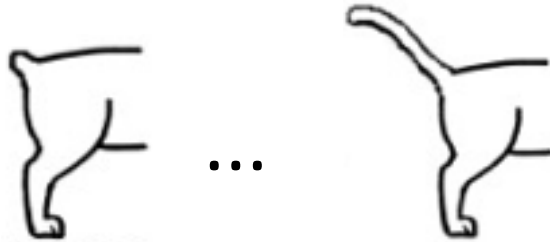
Each object (**instance**)



can be described with a set of parameters
called **features**

Introduction to Machine Learning

Tail length f_1 :



Introduction to Machine Learning

Tail length f_1 :



...



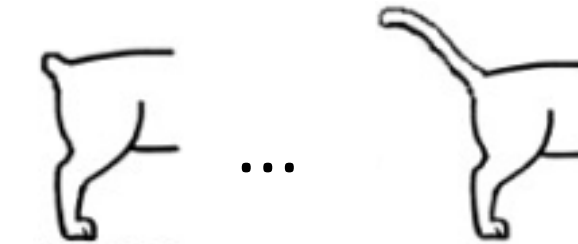
Furriness f_2 :




...



Introduction to Machine Learning

Tail length f_1 : 

Furriness f_2 : 

Form a **feature vector** $\mathbf{f} = (f_1, f_2)$

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Together feature vectors and corresponding classes form a **dataset**

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Together feature vectors and corresponding classes form a **dataset**

Instance

Cat 1

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Together feature vectors and corresponding classes form a **dataset**



Instance	Feature 1
Cat 1	8 cm

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Together feature vectors and corresponding classes form a **dataset**



Instance

Feature 1

Feature 2

Cat 1

8 cm

546 h/cm²

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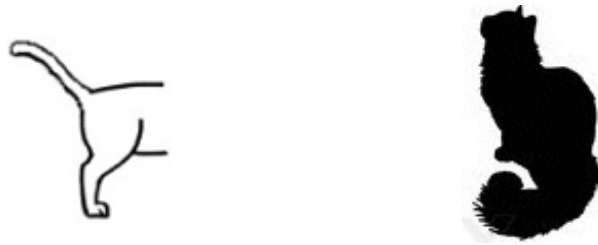
Together feature vectors and corresponding classes form a **dataset**



Instance	Feature 1	Feature 2	Class
Cat 1	8 cm	546 h/cm ²	M

Introduction to Machine Learning

Together feature vectors and corresponding classes form a **dataset**



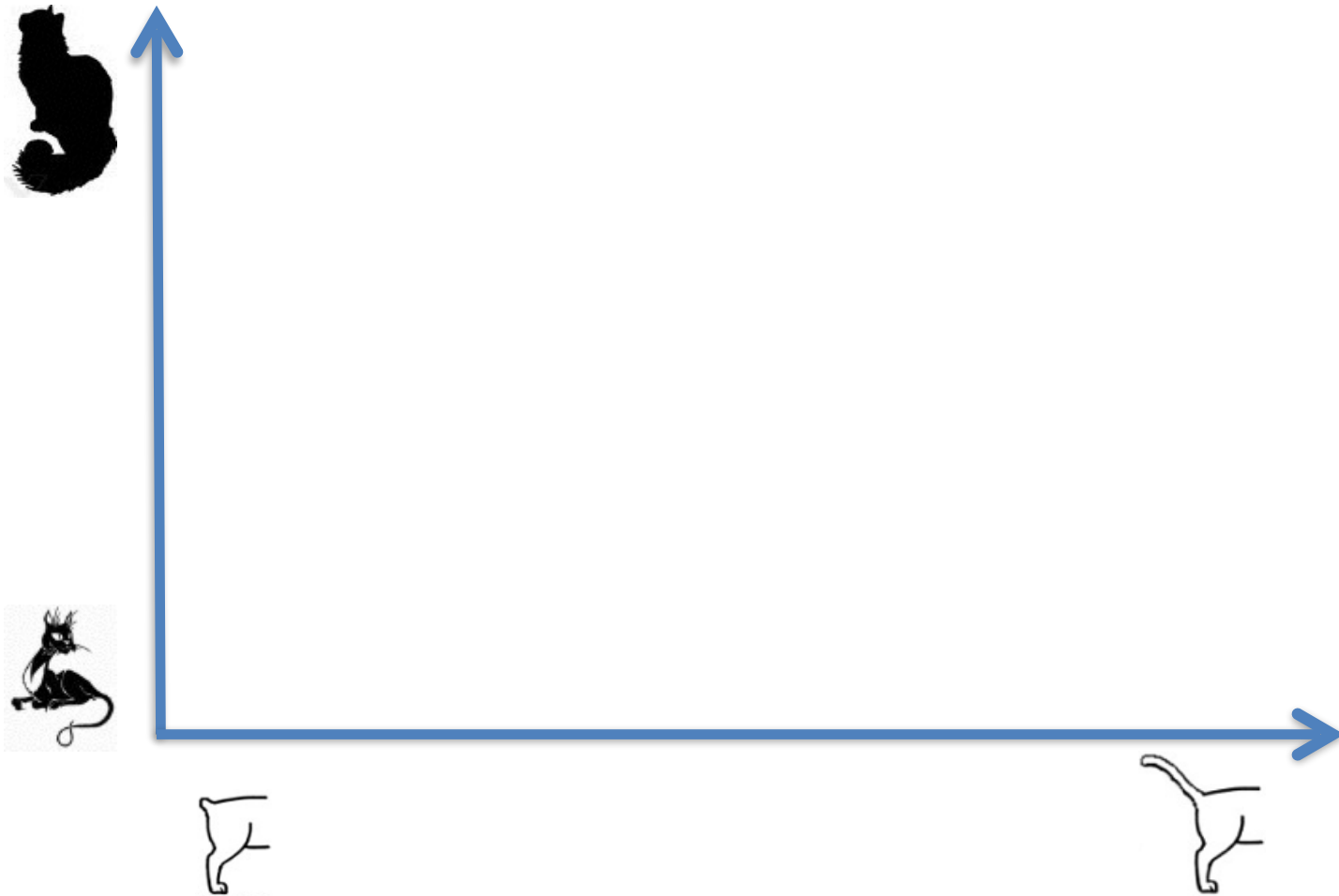
Instance	Feature 1	Feature 2	Class
Cat 1	8 cm	546 h/cm ²	M
Cat 2	7.5 cm	363 h/cm ²	M
...
Cat N	11 cm	614 h/cm ²	F

Introduction to Machine Learning

Feature vector lives in a **feature space**

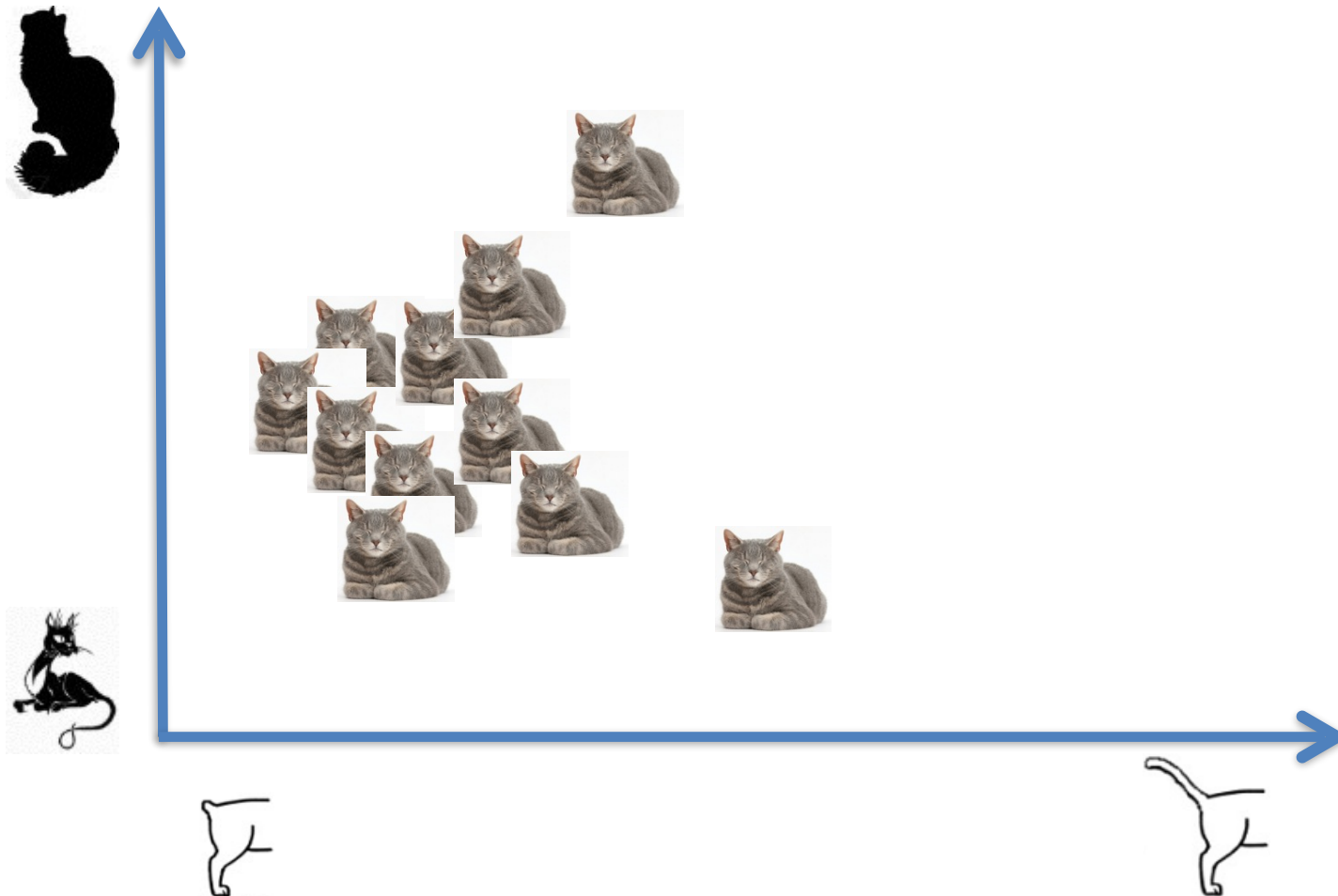
Introduction to Machine Learning

Feature vector lives in a **feature space**



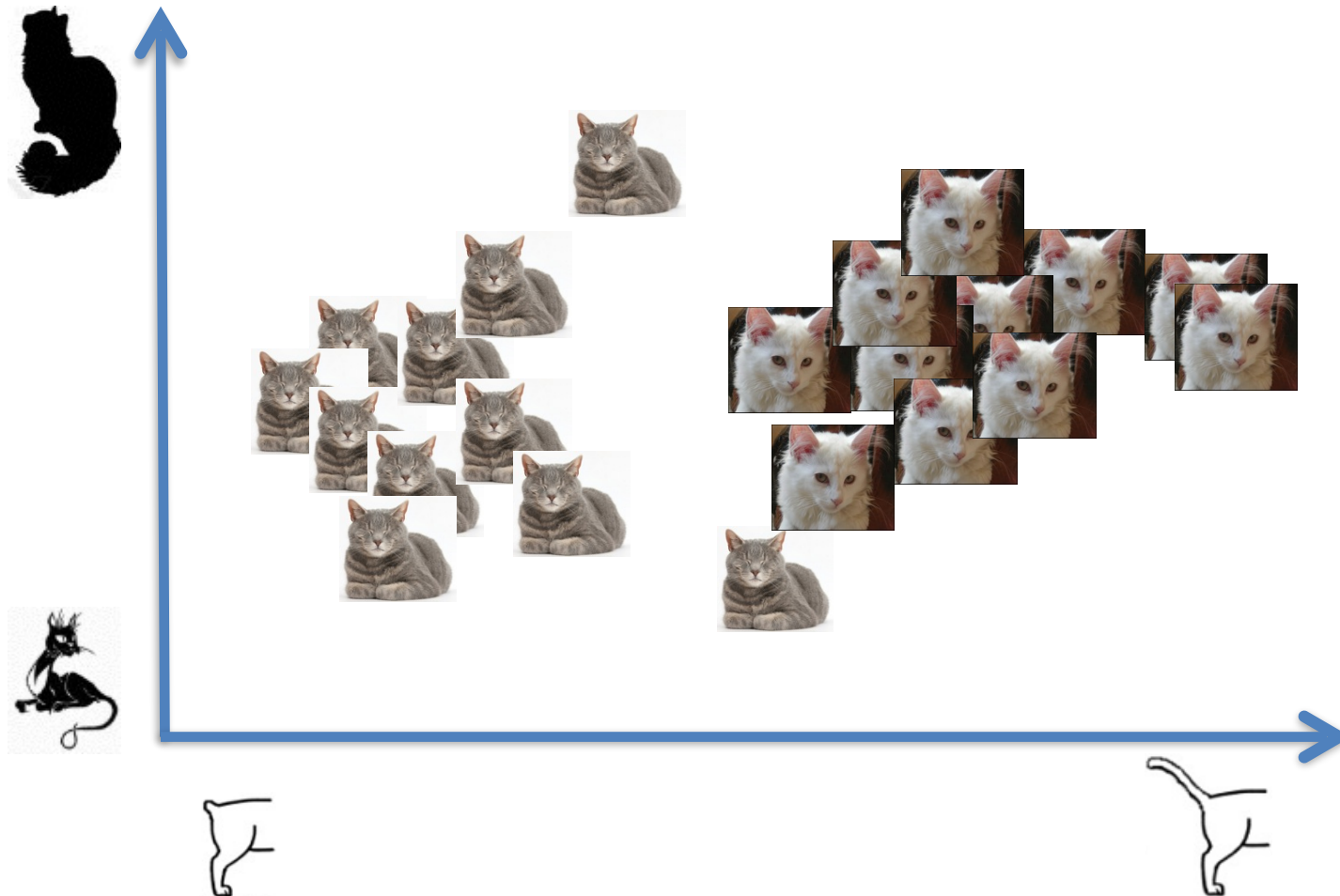
Introduction to Machine Learning

Feature vector lives in a **feature space**



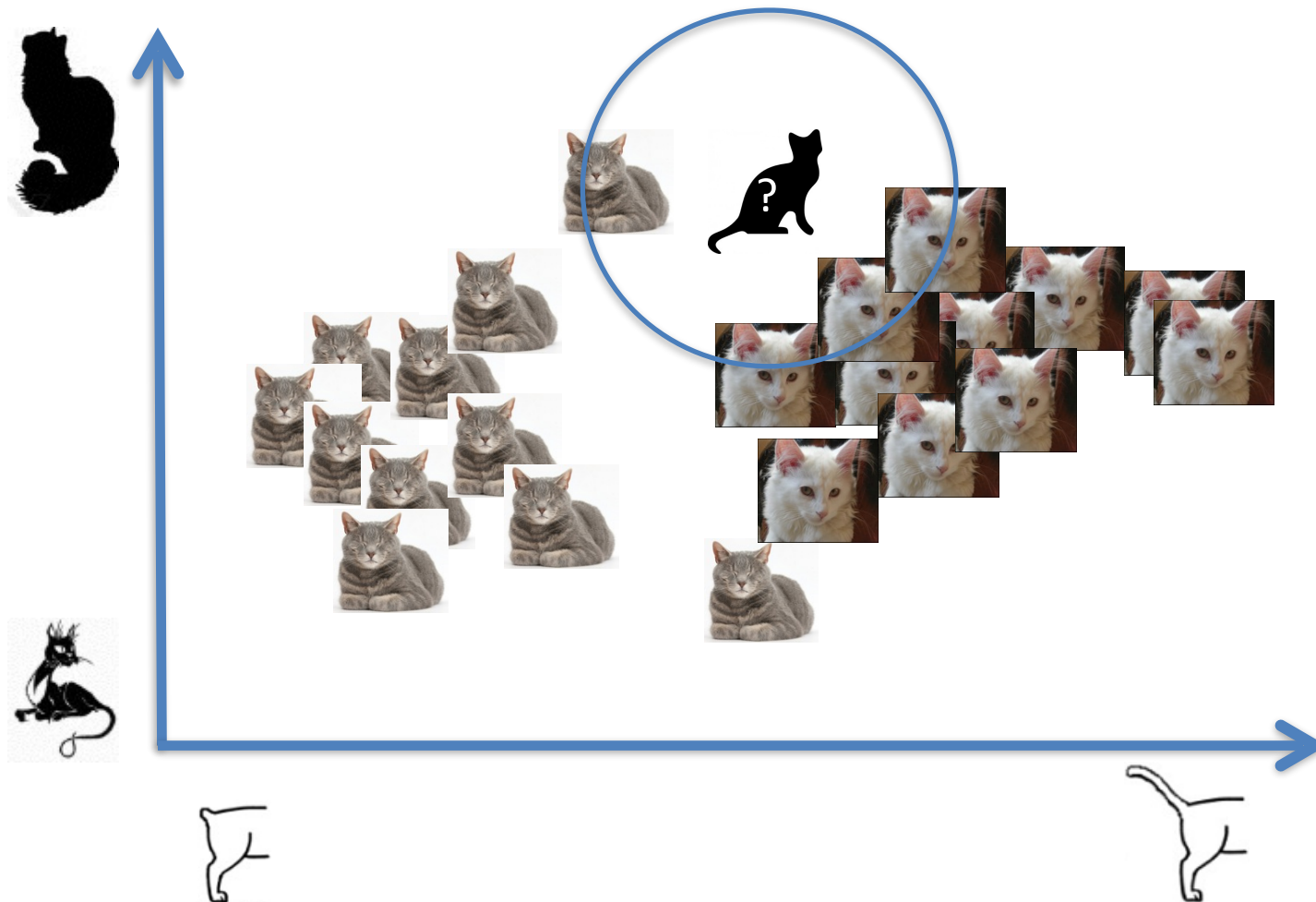
Introduction to Machine Learning

Feature vector lives in a **feature space**



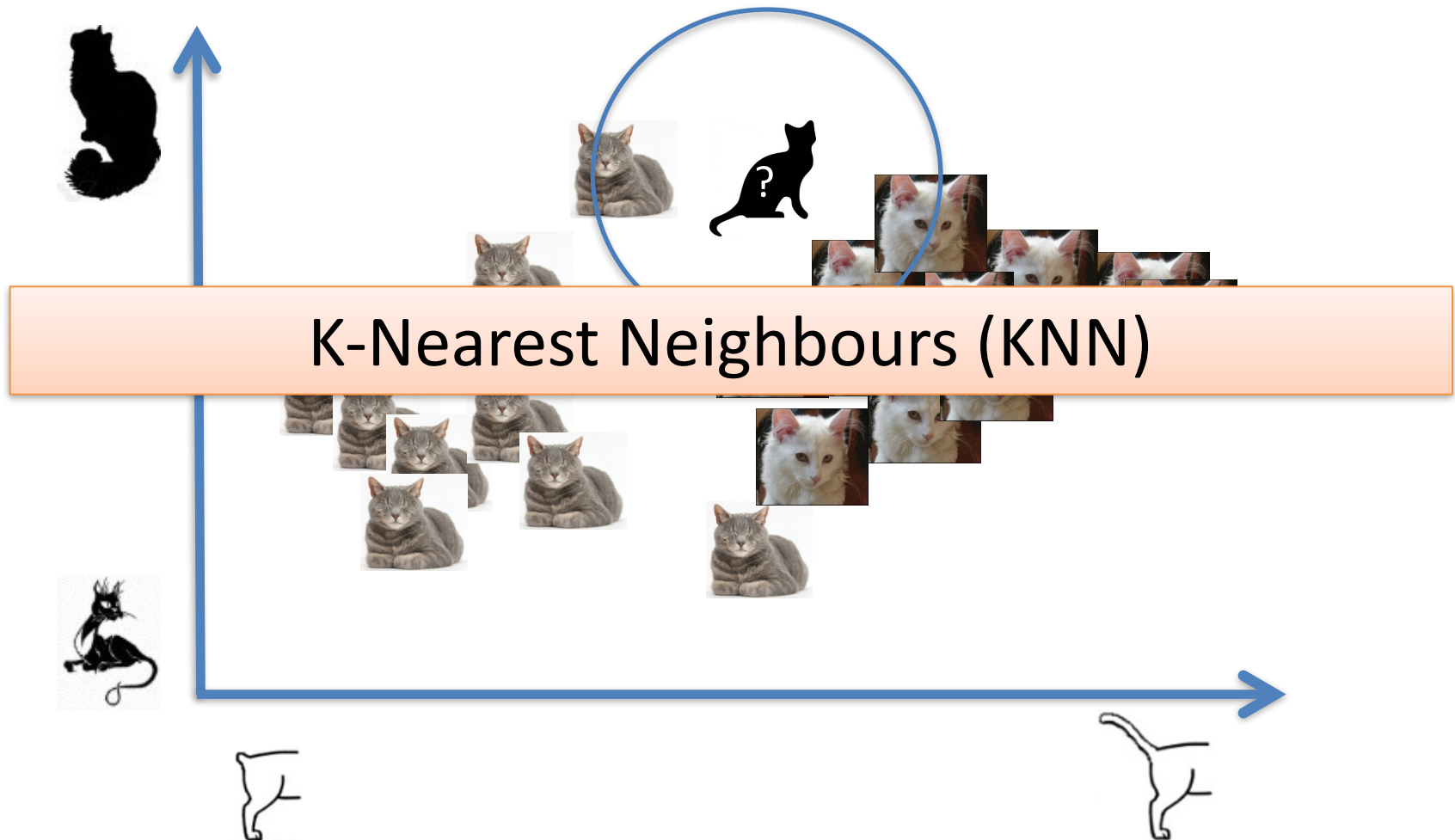
Introduction to Machine Learning

Feature vector lives in a **feature space**



Introduction to Machine Learning

Feature vector lives in a **feature space**



Introduction to Machine Learning

- Decision trees
- C4.5
- Random forests
- Bayesian networks
- Hidden Markov models
- Artificial neural network
- Data clustering
- Expectation-maximization algorithm
- Self-organizing map
- Radial basis function network
- Vector Quantization
- Generative topographic map
- Information bottleneck method
- IBSEAD
- Apriori algorithm
- Eclat algorithm
- FP-growth algorithm
- Single-linkage clustering
- Conceptual clustering
- K-means algorithm
- Fuzzy clustering
- Temporal difference learning
- Q-learning
- Learning Automata
- Monte Carlo Method
- SARSA
- AODE
- Artificial neural network
- Backpropagation
- Naive Bayes classifier
- Bayesian network
- Bayesian knowledge base
- Case-based reasoning
- Decision trees
- Inductive logic programming
- Gaussian process regression
- Gene expression programming
- Group method of data handling (GMDH)
- Learning Automata
- Learning Vector Quantization
- Logistic Model Tree
- Decision trees
- Decision graphs
- Lazy learning
- Instance-based learning
- Nearest Neighbor Algorithm
- Analogical modeling
- Probably approximately correct learning (PAC)
- Symbolic machine learning algorithms
- Subsymbolic machine learning algorithms
- Support vector machines
- Random Forests
- Ensembles of classifiers
- Bootstrap aggregating (bagging)
- Boosting (meta-algorithm)
- Ordinal classification
- Regression analysis
- Information fuzzy networks (IFN)
- ANOVA
- Linear classifiers
- Fisher's linear discriminant
- Logistic regression
- Naive Bayes classifier
- Perceptron
- Support vector machines
- Quadratic classifiers
- k-nearest neighbor
- Boosting