



数据挖掘与机器学习

机器学习的分类

Artificial intelligence

Machine learning

Supervised
learning

Unsupervised
learning

Reinforcement
learning

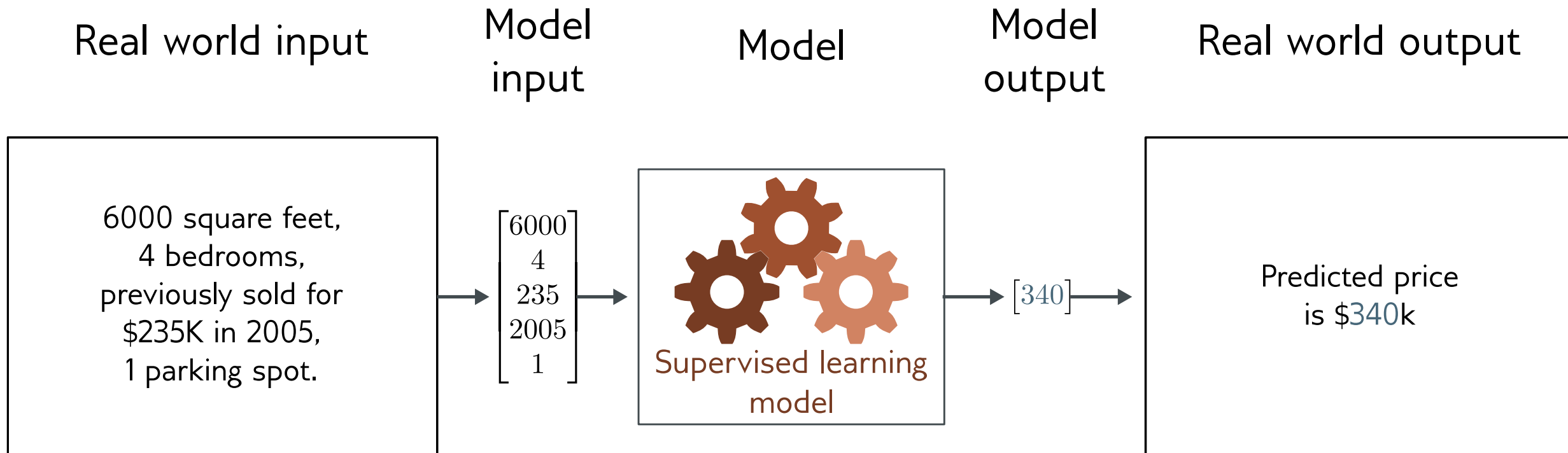
Deep learning



监督学习 (Supervised learning)

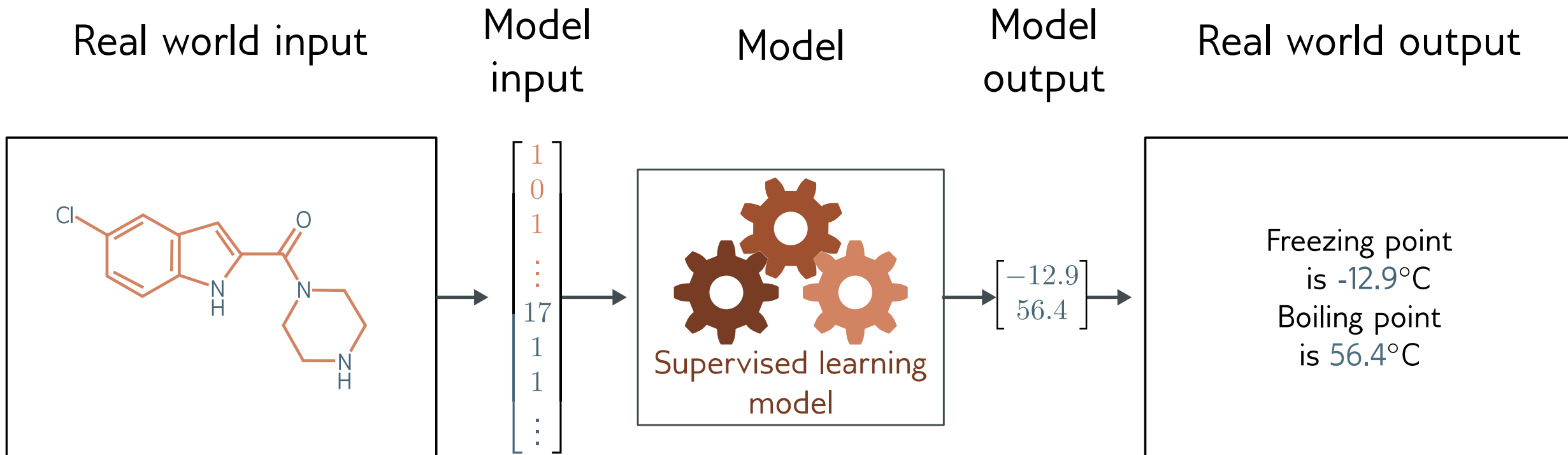
- 定义一个从输入到输出的映射
- 从输入-输出数据样例中学习这个映射的函数表达

回归 (Regression)



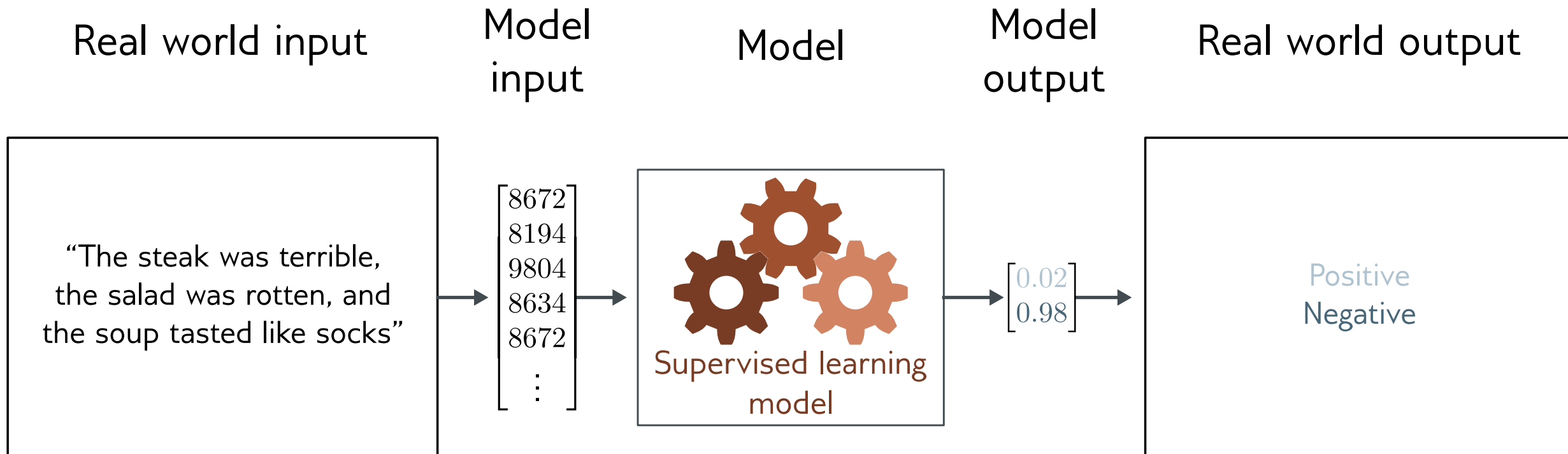
- 一元回归问题（单维、数值型输出）

图回归 (Graph regression)



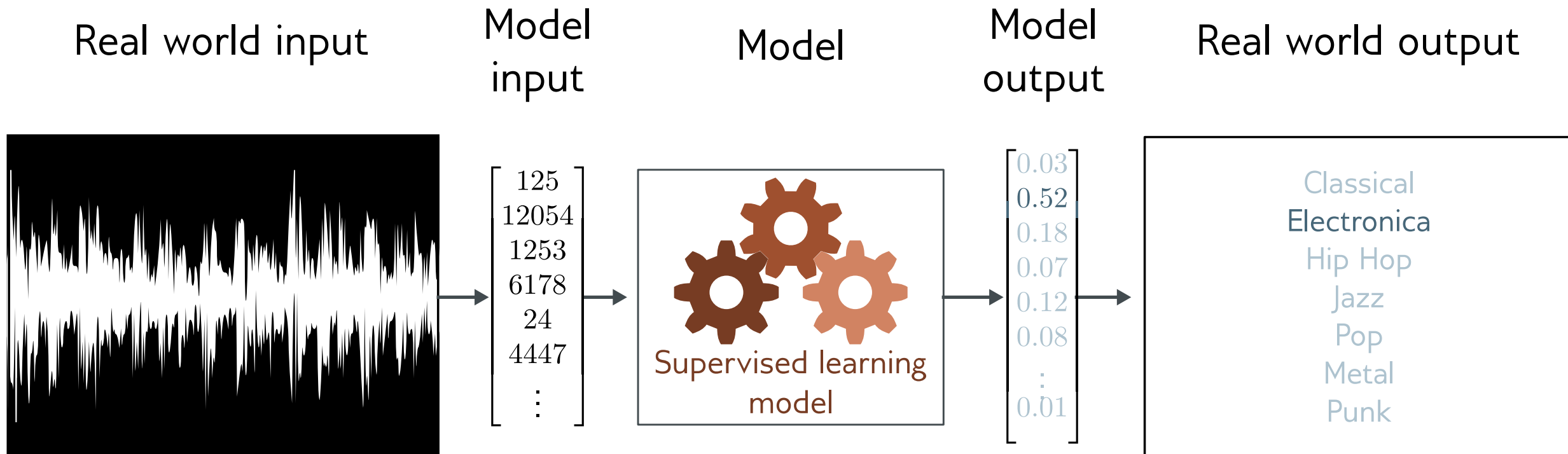
- 多元回归问题（多维、数值型输出）

文本分类 (Text classification)



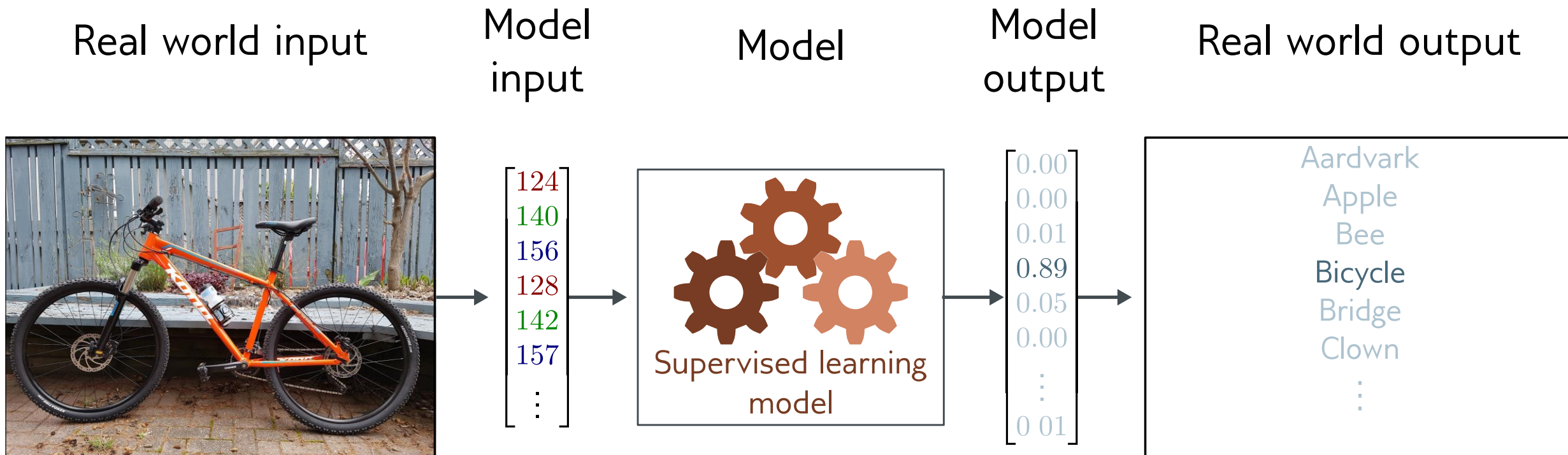
- 二分类问题 (两个类别)

音乐类型分类 (Music genre classification)



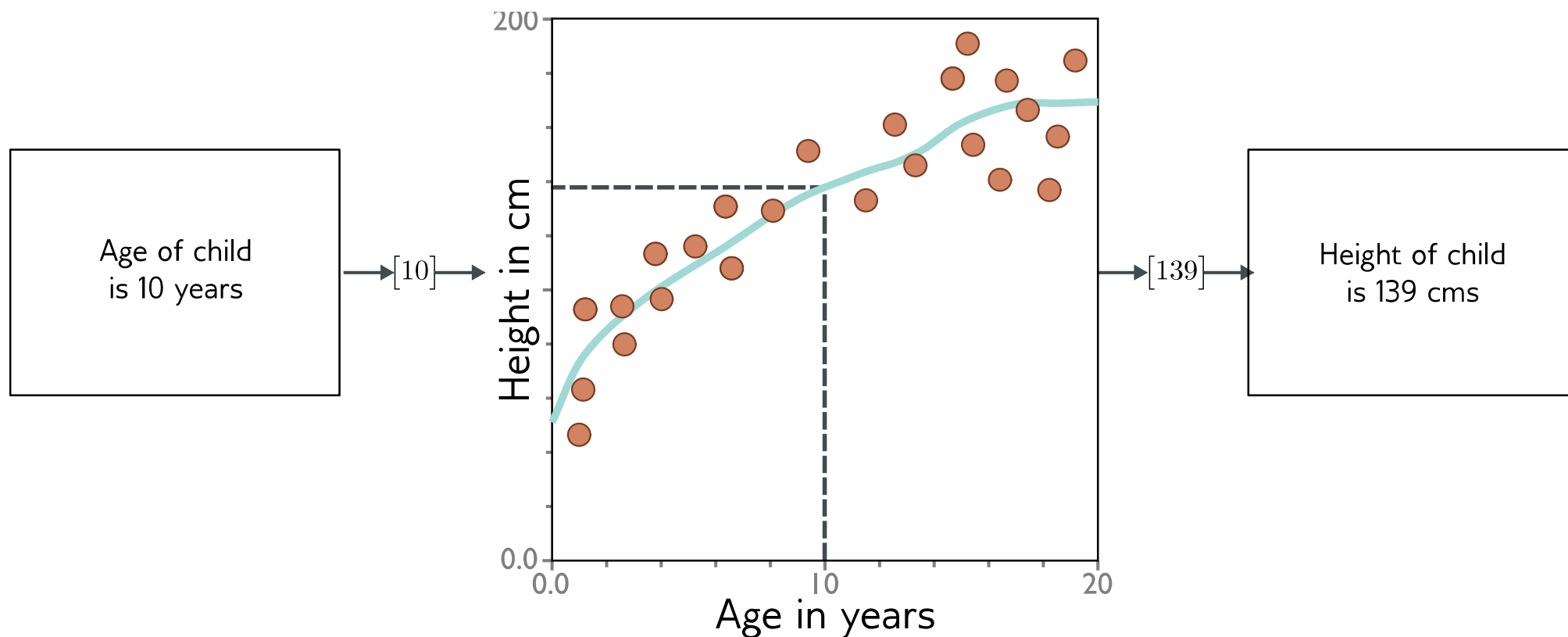
- 多分类问题 (离散类别, 大于等于两种取值)

图片分类 (Image classification)



- 多分类问题（离散类别，大于等于两种取值）

什么是一个监督学习模型？



- 一个把输入（年龄）与输出（身高）联系起来的方程
- 搜索可能的方程，找到可以把训练数据拟合得好的那个方程

术语

- 回归（Regression） = 输出是连续型变量
- 分类（Classification） = 输出是分类型变量
- 二分类和多分类问题不同
- 一元（Univariate） = 一维输出
- 多元（Multivariate） = 多维输出

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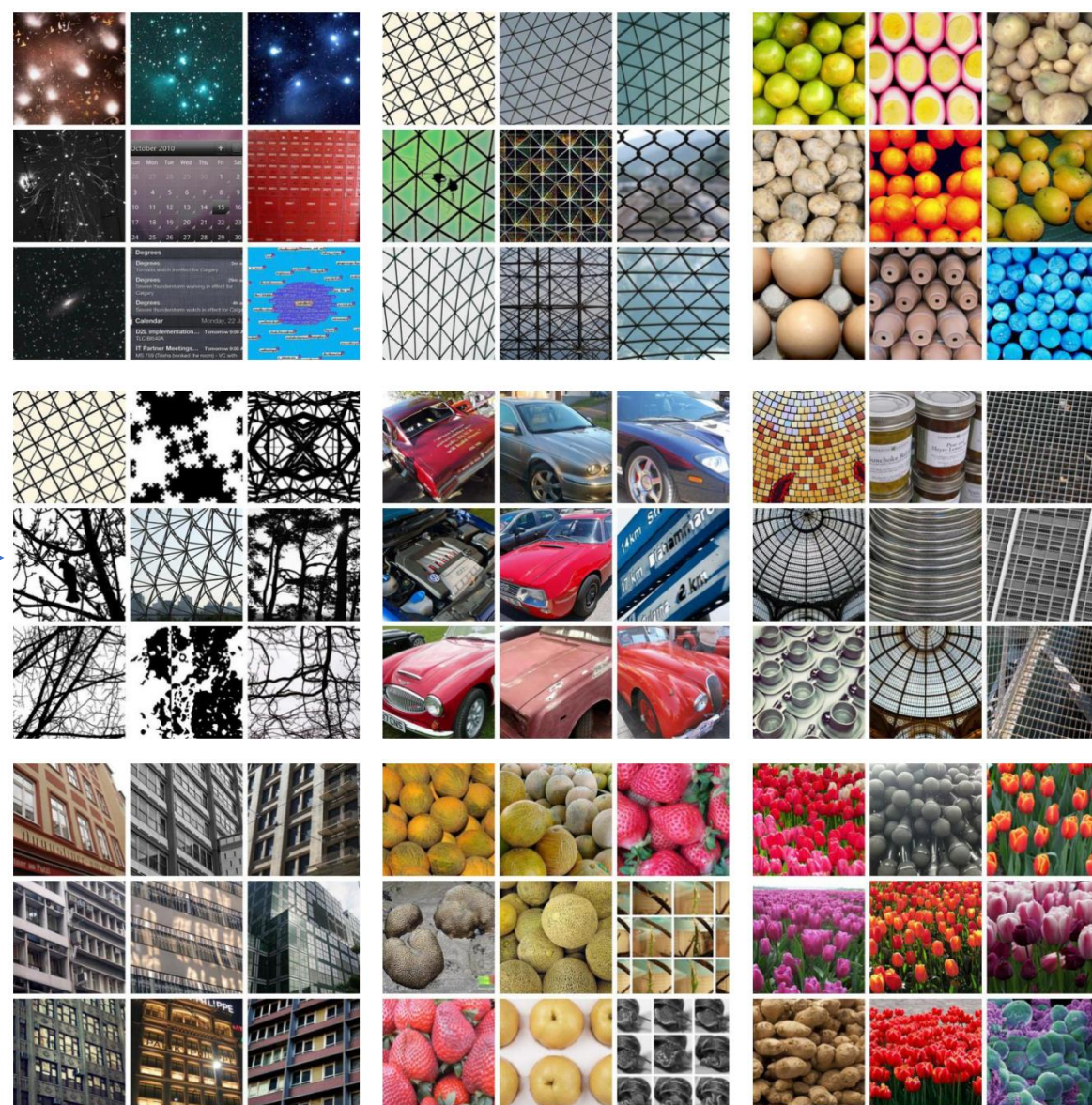


无监督学习（Unsupervised Learning）

- 对一个无标签的数据集进行学习
 - 聚类
 - 找出异常值
 - 生成新样例
 - 填补缺失值



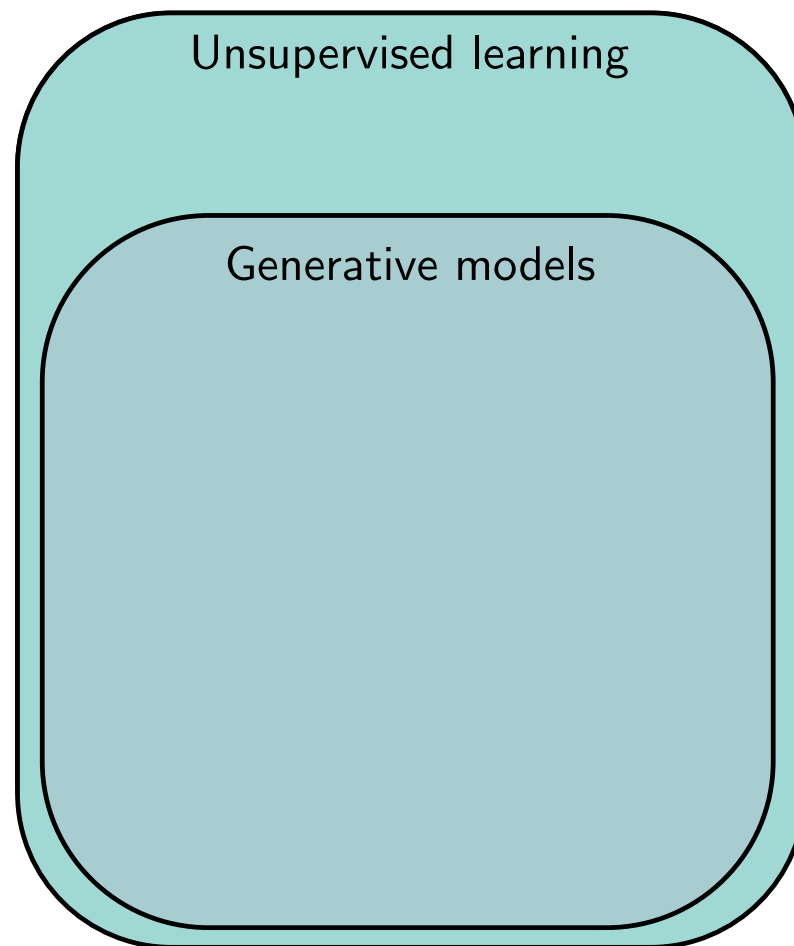
Unsupervised learning



DeepCluster: Deep Clustering for Unsupervised Learning of Visual Features (Caron et al., 2018)

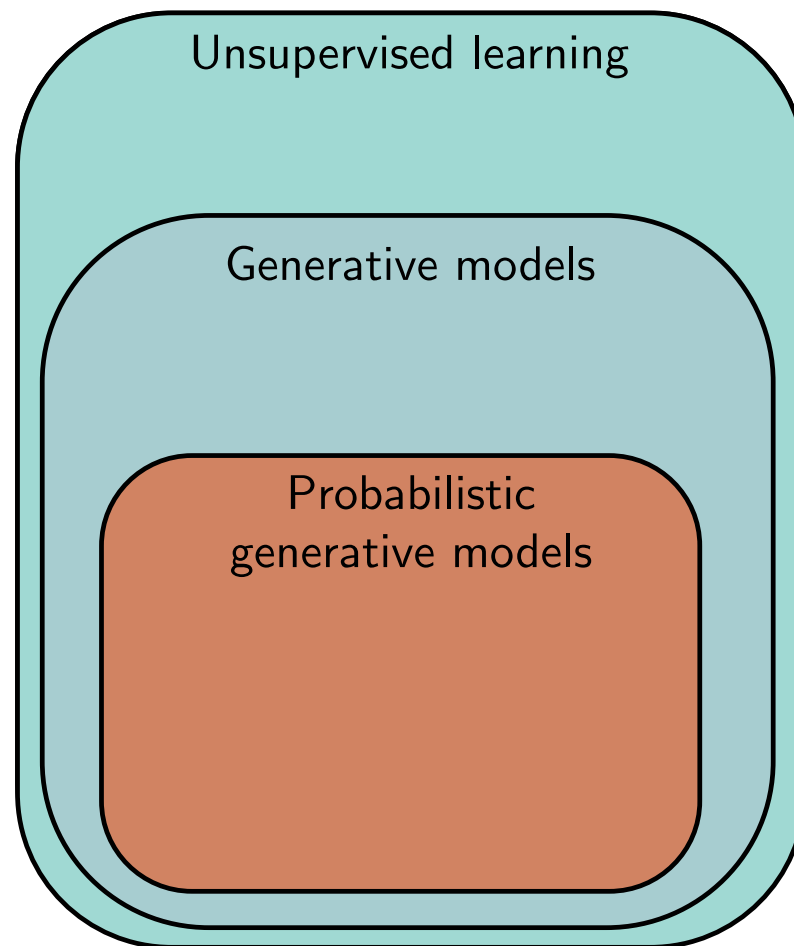
无监督学习

- 对一个无标签的数据集进行学习
 - e.g., 聚类
- 生成式模型可以生成新样例
 - e.g., 生成对抗网络（GANs）



无监督学习

- 对一个无标签的数据集进行学习
 - e.g., 聚类
- 生成式模型可以生成新样例
 - e.g., 生成对抗网络（GANs）
- 概率生成模型通过数据学习分布
 - e.g., 变分自编码器（编码器+解码器）,
 - e.g., 归一化流,
 - e.g., 扩散模型



生成式模型-训练数据集



National Geographic
Domestic cat



Wikipedia
Cat - Wikipedia



The Guardian
pet guru Yuki Hattori explain | ...



Britannica
Cat | Breeds & Facts | Britannica



The Spruce Pets
Tabby Cat: Breed Profile ...



Britannica
Cat | Breeds & Facts | Britannica



Wikipedia
Cat intelligence - Wikipedia



Smithsonian Magazine
Cats React to 'Baby Talk' From Their ...



Alley Cat Allies
The Natural History of Domestic Cats ...



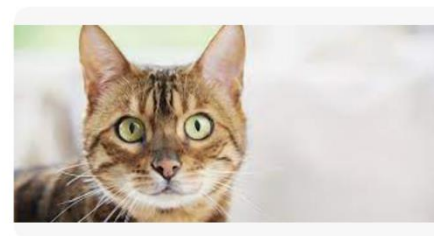
The New York Times
How the Cat Gets Its Stripe...



Country Living Magazine
Friendliest Cat Breeds Tha...



Freepik
Cat Images - Free D...



BBC Science Focus
What's the longest a cat can live for ...



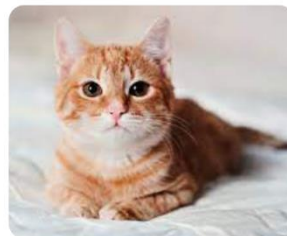
National Geographic
Domestic cat



DK Find Out!
Cat Facts for Kids | What is a Cat | DK ...



The Spruce Pets
Ragdoll Cat: Breed Profile ...



Good Housekeeping
25 Best Cat Instagram Caption...



Daily Paws
17 Long-Haired Cat Breeds to Swoon...



Unsplash
500+ Domestic Cat ...



Four Paws
A Cat's Personality - FOUR PAWS ...

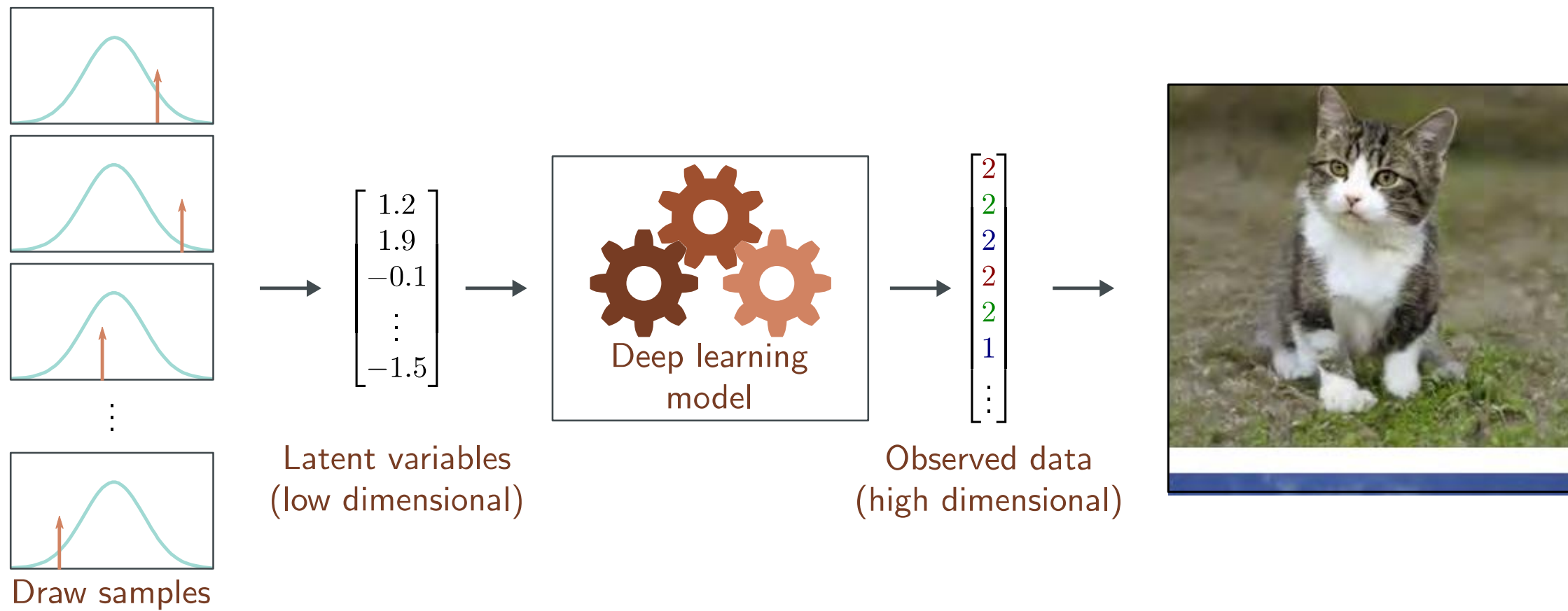


The Guardian
pet guru Yuki Hattori explain | ...

生成式模型-输出



隐变量 (Latent variables)



图像插值 (Interpolation)



I was a little nervous before my first lecture at the University of Bath. It seemed like there were hundreds of students and they looked intimidating. I stepped up to the lectern and was about to speak, when something bizarre happened.

Suddenly, the room was filled with a deafening noise, like a giant roar. It was so loud that I couldn't hear anything else and I had to cover my ears. I could see the students looking around, confused and frightened. Then, as quickly as it had started, the noise stopped and the room was silent again.

I stood there for a few moments, trying to make sense of what had just happened. Then I realized that the students were all staring at me, waiting for me to say something. I tried to think of something witty or clever to say, but my mind was blank. So I just said, "Well, that was strange," and then I started my lecture.

I was a little nervous before my first lecture at the University of Bath. It seemed like there were hundreds of students and they looked intimidating. I stepped up to the lectern and was about to speak, when something bizarre happened.

Suddenly, a giant rabbit ran into the lecture hall! The students started screaming and running around in panic. I was so shocked that I couldn't move. The rabbit ran up to me and hopped onto the lectern. Then, in a booming voice, it said:

"I am the Easter Bunny! I have come to give you all a special gift!"

The students were so surprised that they stopped screaming and listened to the Easter Bunny. Then, the Easter Bunny started handing out chocolate eggs to everyone in the lecture hall. The students were so happy that they started cheering and clapping. I was so relieved that the Easter Bunny had saved my lecture! After that, I was able to continue and the students paid attention for the rest of the hour. It was a great success!

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强化学习（Reinforcement learning）

- 一组状态（states）
- 一组动作（actions）
- 一组奖励（rewards）
- 目标：采取行动（actions）改变状态（state）获得奖励（rewards）
- 没有现成的数据 – 通过自己摸索环境来采集数据

例子： 国际象棋

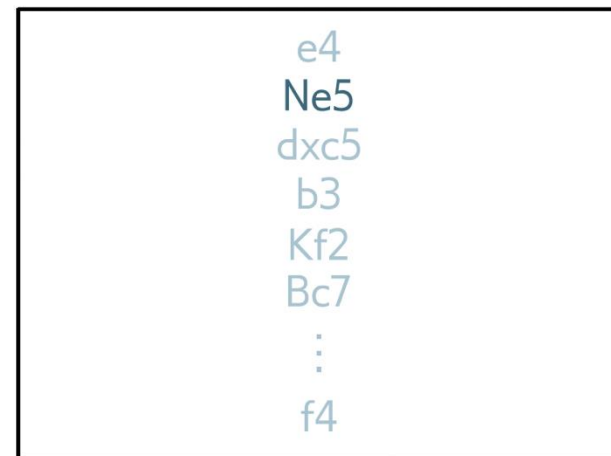
- 状态是棋盘上棋子的当前布局
- 动作是当前符合规则的走棋方式
- 成功吃掉对方棋子可以得到正奖励， 而自己的棋子被对方吃掉会得到负奖励

State



:

Action



例子： 国际象棋

- 状态是棋盘上棋子的当前布局
- 动作是当前符合规则的走棋方式
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