

An Introduction to Machine Learning

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STEM Camp (2017)

Game Time!

Alaskan Malamute or Siberian
Husky?

Training Set

What distinguishing **features** do you notice?



Malamute



Husky

Testing Set



How can we do better?

How can we do better?

- **More training data**
 - More data > Better algorithm

How can we do better?

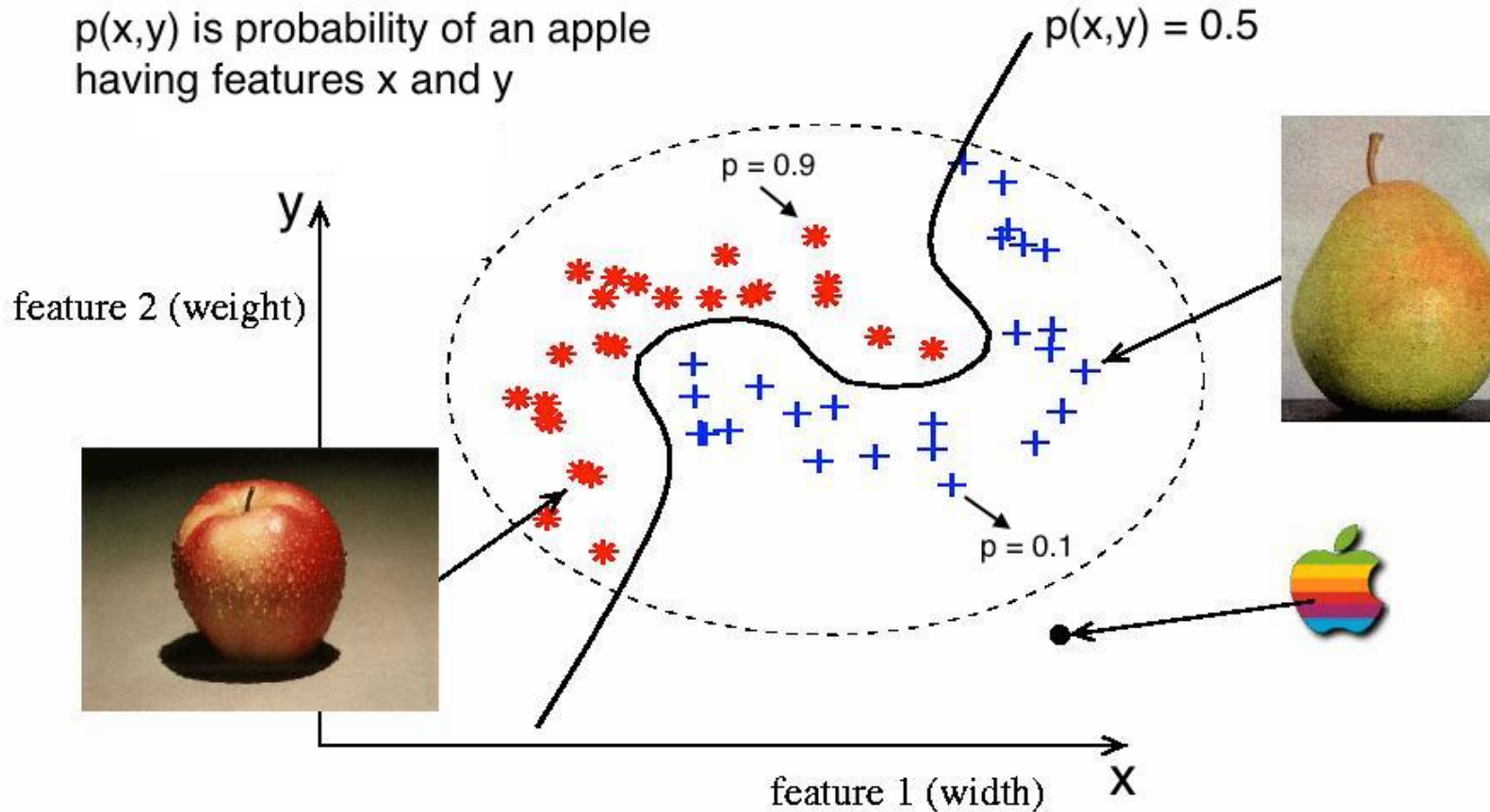
- **More training data**
 - More data > Better algorithm
- Better picture quality
 - Clean data > More data

How can we do better?

- **More training data**
 - More data > Better algorithm
- Better picture quality
 - Clean data > More data
- More information about huskies and malamutes
 - Data is useless if we're looking in the wrong direction!

How do we make computers
think?

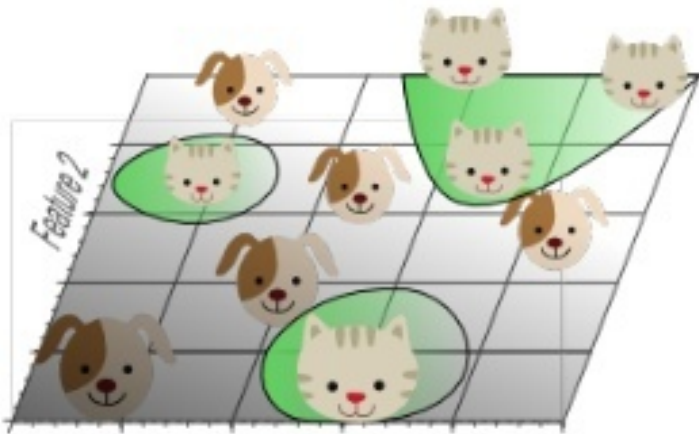
Classification



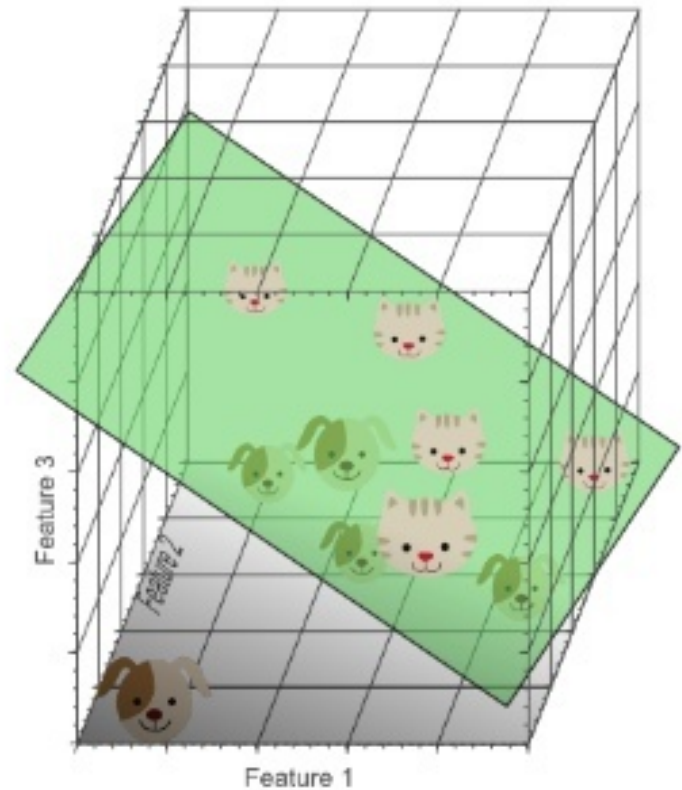
Classification



1 feature



2 features



3 features

Classification



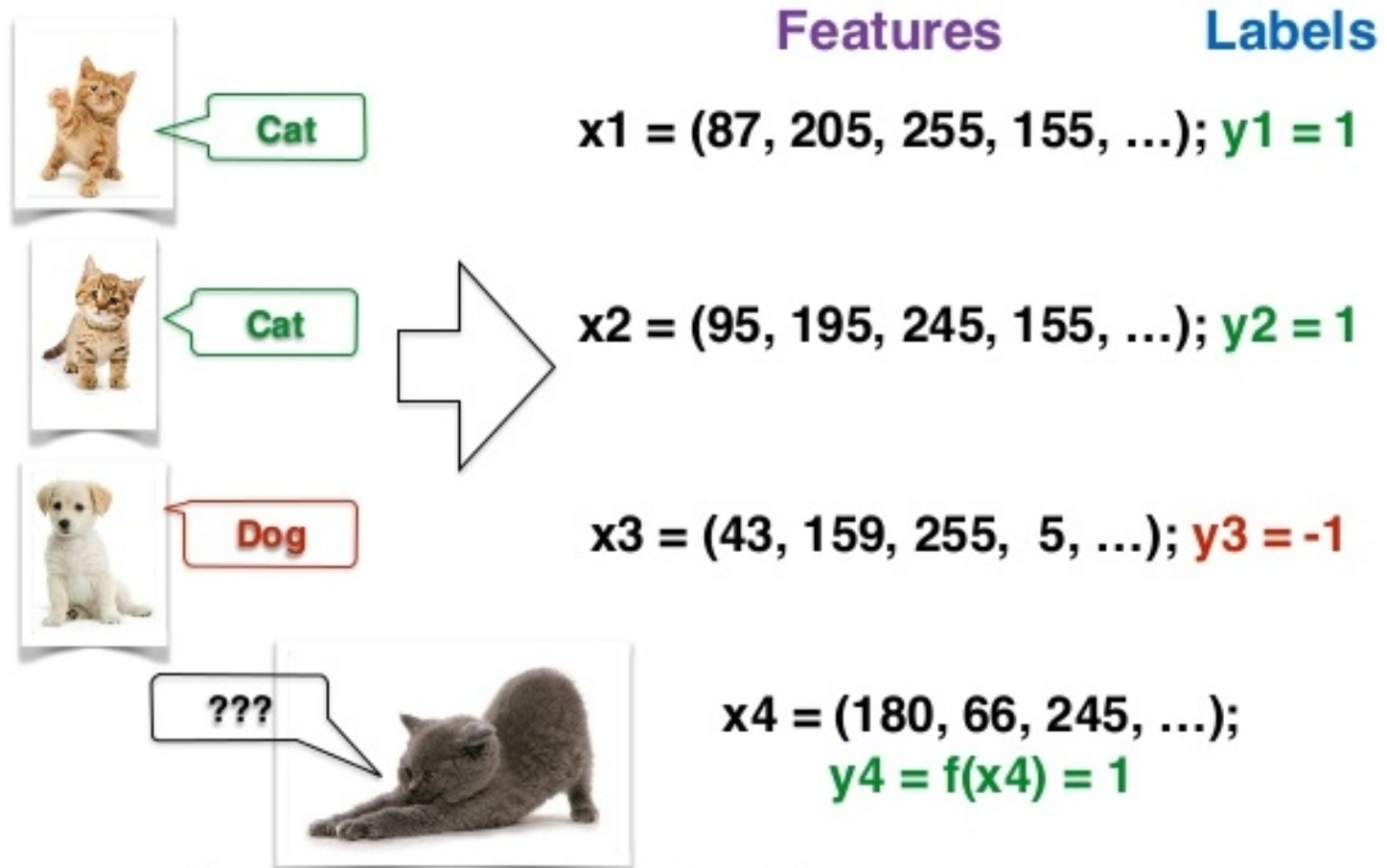
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52	70	95	23	04	60	11	42	62	21	68	56	01	32	56	71	37	02	36	91
22	31	16	71	51	65	83	89	41	92	36	54	22	40	40	28	66	33	13	80
24	47	33	60	99	03	45	02	44	75	33	53	78	36	84	20	35	17	12	50
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20	73	35	29	78	31	90	01	74	31	49	71	48	88	81	16	23	57	05	54
01	70	54	71	83	51	54	69	16	92	33	48	61	43	52	01	89	21	67	48

What the computer sees

→
image classification

82% cat
15% dog
2% hat
1% mug

Supervised Learning



Adopted from P.Vincent http://videlectures.net/deeplearning2015_vincent_machine_learning/

Supervised Learning

- The computer “sees” a training set,
- “Learns” the probability that a combination of features matches each class,
- “Predicts” a class for a new set of features

What to take away:

- **Probability** is the language of machine learning!
- **Data** quality and quantity are vital
- Computers don't see the way we do, and they **can't explain their decisions**

Coming Up:

- A lab on probability
- A lesson on Naïve Bayes, our first machine-learning algorithm
- Building your own Bayes-Law simulator