

# Intro to Monte Carlo methods and reservoir simulation

Friday, October 23, 2020 9:12 AM

- Monte Carlo (MC)
  - broad class of repeated sampling techniques
  - Optimization
  - Bayesian stats
  - Integration
    - Probability / uncertainty into models
- Let's - PM10 example
  - PM10 ~ Normal( $\mu = 90$ ,  
 $\sigma = 20$ )
- $\text{Prob}(\text{PM10} > 150)$ 
$$Z = \frac{150 - 90}{20} = 3$$

$$P(Z > 3) \approx 0.0014$$

0.14%

• What is 95<sup>th</sup> percentile PM10?

Z-score table

$$Z_{0.95} = 1.645$$

$$PM10_{0.95} = Z_{0.95} \cdot 20 + 90$$

$$= 123 \text{ } \mu\text{g/m}^3$$

• deaths (pm10)

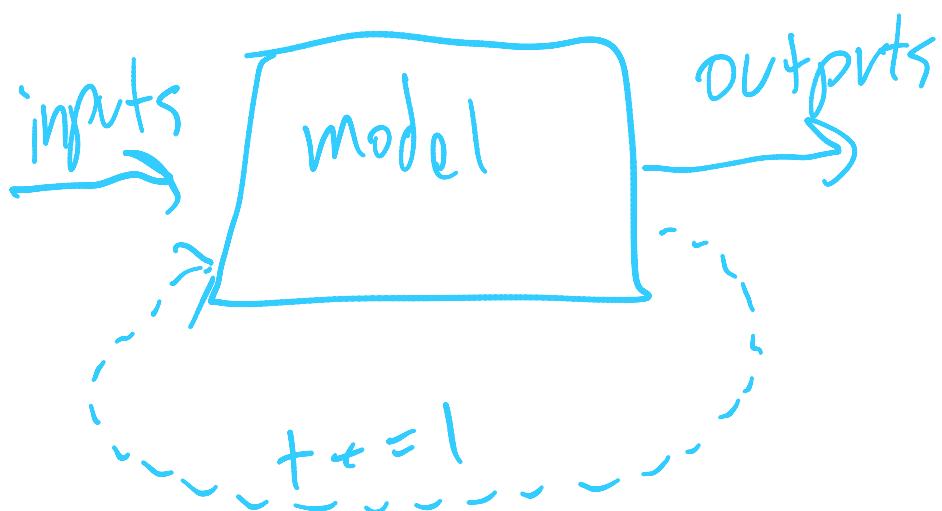
$$= \frac{15}{1 + \exp(-(\frac{x-80}{35}))}$$





## Reservoir Simulation

- Simulation: An imitation (via computer ~~model~~) of dynamic process over time



- Stuff balance model
  - Stuff in - Stuff out
  - $\Leftarrow \Delta \text{Stuff}$

- Mass, energy, momentum
- People, money, birds

'Reservoir  
(Inflow + precip)

-(Releases + evap)

*Switch back to Jupyter notebook*