AI1: Topic 1 : Week 4

Search in continuous spaces

Attendance Code:

Searching in different types of spaces

- A candidate solution encodes values for a set of decisions that define a solution
- examples so far: decisions take **categorical** values
- so at every stage we have a fixed set of neighbours
- **What happens if the decisions take real/continuous values?**

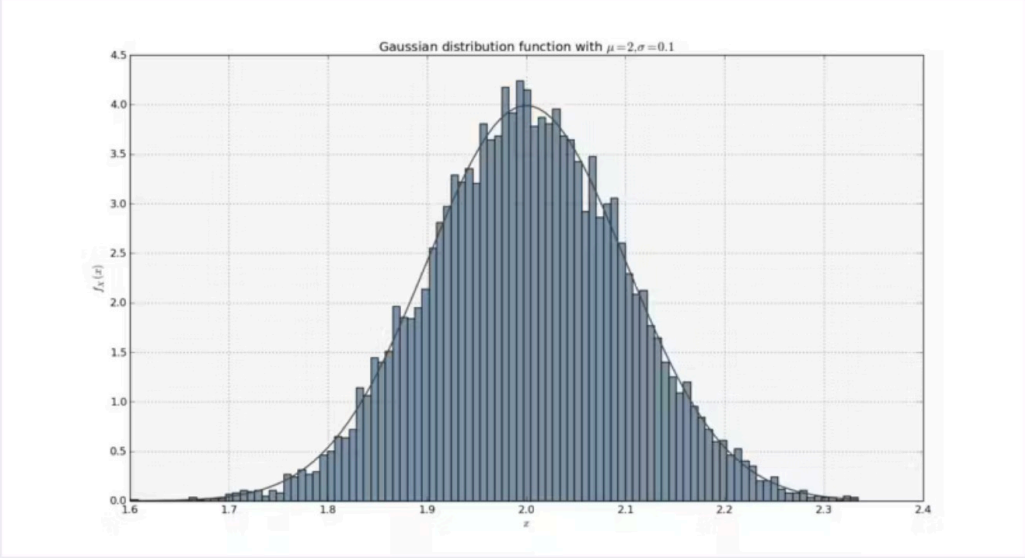
Continuous variables have infinite numbers of neighbours!

only limited by precision of floating points
so we can't examine all the neighbours.

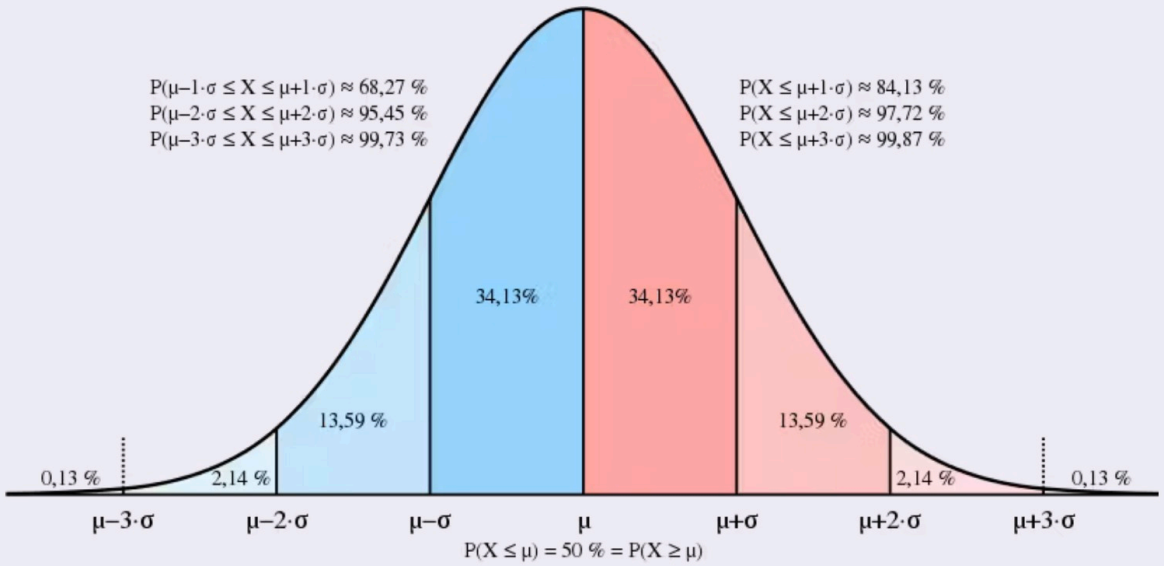
Option1: make neighbours by adding noise and
just sample a few

Option 2: put. the effort into use some cunning
maths, and just generate one neighbour

Can any one describe what a Gaussian/Normal distribution of numbers is



normal distribution from samples Mean is called mu (greek letter like a u) and standard deviation is called sigma (like an o with a tail)



Probability of generating points from a random distribution

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Option 1: Adding noise and sampling

- **Zero-mean** : change up as likely as change down
- **Standard Deviation** (sigma) choose to suit scale of problem
- For each variable:
- * generate a random number from a N(0,1) distribution
- * scale to problem (multiply by sigma)
- * add the random numbers to the variable
- Might need some trial and error to decide how many samples to use

option 2: where possible

- → Apply some maths to estimate local slope
- → do this while calculating quality
- → move operator = 1 step in that direction
- → repeat

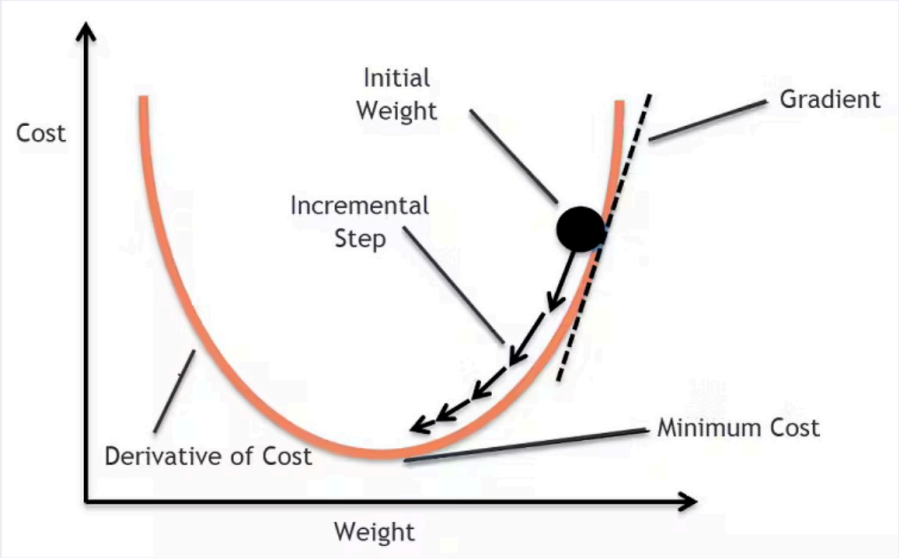

Image from https://www.analyticsvidhya.com/blog/2020/10/how-does-the-gradient-descent-algorithm-work-in-machine-learning/

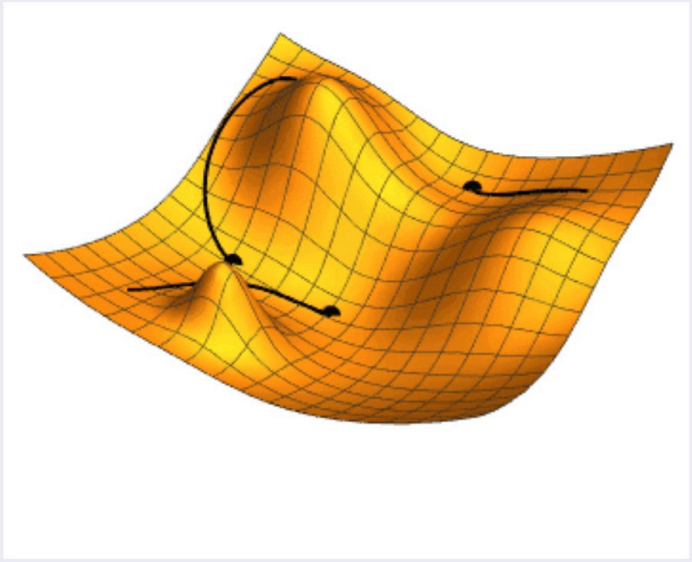

image from Wikimedia