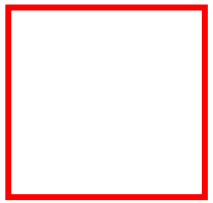
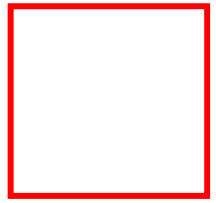
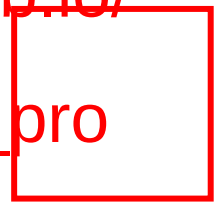
Universal Law of G on

- Let’s say I eat this leaf, and I feel sick.

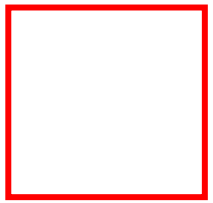
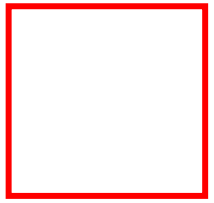
- What other leaves might I avoid?

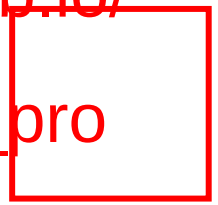



- What other leaves might I avoid?

- There is a “consequential region” of different possible objects that satisfy the property of being sickness-inducing leaves.
- I have generalized the property to other leaves.

- The region basically tells you how generalizable a property is
- A bigger region will mean there are more objects that share that property

Property: being able to reach things on a high shelf

The consequential region (spread of objects that have this property) might be easy to estimate here

The celebrities would be considered objects that may/may not be in the region.

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But sometimes it might not be obvious.

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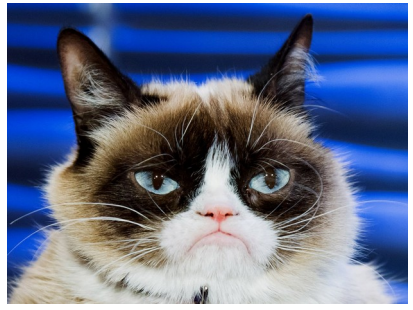
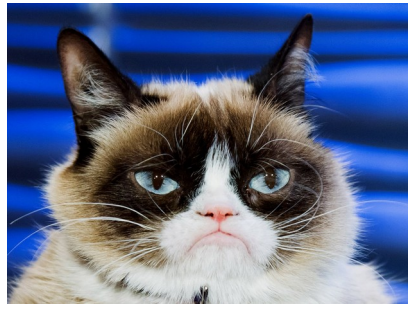


Which animals have the T-9 hormone?

- Let’s say you know canaries have T-9 hormones.
- What other animals might have them? It’s not obvious which objects (animals) are in the region R (which has the property “T-9 hormone”). The spread of the co the number of objects/animals that sh operty, is not obvious.



2. [10pts, HELP] What is the probability of getting x=1 for regions containing x=0?

You can think of it as:

- A canary (x=0) has the T-9 hormone
- The canary is in a region R where all objects in R share the property of having a T-9 hormone
- You don't know the e on R
- But there are differe regions, R, and say the canary (x=0) is in all of them.

- What's the probability that a robin (x=1) has a T-9 hormone?
- What's the probability that a robin is in the R of objects that have the property of having a T-9 hormone (the region to which canary, x=0, belongs)?

0

X axis: different objects that are arranged by just one feature.

Y axis: probability y is in a region given that x is in a region

Here, we don't know what the spread of the consequential region will be.

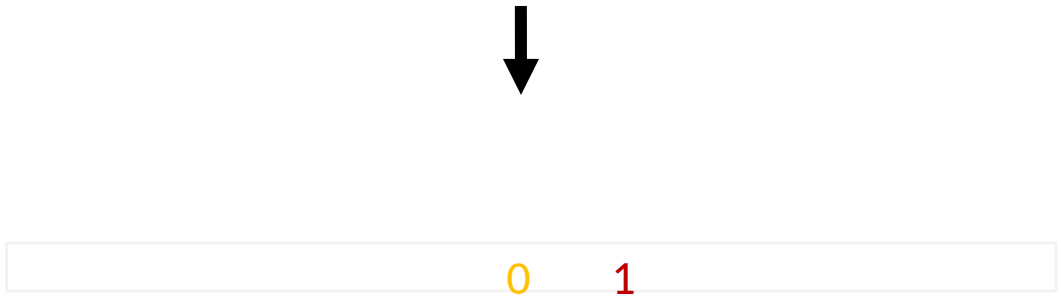
These black bars are all possible spreads of the CR, generated randomly

(Note that if you are instructed to find the probability of getting x=1 for regions containing x=0, you need to make sure all your regions contain x=0)

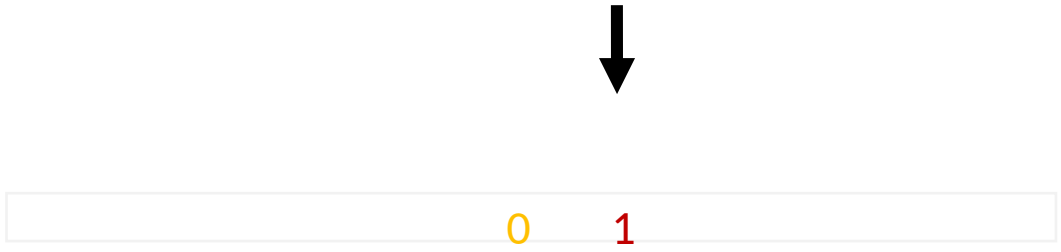
0 1

Because we don’t know what the true spread of the consequential region (property: animals that have a T-9 hormone) is, we will use all these possible Rs to determine the probability that x=1 (or “robin”) is included in that region.

So how do we actually determine this?



- This graph can tell you the relative probabilities of the different objects within it
- ry, at 0, has the highest bility.



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- The y axis of this graph represents the probability that you would sample object x (if you considered all possible CRs).

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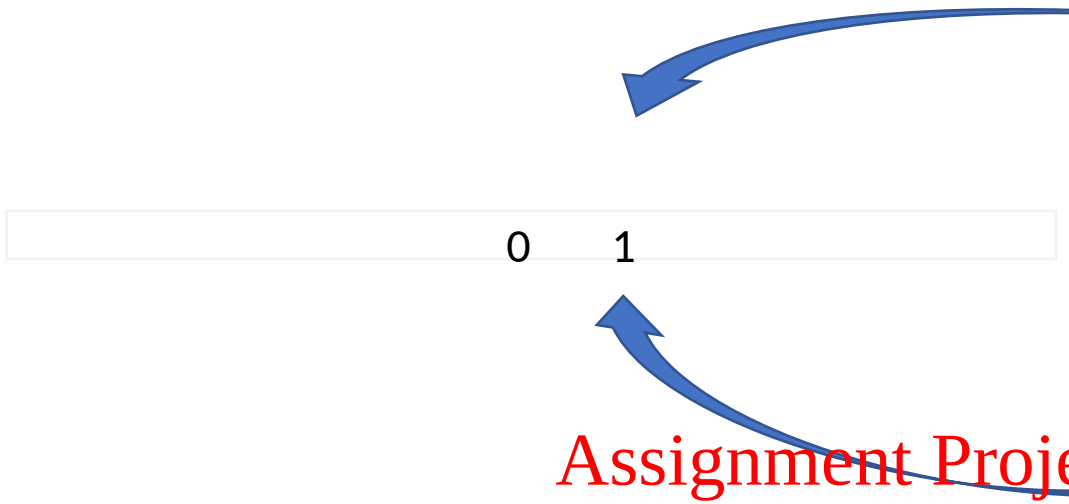
In the HW, canary is the only observed object in that property; is in all the regions.

So if we sampled objects from all the regions, canary will be sampled the most (every time) whereas robin will be sampled less, and so on.

So what does this mean?

- The y axis of this graph represents the probability that you would sample object x (if you considered all possible CRs).

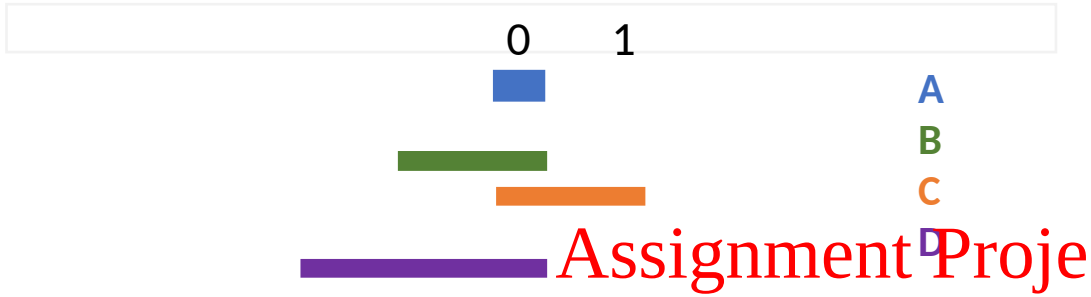


- You can compute the y value at any x using this procedure:

at concept X =

$$\sum_R P(X|R)P(R)$$

=



$P(X|A)*P(A)$

+

$P(X|B)*P(B)$

+

$P(X|C)*P(C)$

+

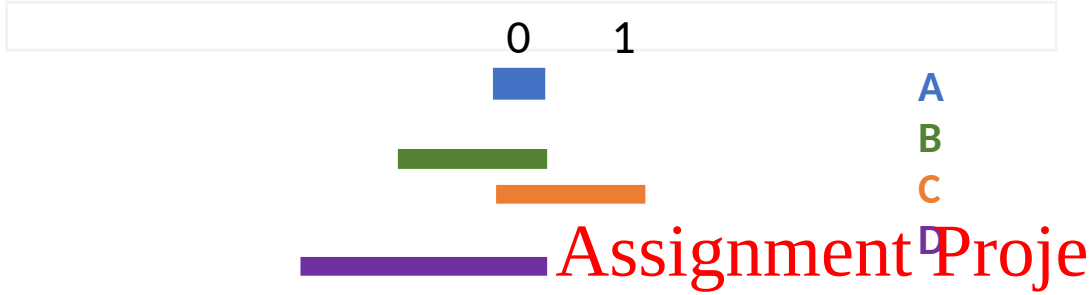
$P(X|D)*P(D)$

+

.....

$$\sum_R P(X|R)P(R)$$

=



P(X|A)*P(A)

+

P(X|B)*P(B)

+

P(X|C)*P(C)

+

P(X|D)*P(D)

+

.....

you

c

his

f

*NOTE: If X is not in the consequential region R, then for that specific R,

$$P(X|R)P(R) = 0$$

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All the regions in this assignment should contain x=0, but how would you check if they contain x=1?

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All the regions in this assignment should contain x=0, but how would you check if they contain x=1?

edge1<= (x=1) <= edge2

What's the probability of getting x=1, for regions containing x=0?

$$\sum_R P(X|R)P(R)$$

=

P(X|A)*P(A) 0

+

P(X|B)*P(B) 0

+

P(X|C)*P(C)

+

P(X|D)*P(D) 0

+

.....

$$P(X|R)P(R)$$

Probability of observing object X in the region R

(if you put all objects that were in R in a bag, what would the probability of sampling this particular object X be?)

Probability of you sampling region R

(e.g. if you put all regions in a bag, what would the probability of you sampling that particular region R be?)

$$\sum_R P(X|R)P(R)$$

probability that your object x=1 (or whatever x you specify) will ha s x=0 (or whatever other x you sp able object; the object that is in all R).

Computing this sum is marginalizing over every possible R there could be (since you don't know the true R, you see what P(X|R) would be under any of the possible Rs)

How to compute $P(X|R)$ and $P(R)$

$P(X|R)$ 1/(length of the R you have currently sampled) (if X is in R, and 0 otherwise)

$P(R)$ 1/(number of Rs) (since every R has the same chance of being sampled)

Why do we do this?

- You can think of each of these
  s as a uniform distribution

P(X|R)

 edges of the R

$$\int_L^R (ConsequentialRegion) = 1$$; the area of this rectangle = 1

P(X|R)

edges of the R

Since the length is 8,

P(X|R)

edges of the R

Since the length is 8, for length*height to = 1, height has to be 1/8

P(X|R)

edges of the R

Hence, P(X|R) = 1/(length of R)

Scaling of axes

- Takes an axis that is written in normal, linear interval form [1,2,3,4…]
- And instead writes it as [e^1, e^2, e^3, e^4, e^5]
  (or [10^1, 10^2, 10^3, 10^4, 10^5], which is equivalent because of the change of base formula)
- That changes the spacin al is changing a lot, the
  (and causes a distortion
  corresponding spacing on the y axis d y just one space,
  making it seem as if the exponential just decreased by a little, not a lot)
- plt.yscale