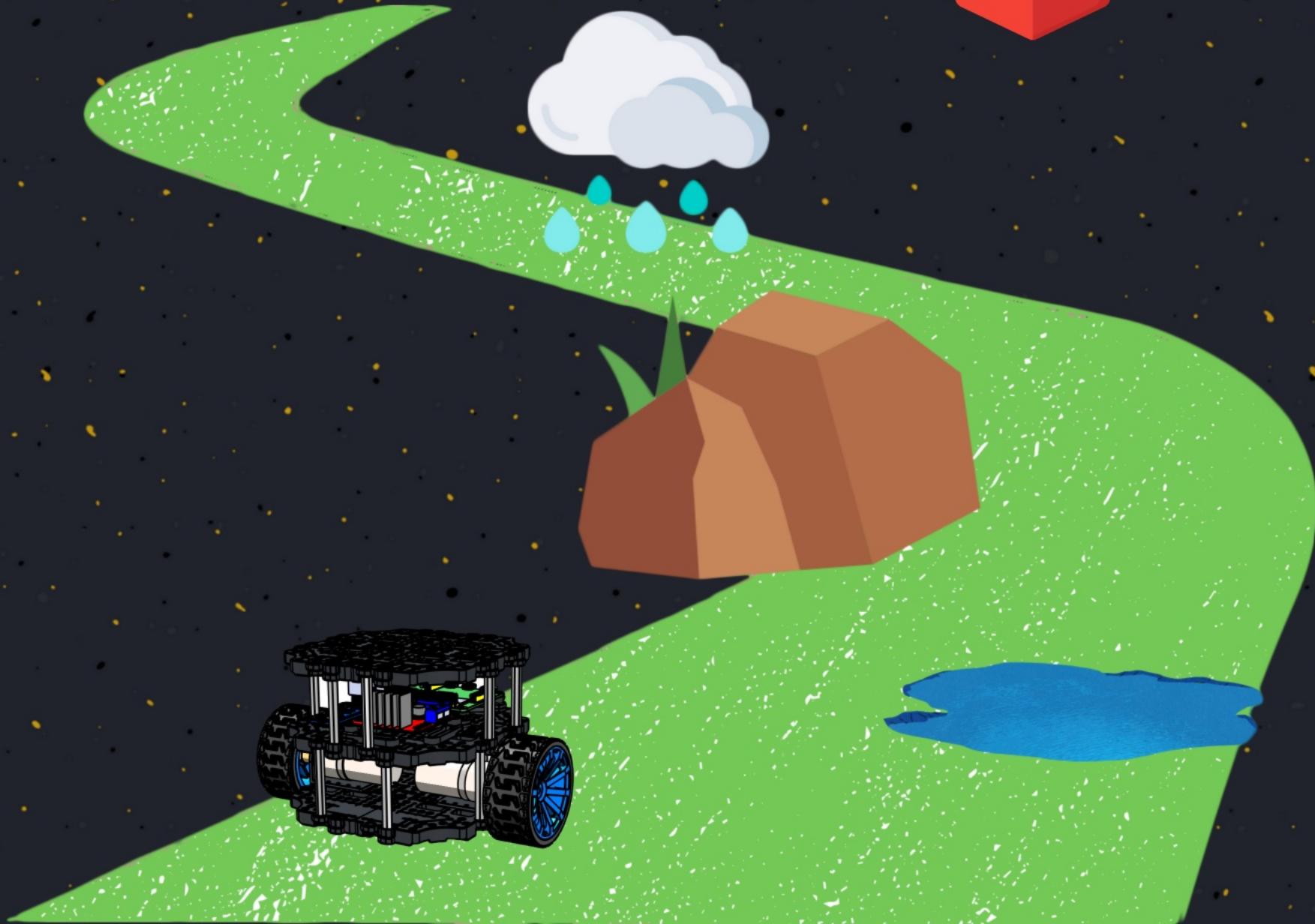
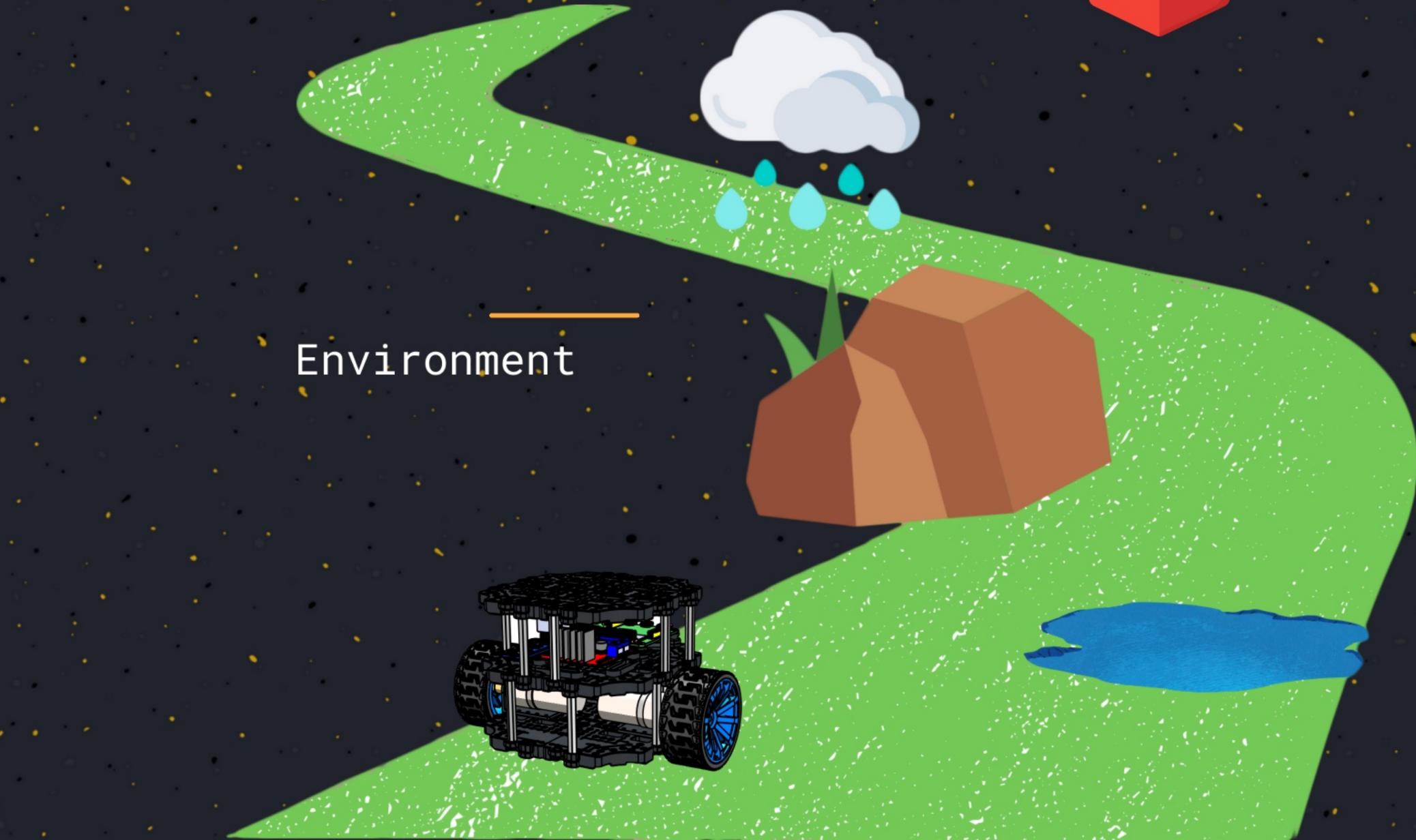
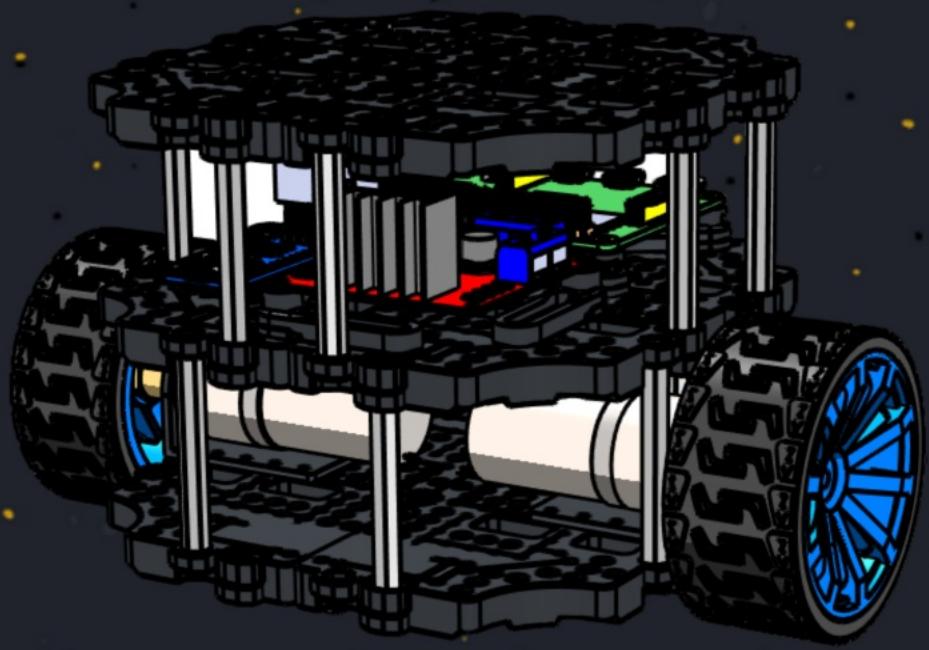


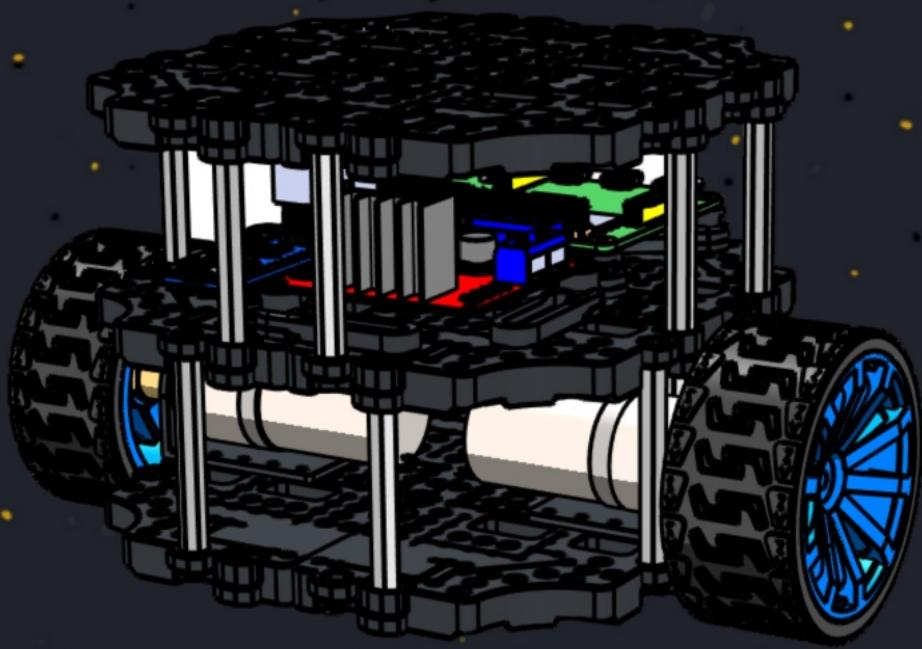
Probability for Robotics



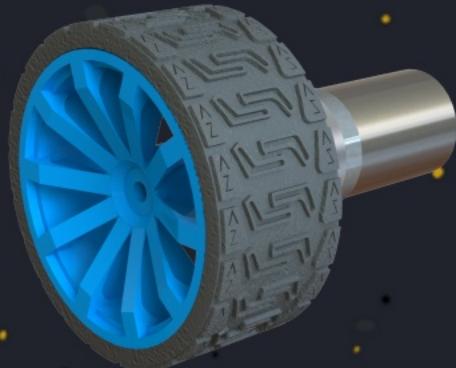
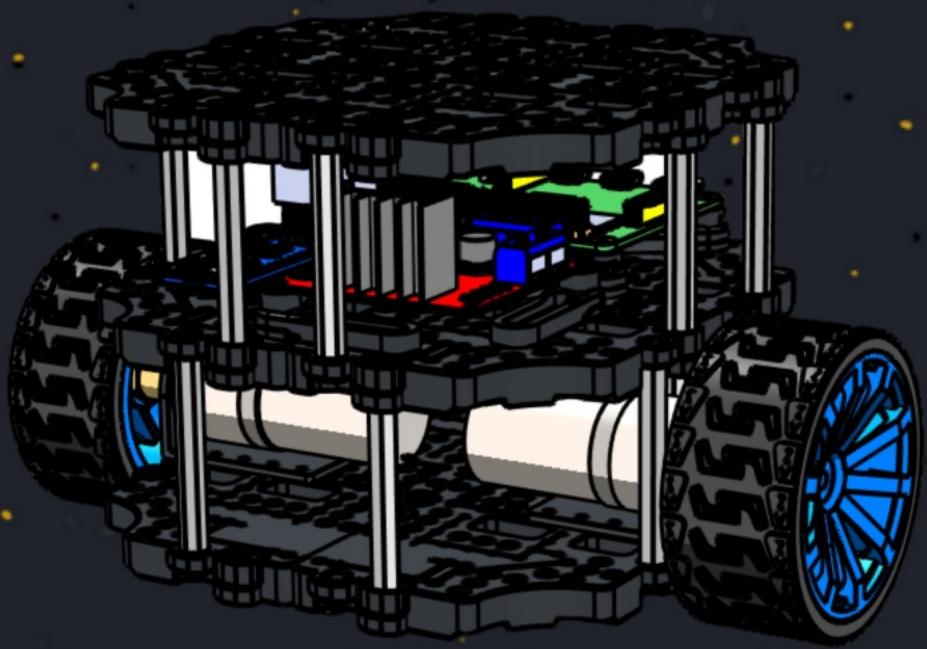
Probability for Robotics



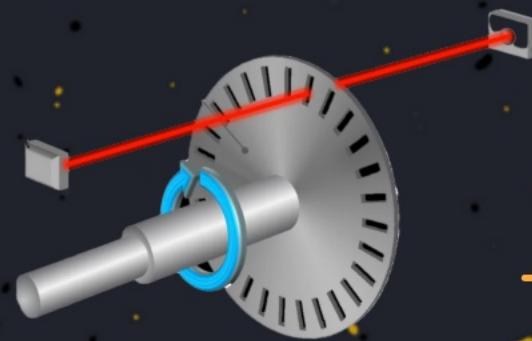




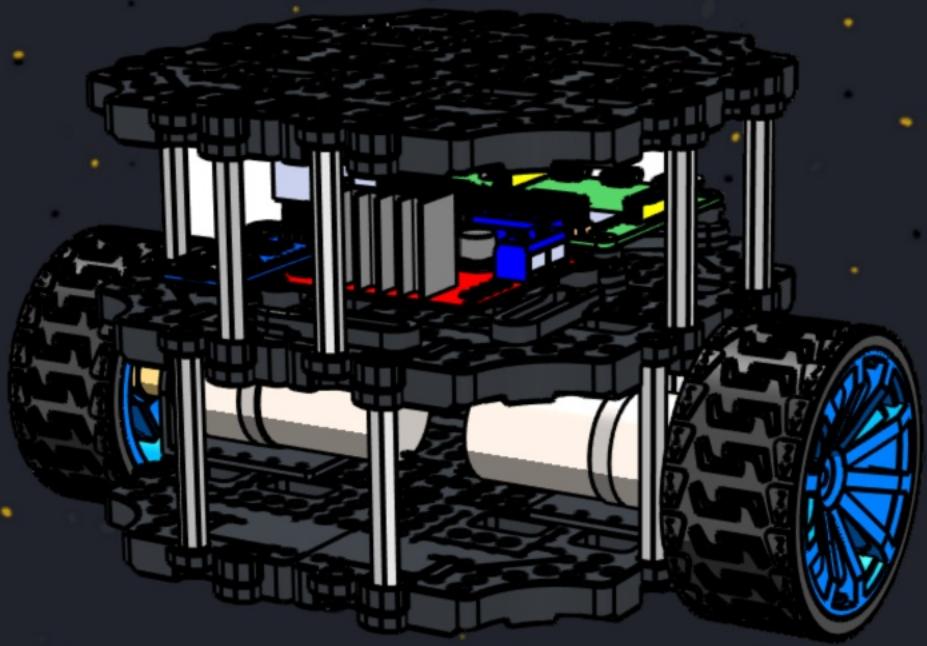
Actuators



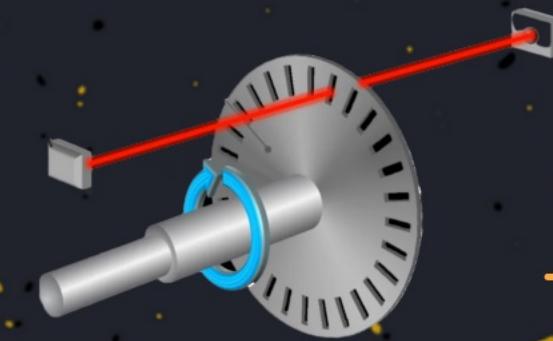
Actuators



Sensors



Odometry Model

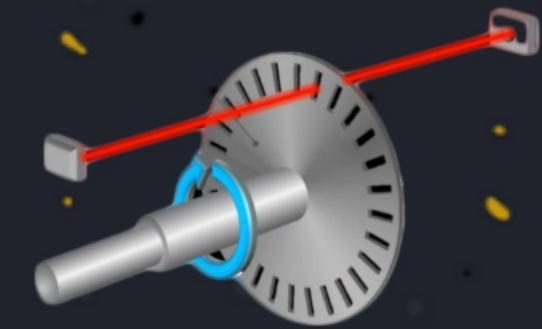


Sensors

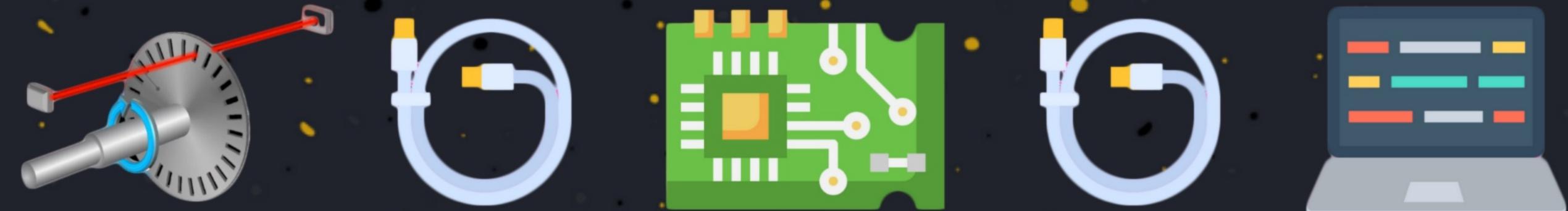


Actuators

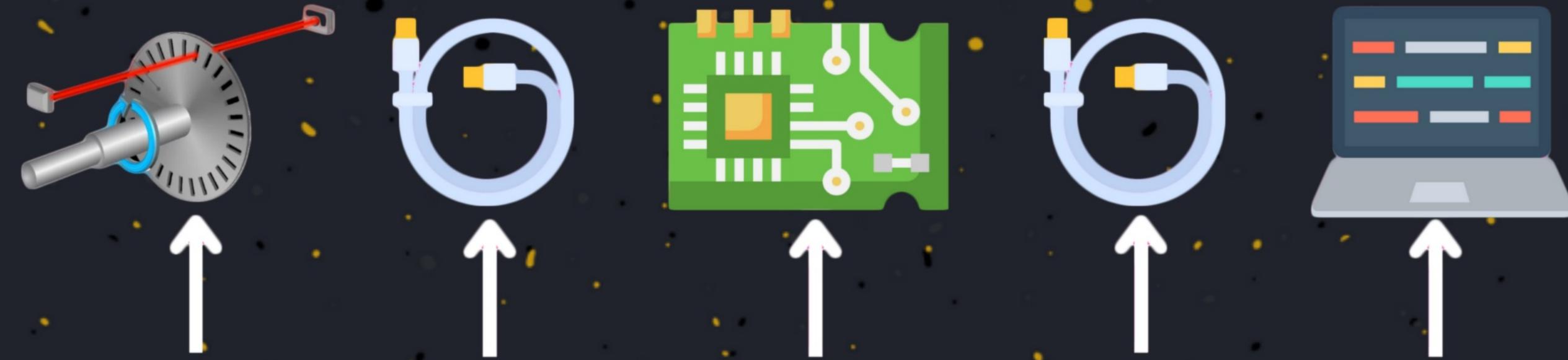
Sensor Noise



Sensor Noise



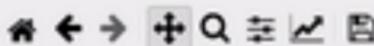
Sensor Noise



Noise



pan/zoom



/bumperbot_controller/odom/twist/twist/linear/x

2

1

0

-1

-2

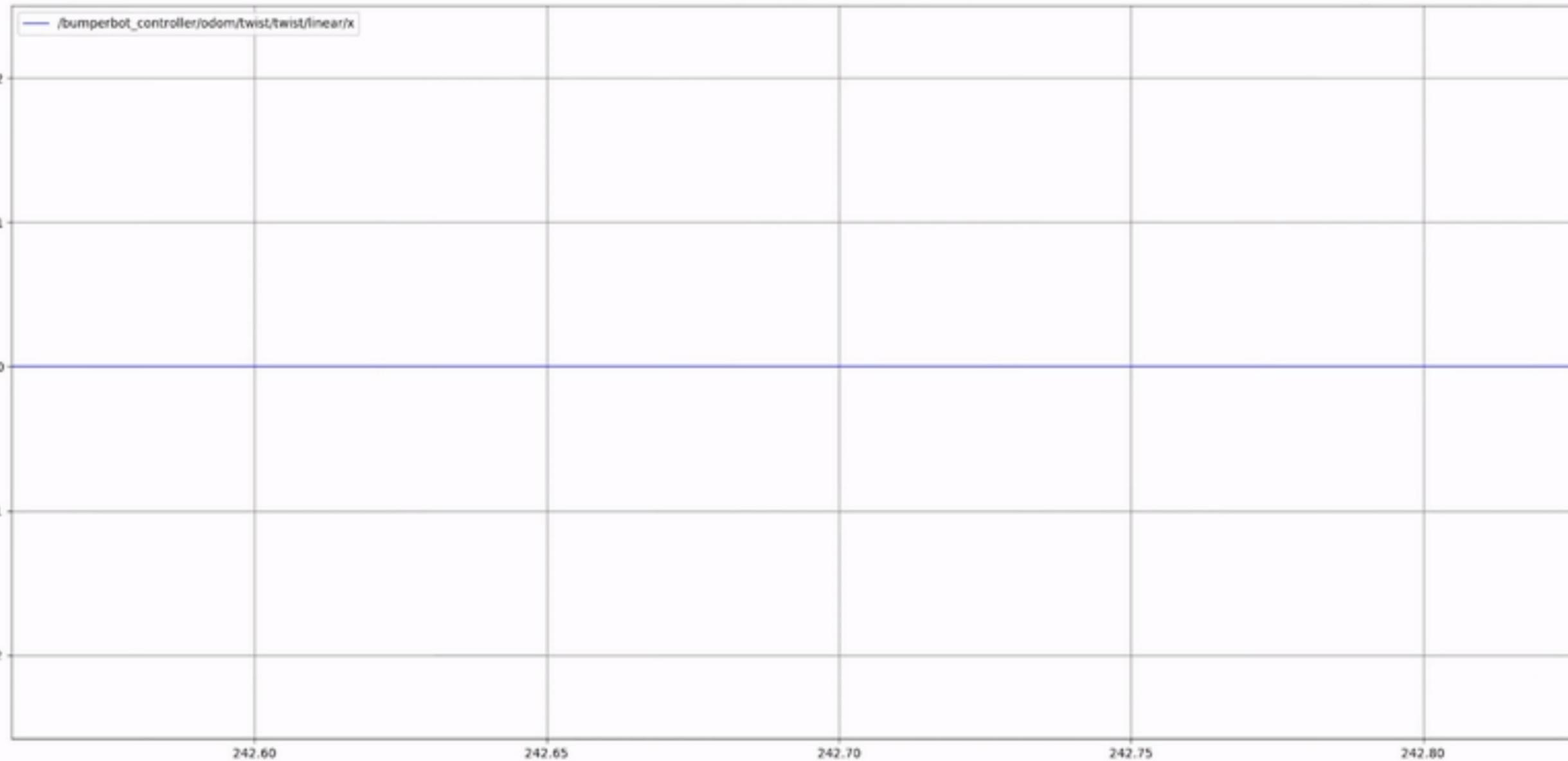
242.60

242.65

242.70

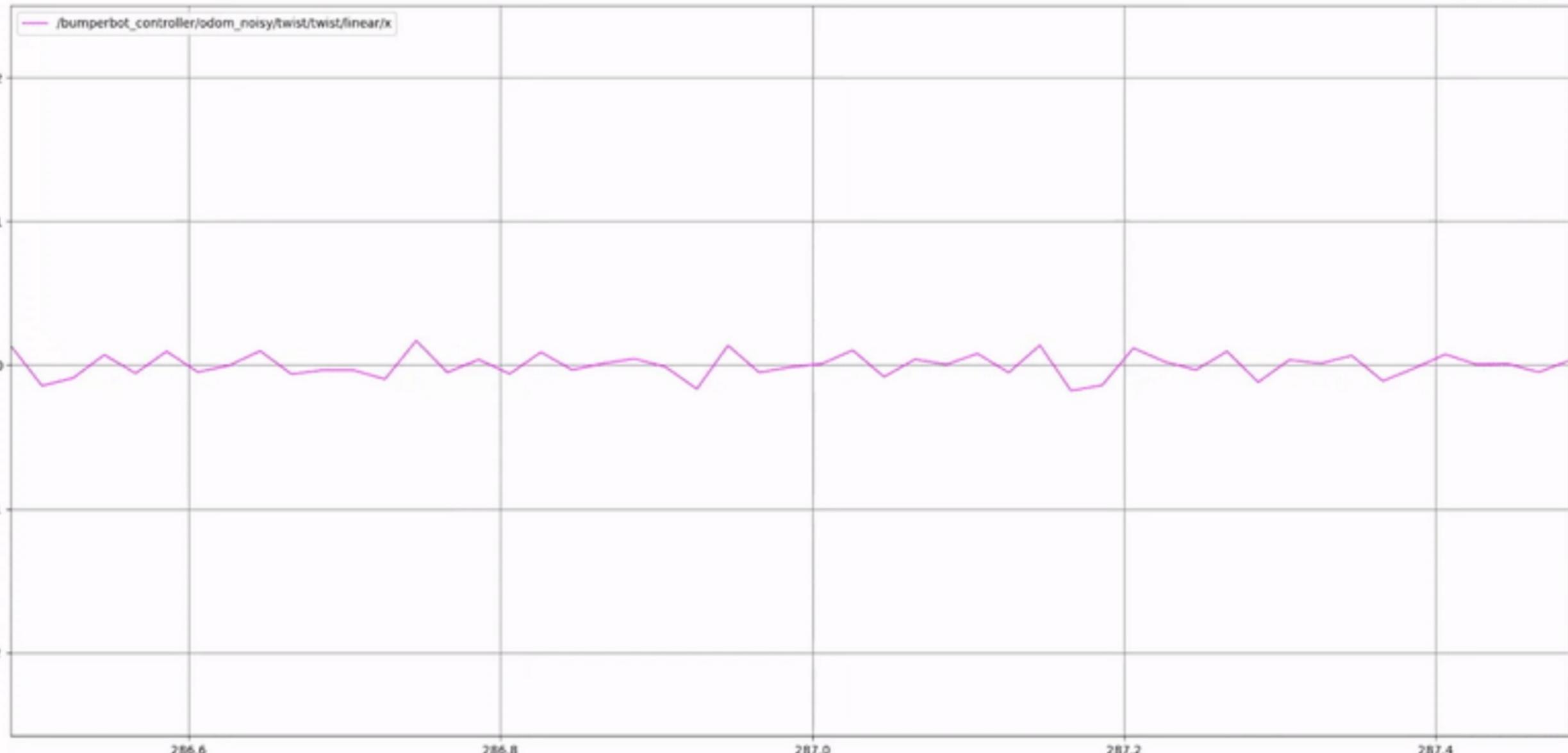
242.75

242.80





pan/zoom, x=285.69 y=-1.19286



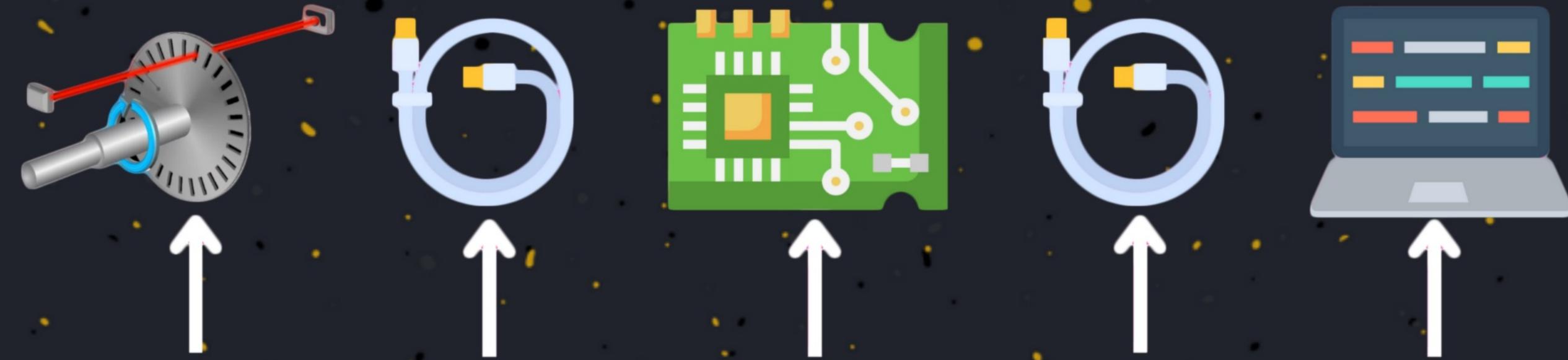


A set of small icons for navigating the plot, including arrows for pan, a plus sign for zoom in, a minus sign for zoom out, a magnifying glass for zoom, and a double arrow for scroll.

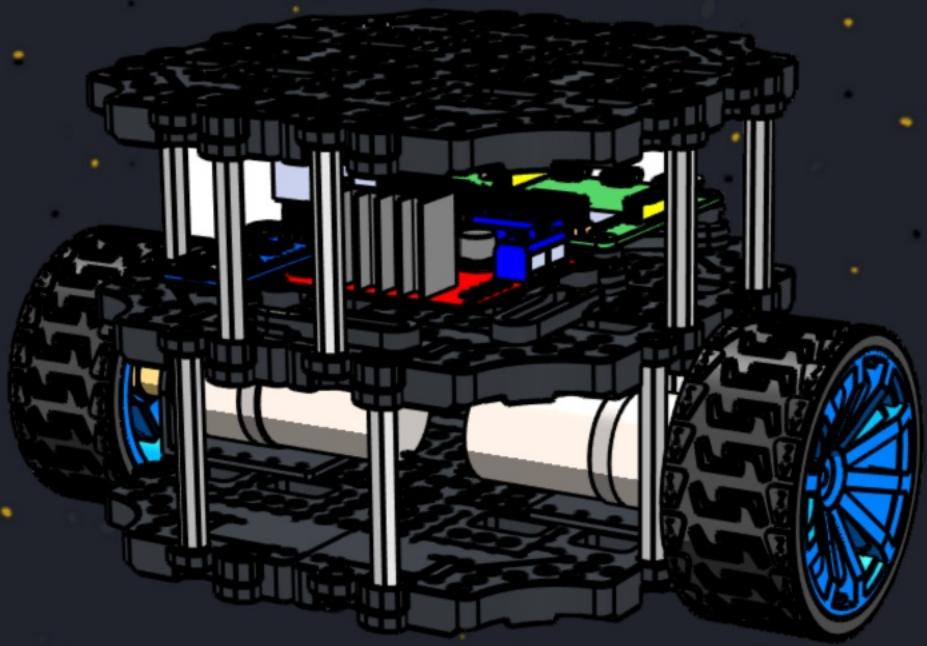
pan/zoom



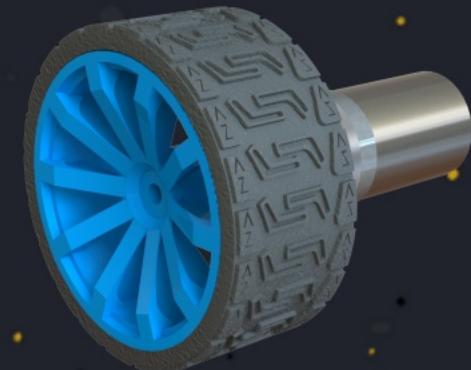
Sensor Noise



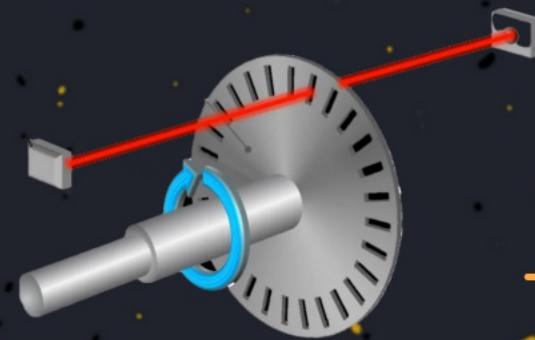
Noise



Odometry Model

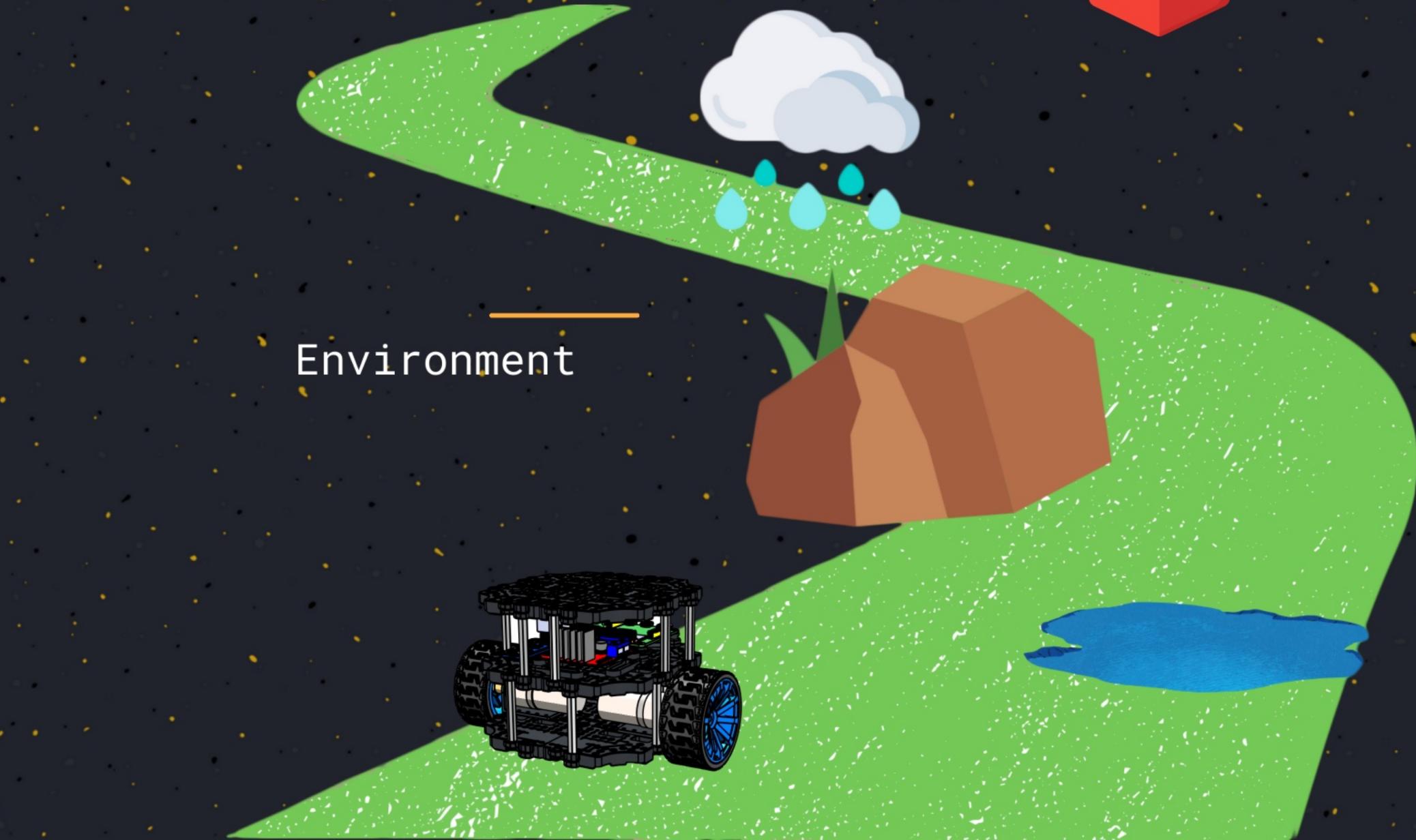


Actuators

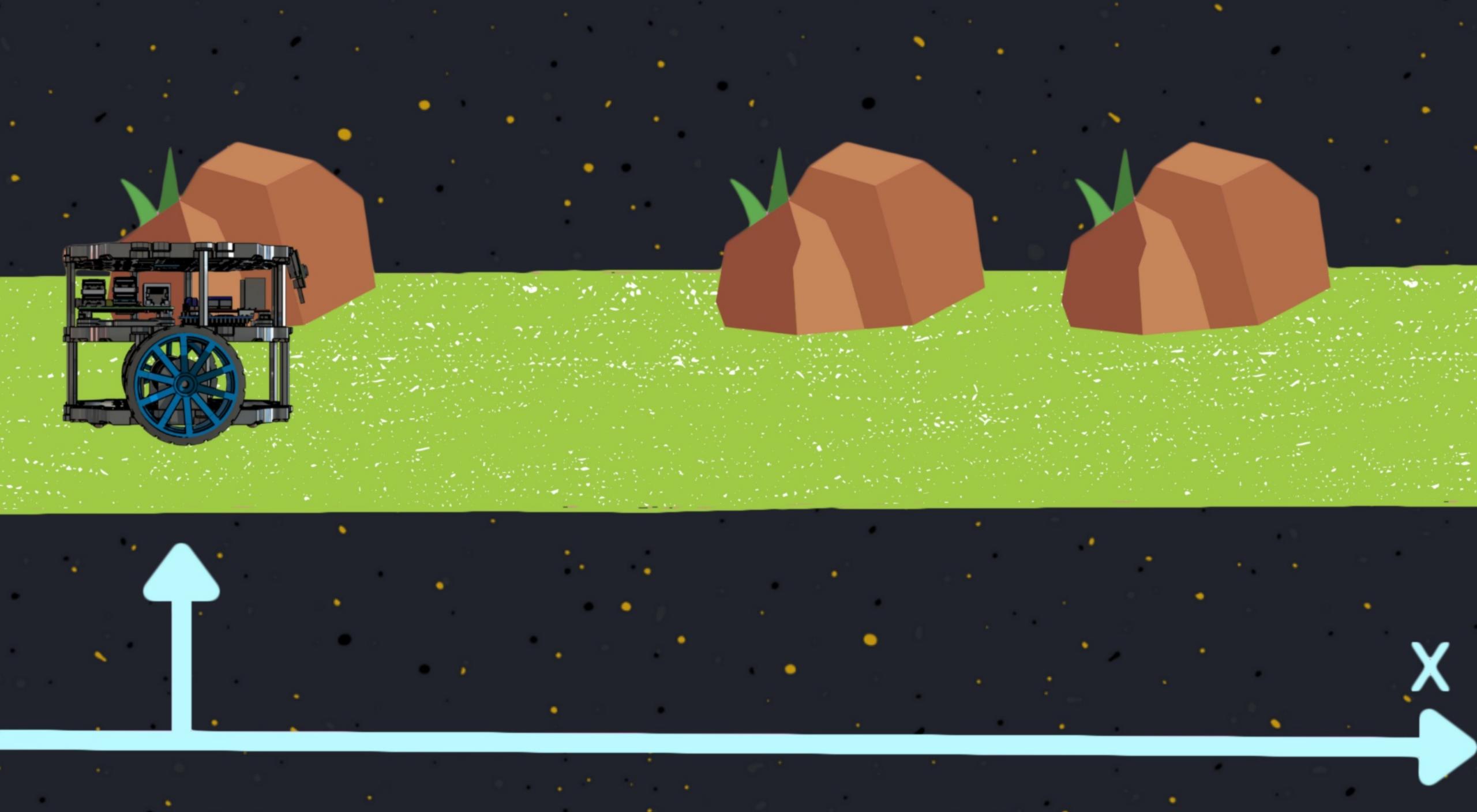


Sensors

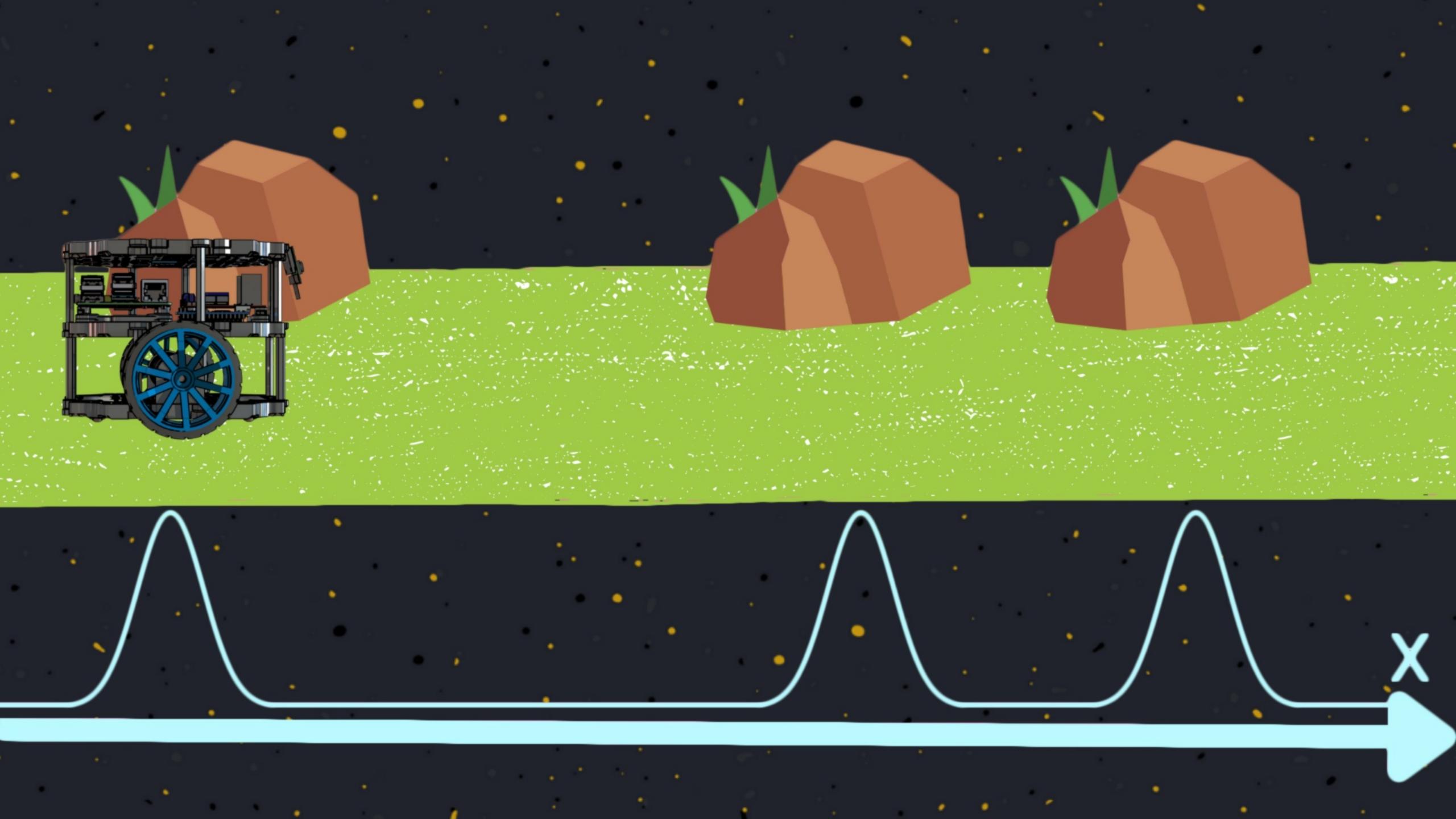
Probability for Robotics

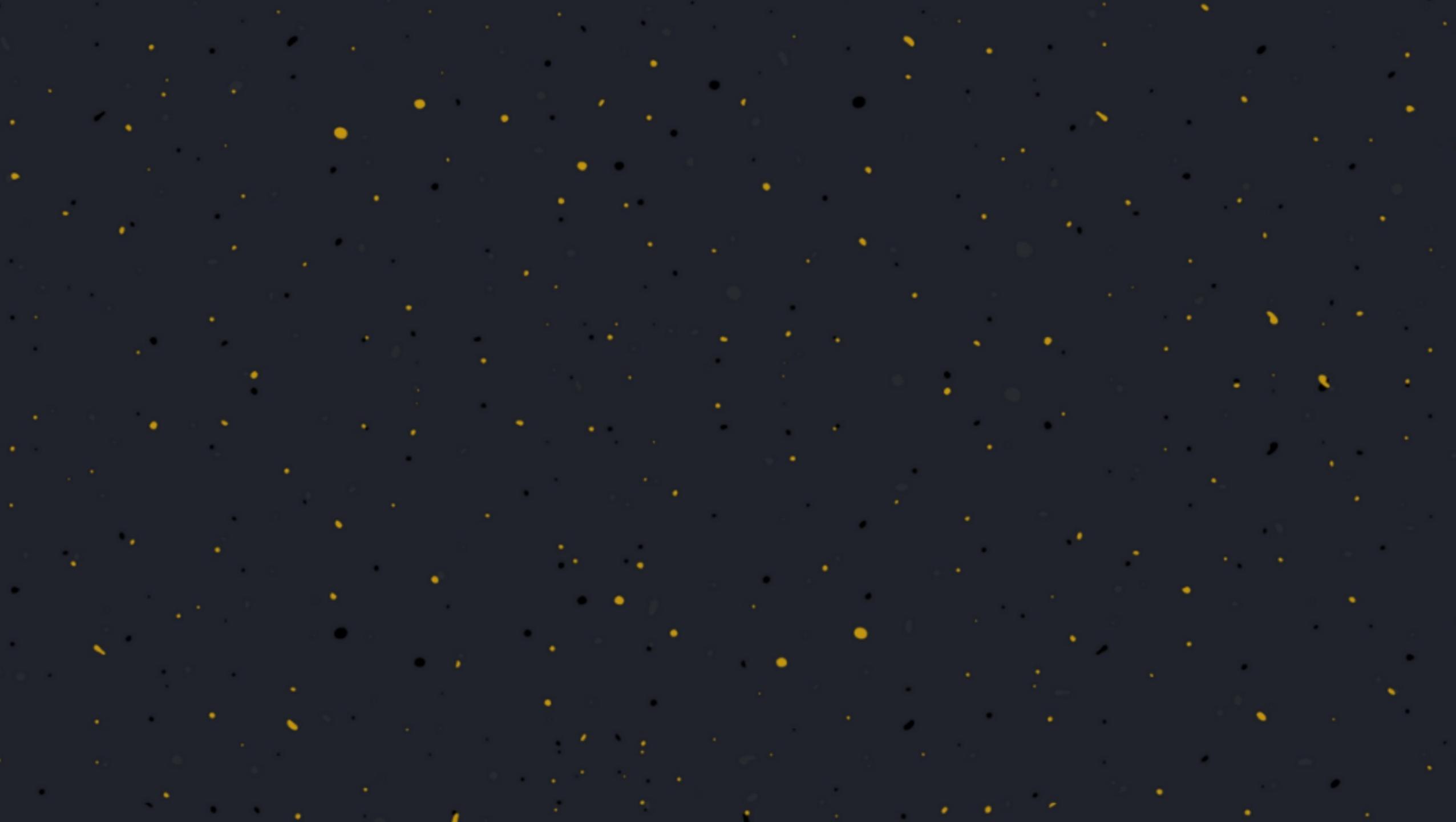


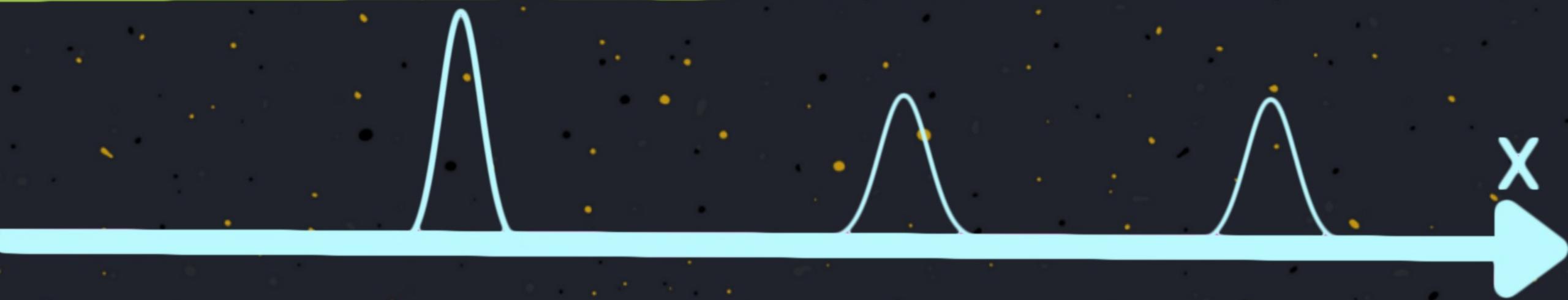
Environment

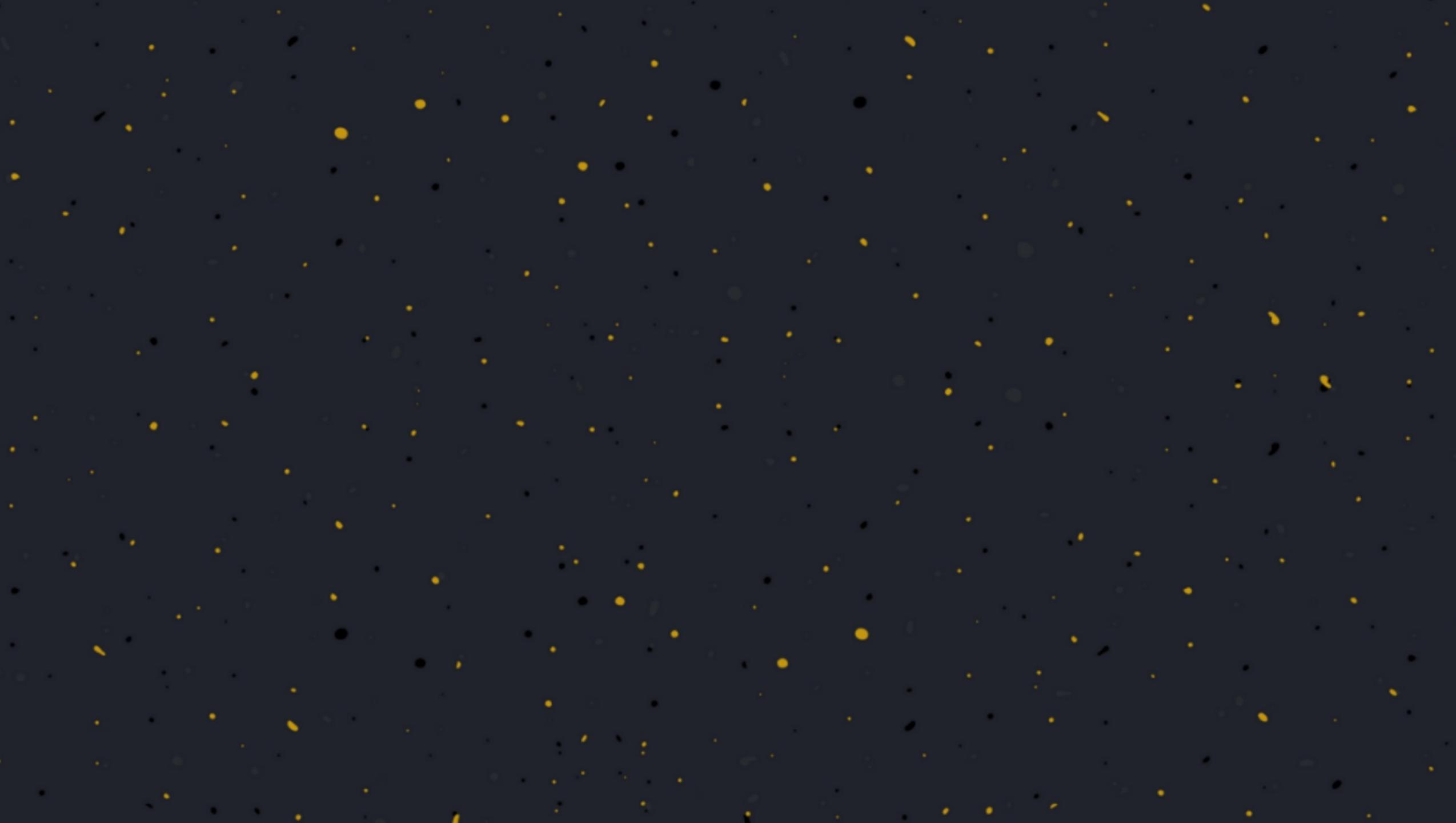


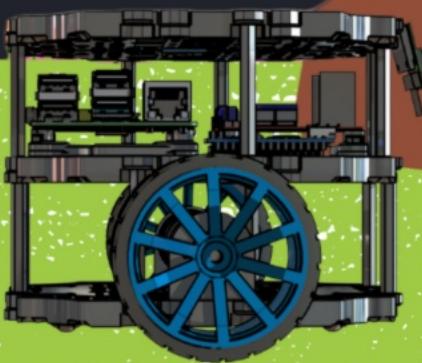




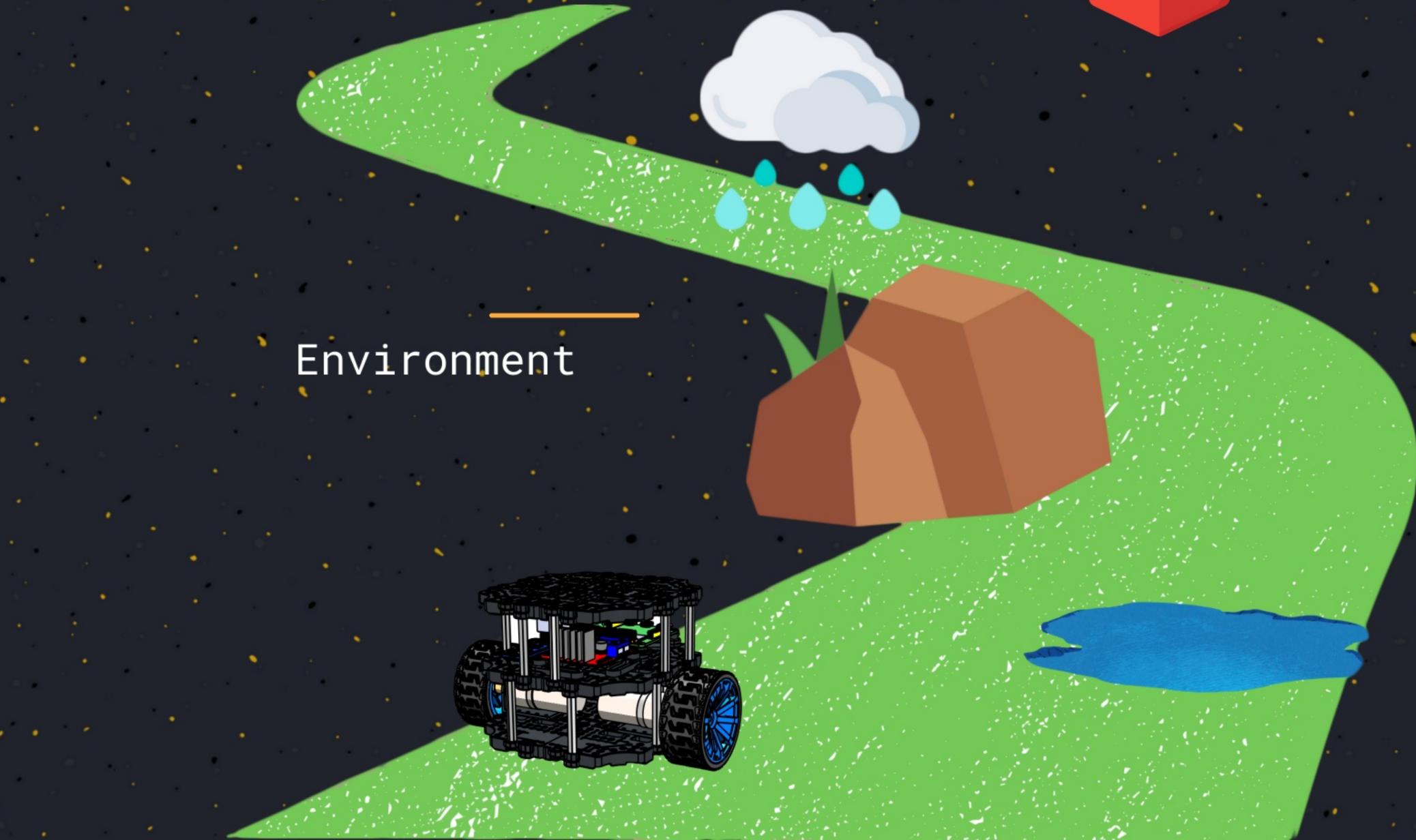




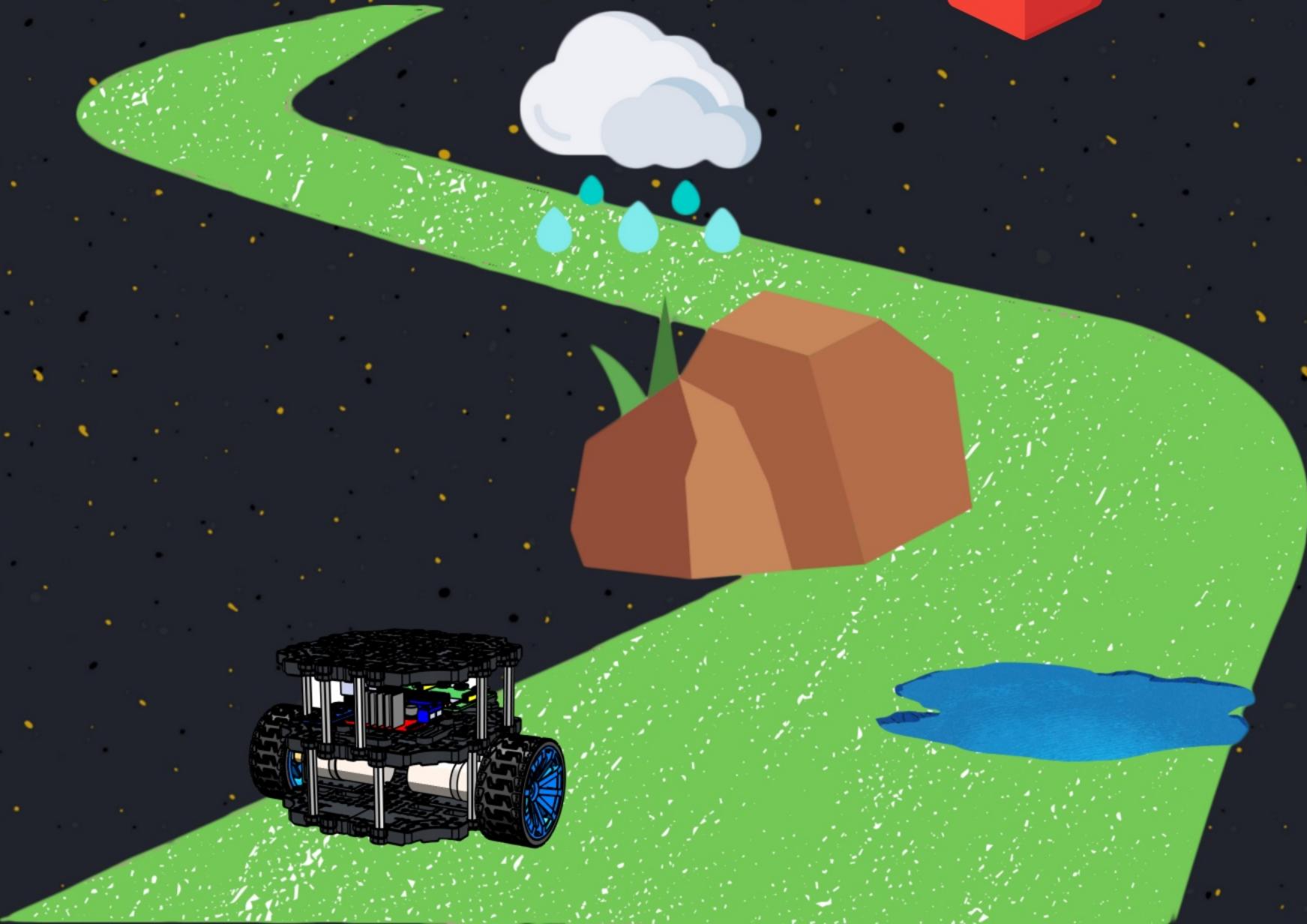




Probability for Robotics



Probability for Robotics



Random Variables



Random Variables



$\{1, 2, 3, 4, 5, 6\}$

Random Variables


$$\{1, 2, 3, 4, 5, 6\}$$


Random Variables



{1, 2, 3, 4, 5, 6}



{head, tail}

Random Variables

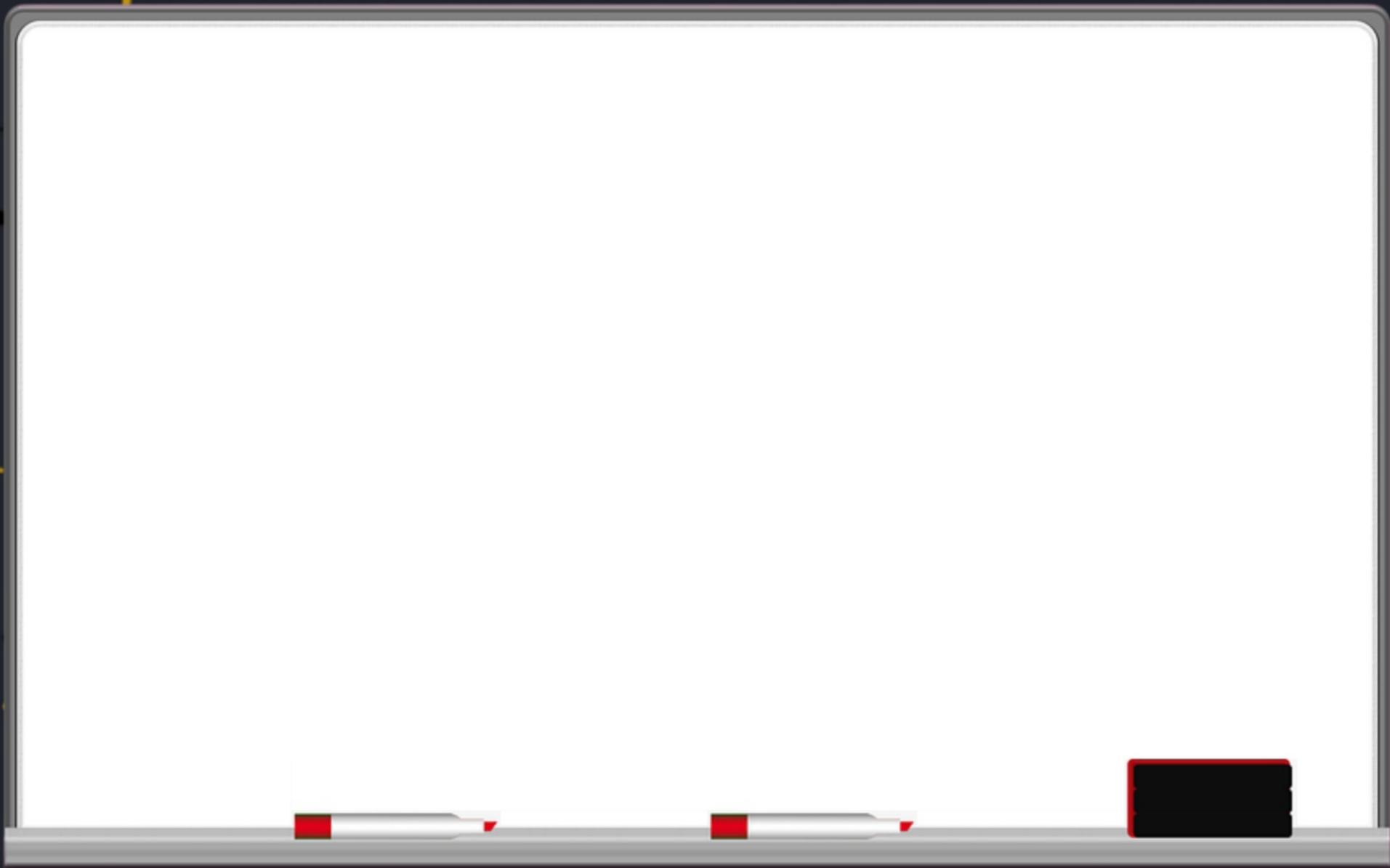

$$X = \{1, 2, 3, 4, 5, 6\}$$


{head, tail}

Random Variables


$$X = \{1, 2, 3, 4, 5, 6\}$$

$$X = \{\text{head}, \text{tail}\}$$



Random Variables


$$X = \{1, 2, 3, 4, 5, 6\}$$

$$X = \{\text{head}, \text{tail}\}$$

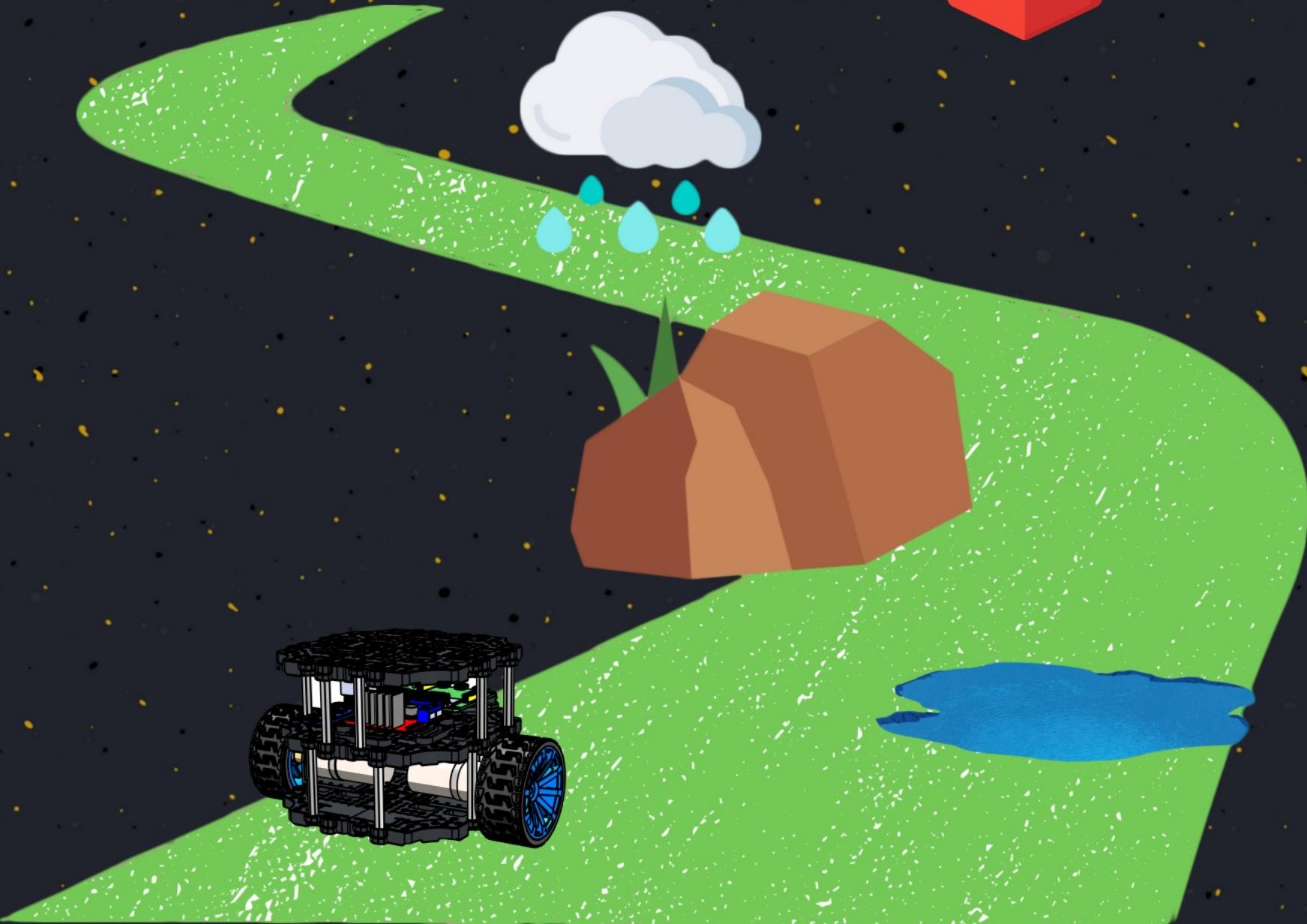


Random Variables


$$X = \{1, 2, 3, 4, 5, 6\}$$

$$X = \{\text{head}, \text{tail}\}$$

Probability for Robotics



Conditional Probability



Conditional Probability

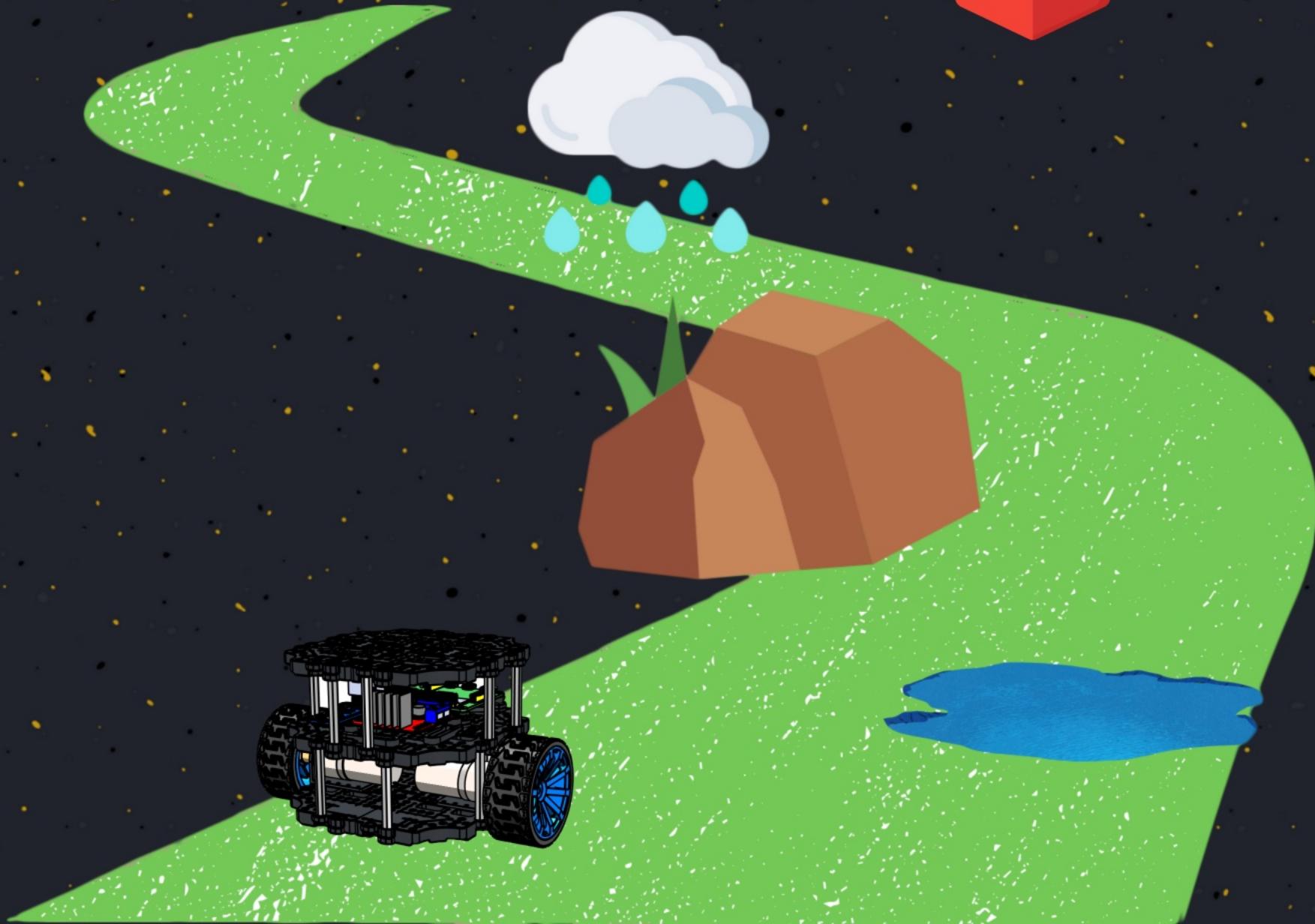




Conditional Probability



Probability for Robotics



Probability Distributions

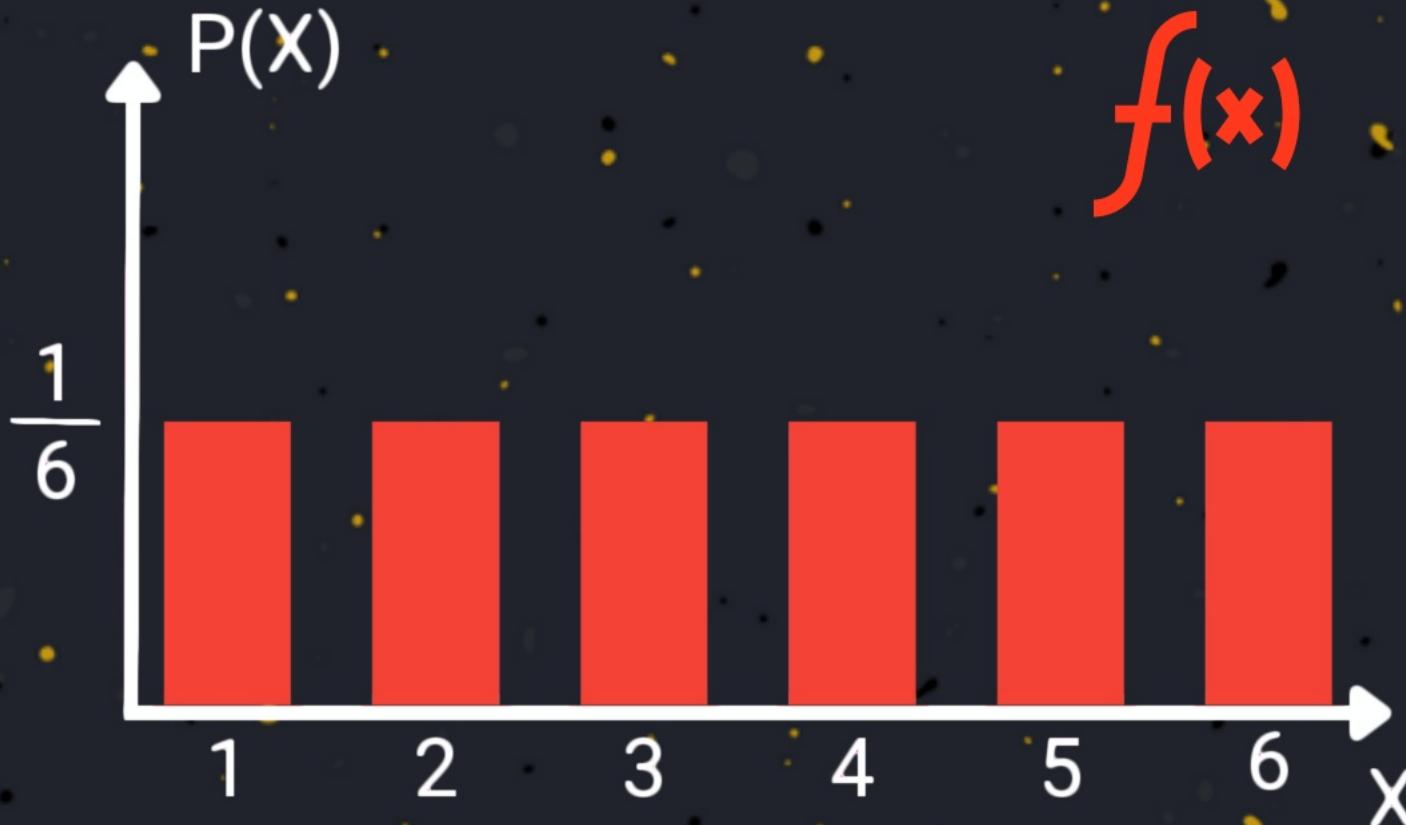


$X = \{1, 2, 3, 4, 5, 6\}$

Probability Distributions



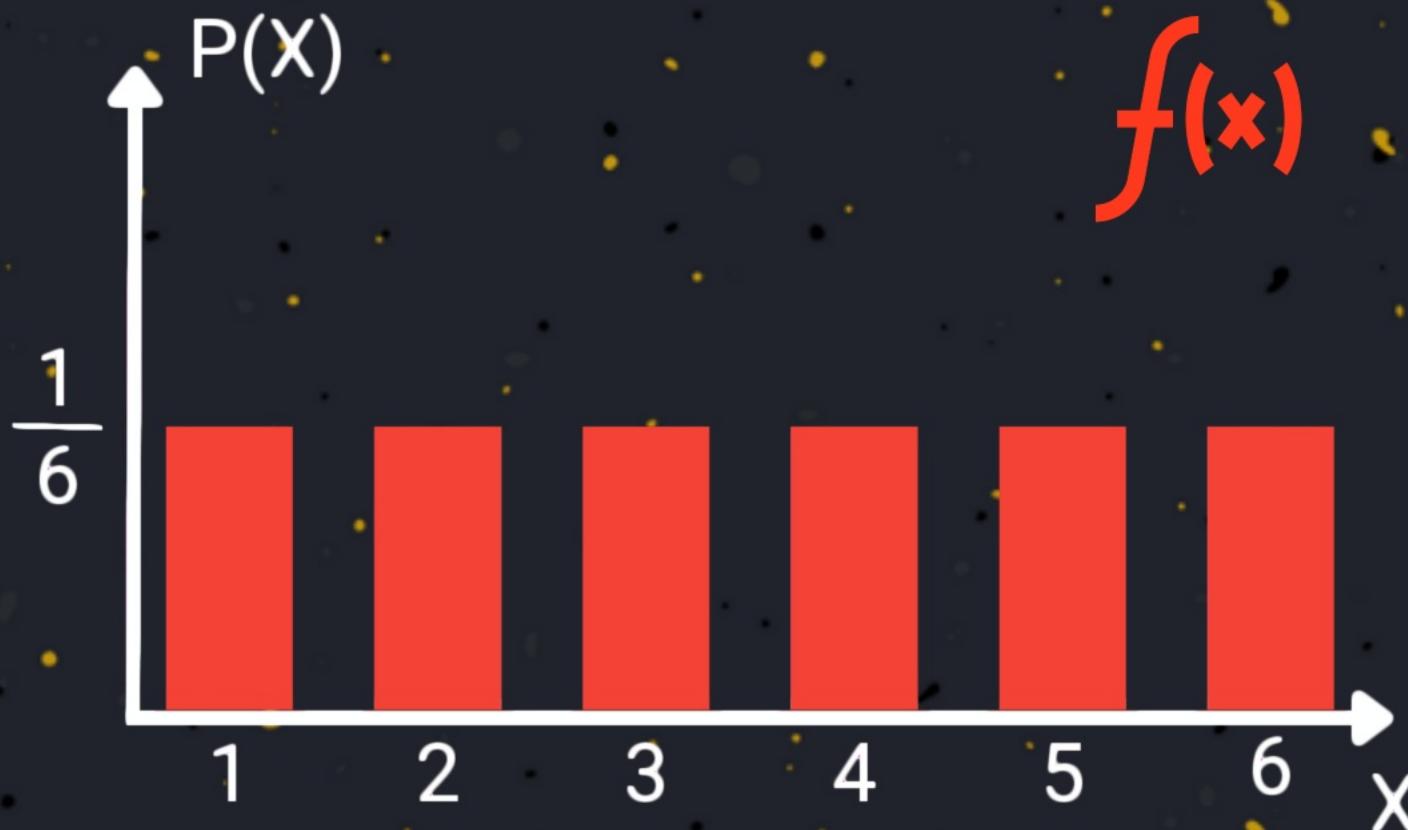
$$X = \{1, 2, 3, 4, 5, 6\}$$



Probability Distributions



$$X = \{1, 2, 3, 4, 5, 6\}$$



Probability Distributions



$$f(x)$$

Probability Distributions

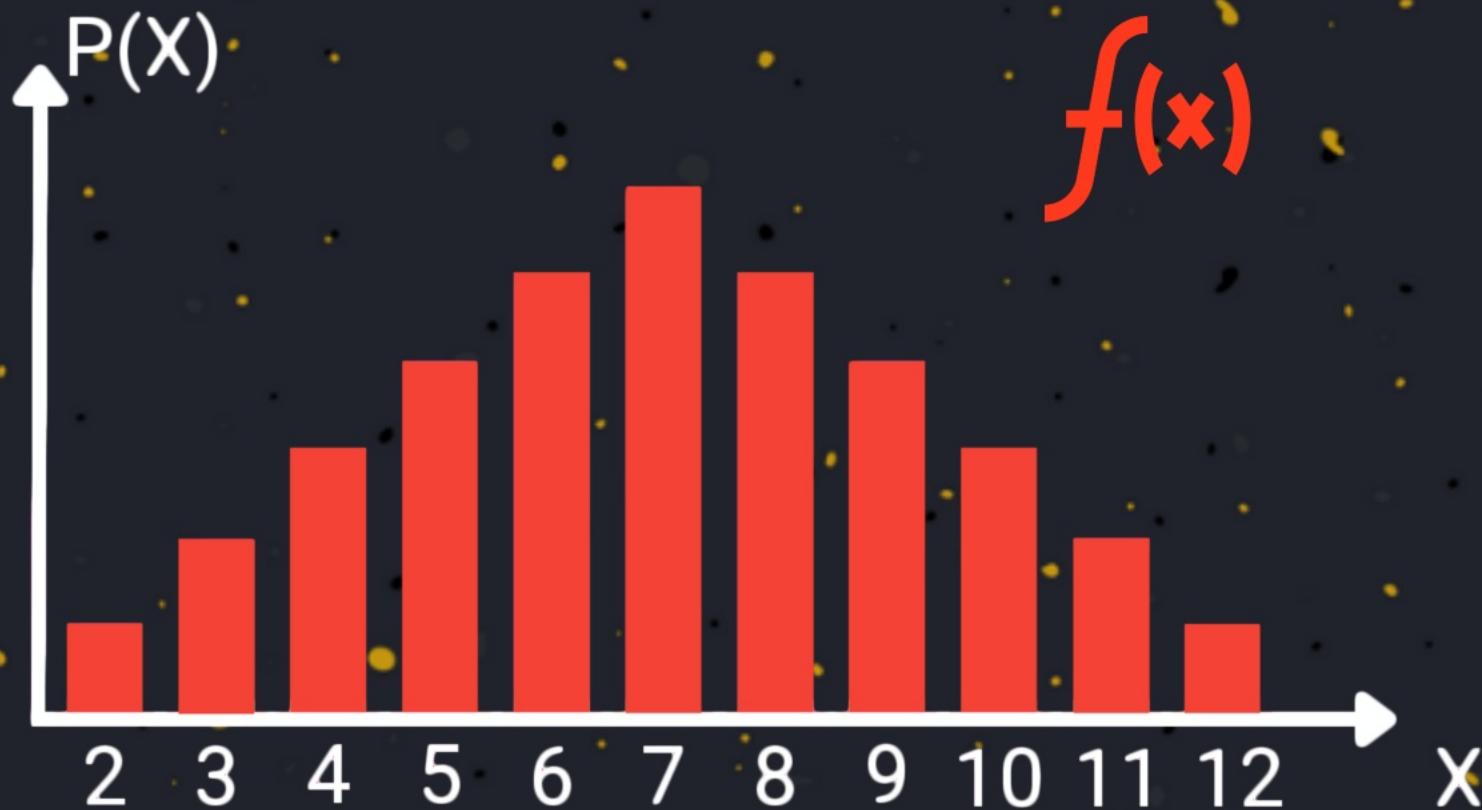

$$X = \{2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$$

$$f(x)$$

Probability Distributions



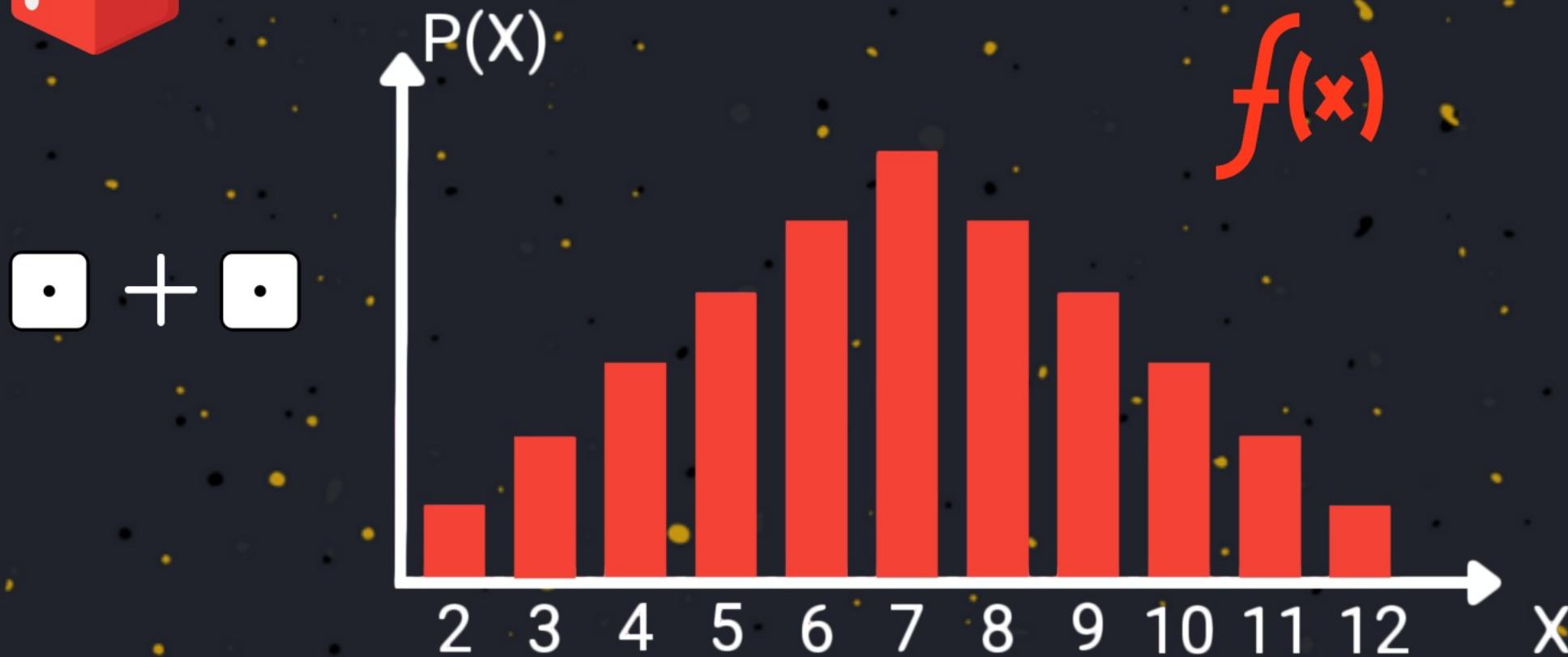
$$X = \{2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$$



Probability Distributions



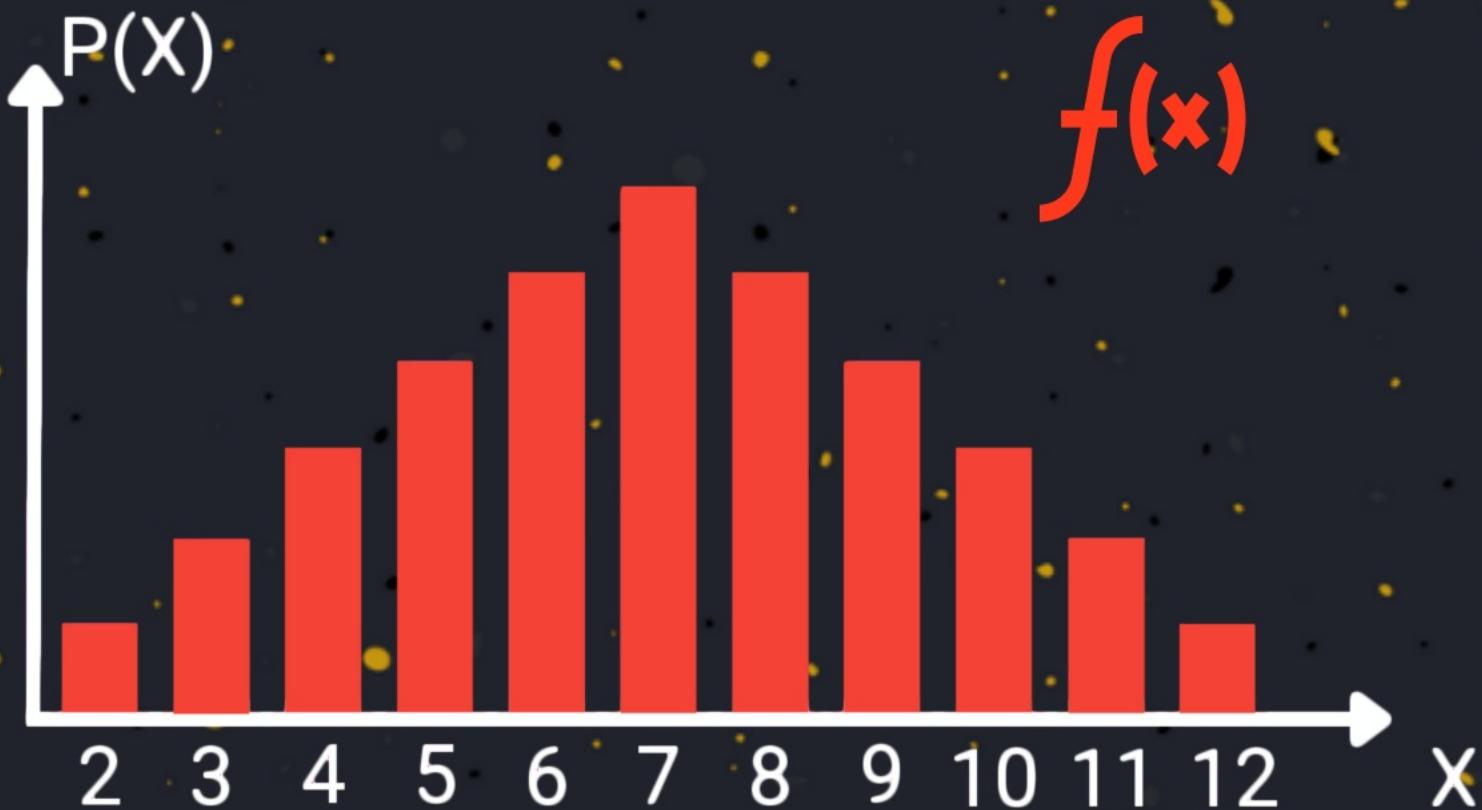
$$X = \{2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$$



Probability Distributions



$$X = \{2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$$

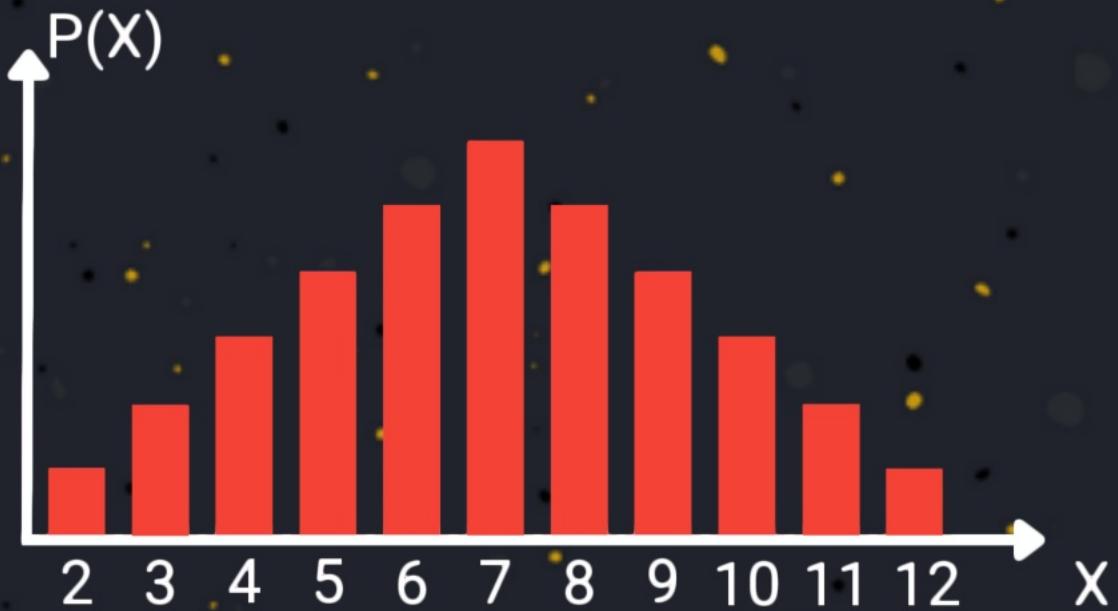






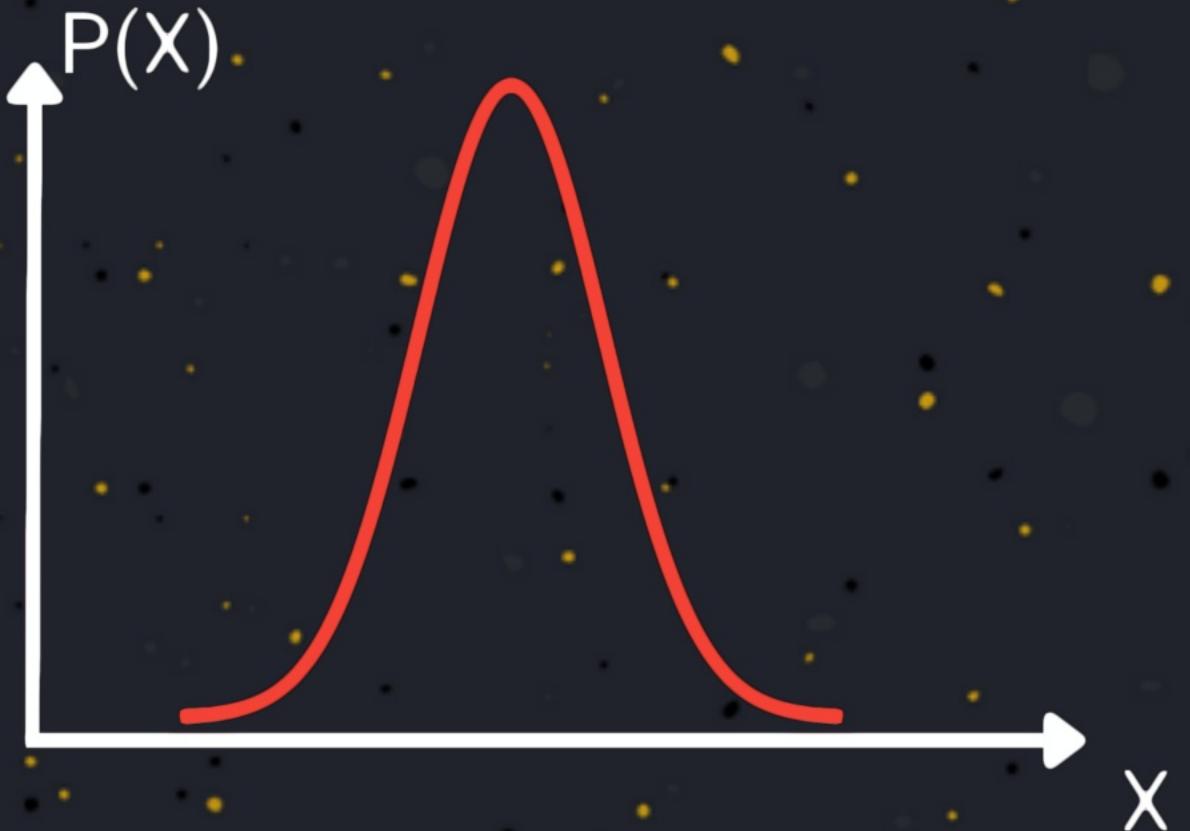


Gaussian Distributions

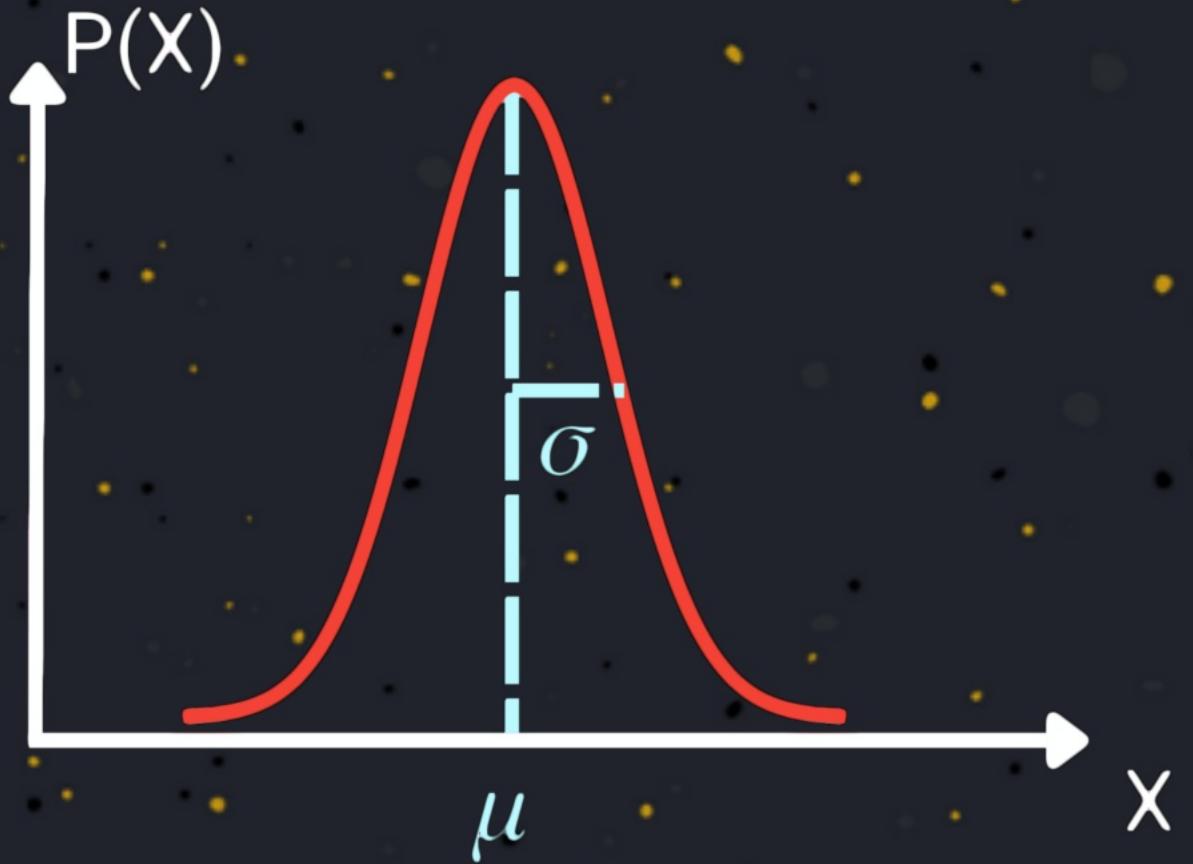


Gaussian Distributions

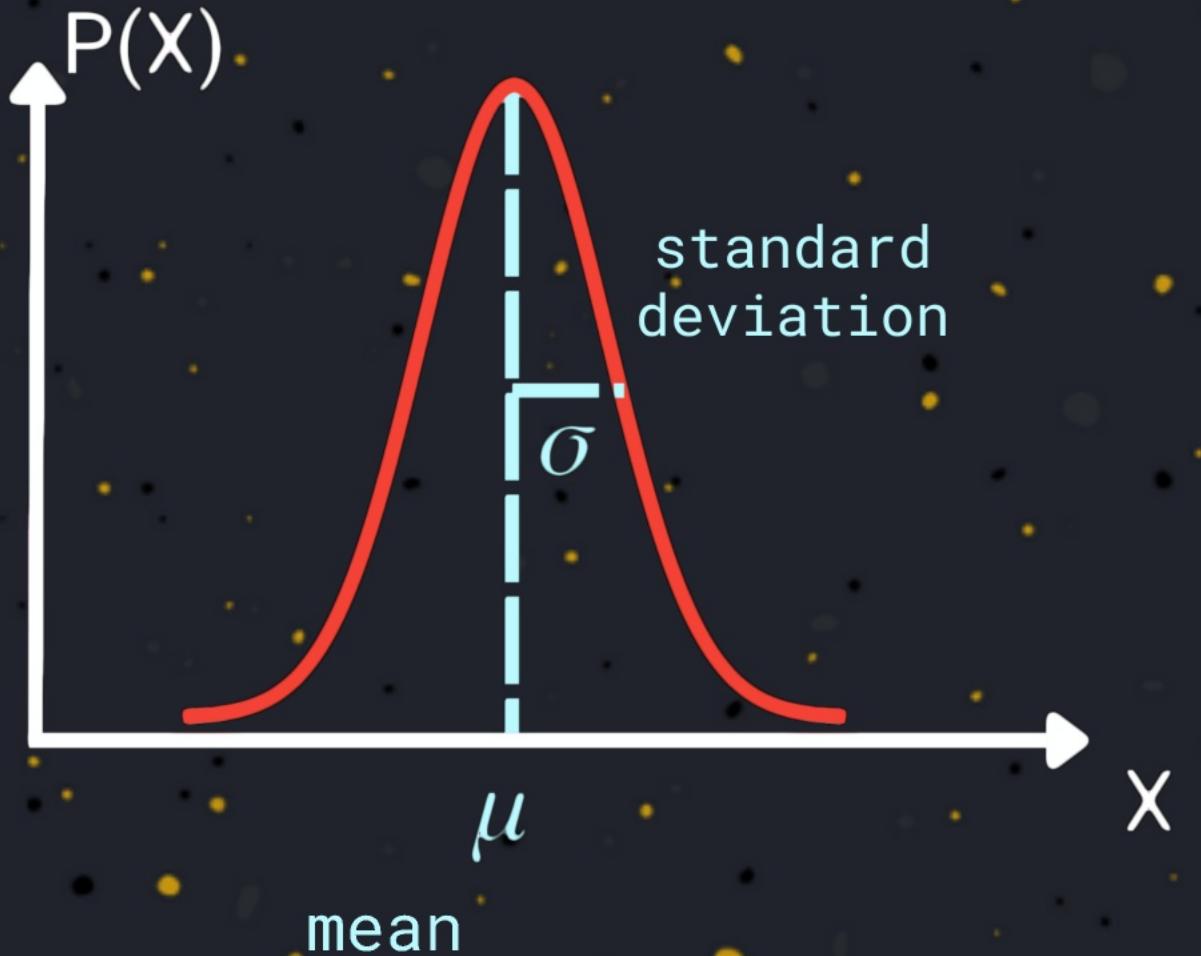
Gaussian Distributions



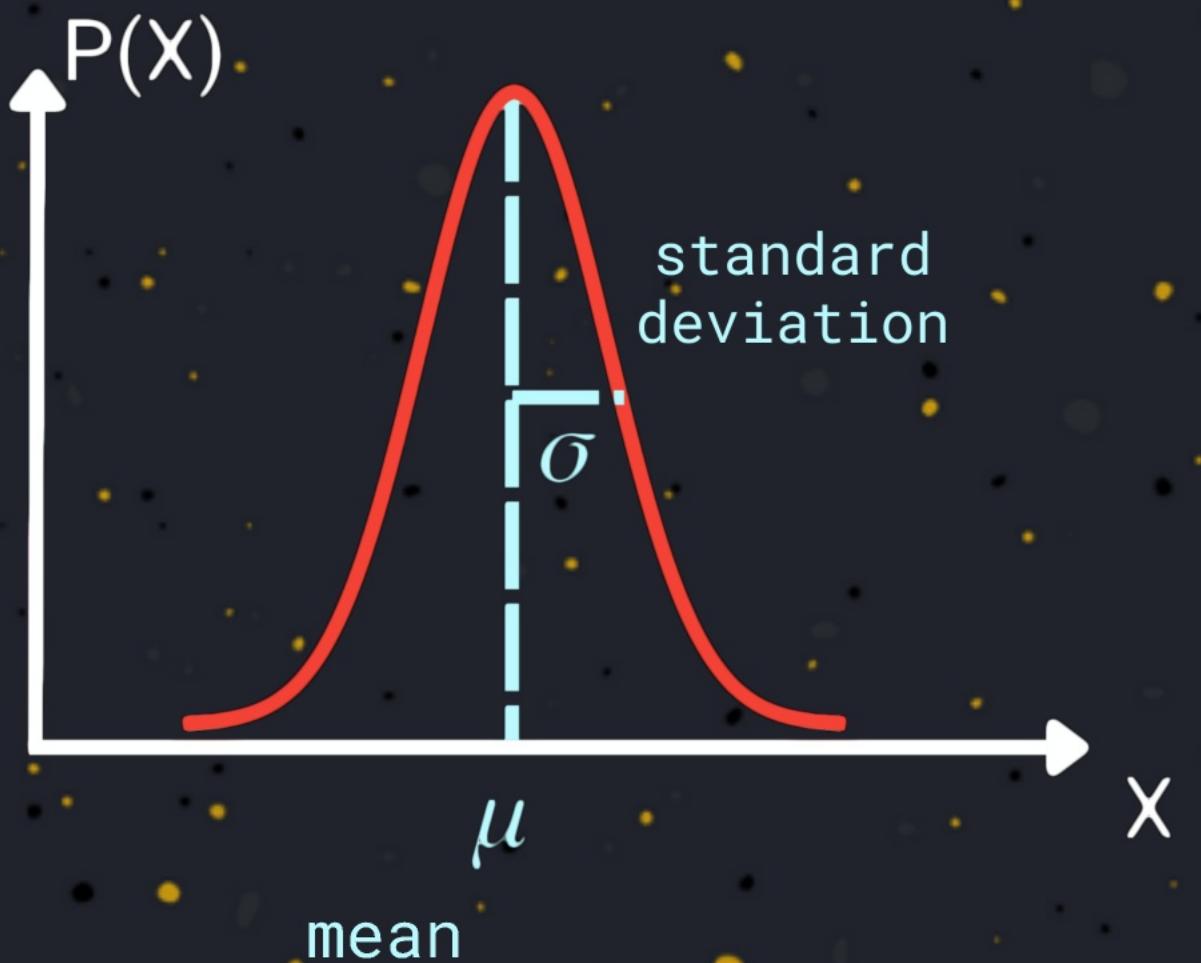
Gaussian Distributions



Gaussian Distributions

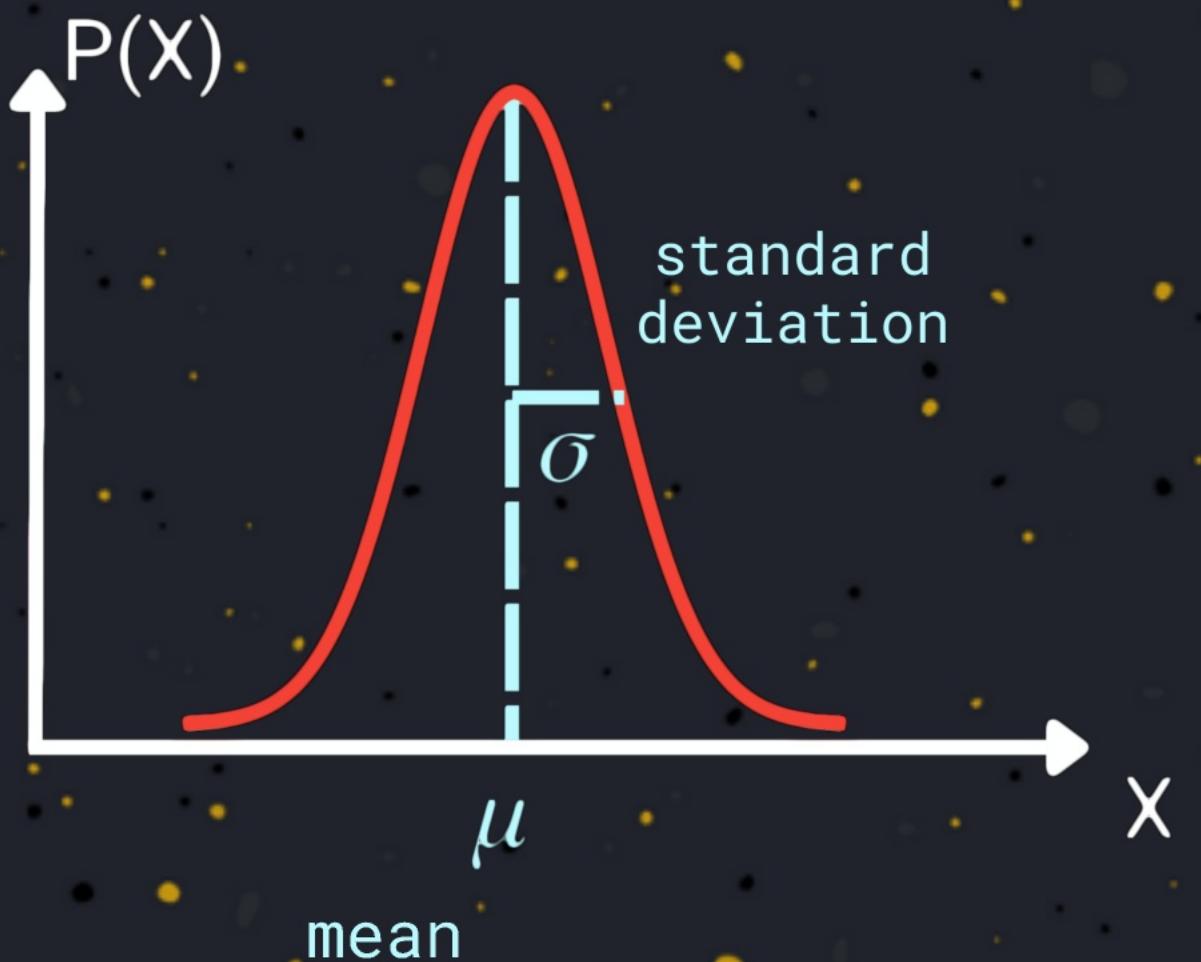


Gaussian Distributions



$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$$

Gaussian Distributions

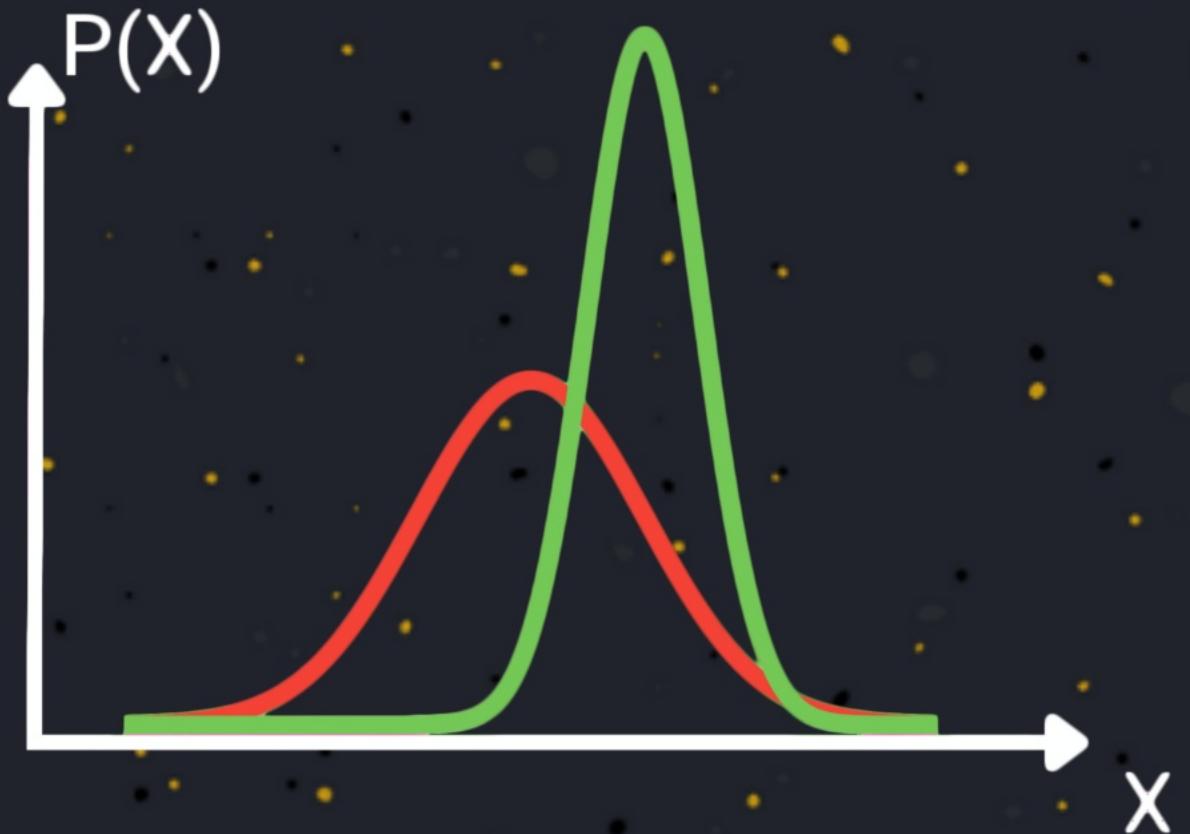


$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$$

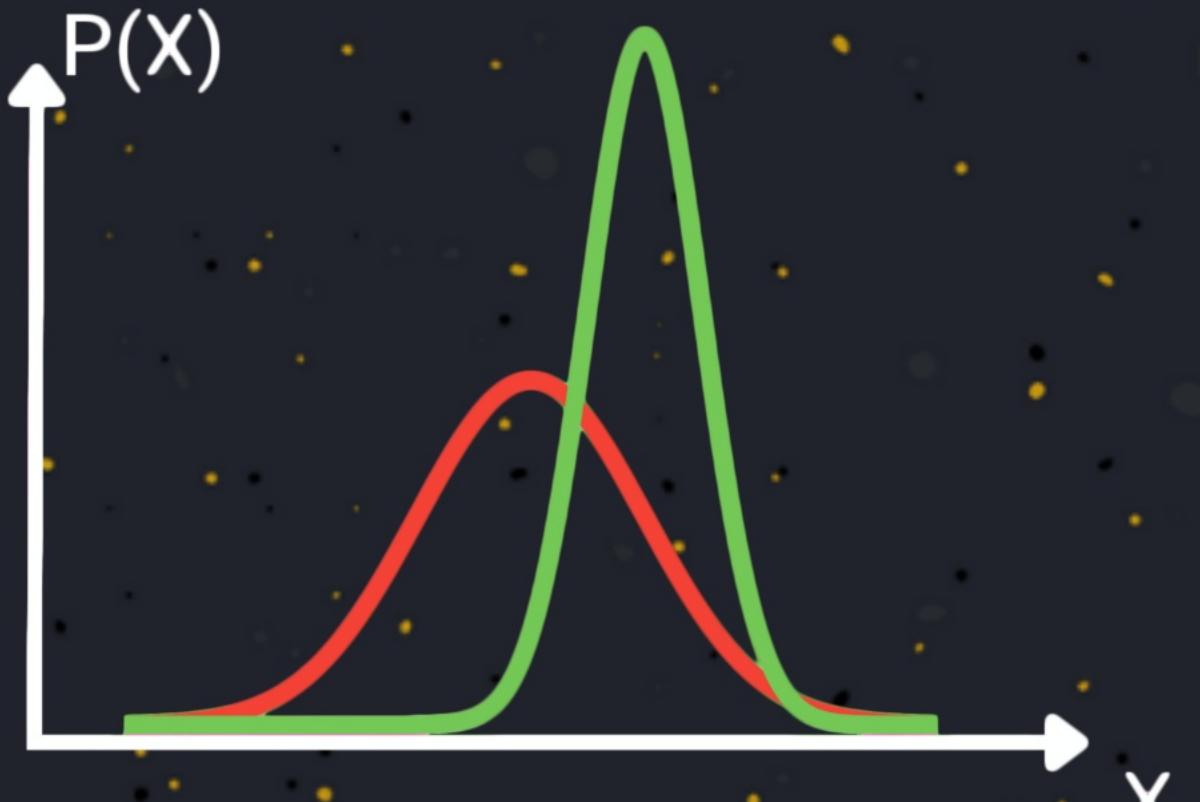
$$\int f(x) dx = 1$$

Gaussian Distributions

Gaussian Distributions

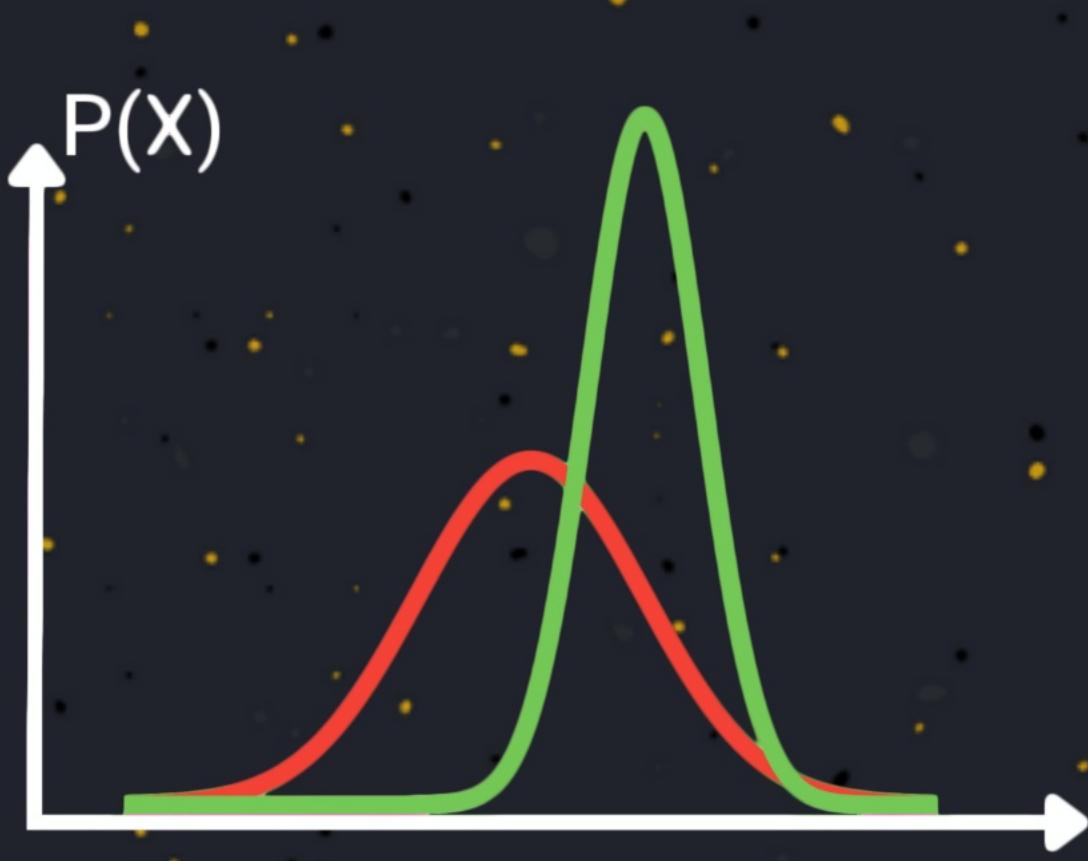


Gaussian Distributions



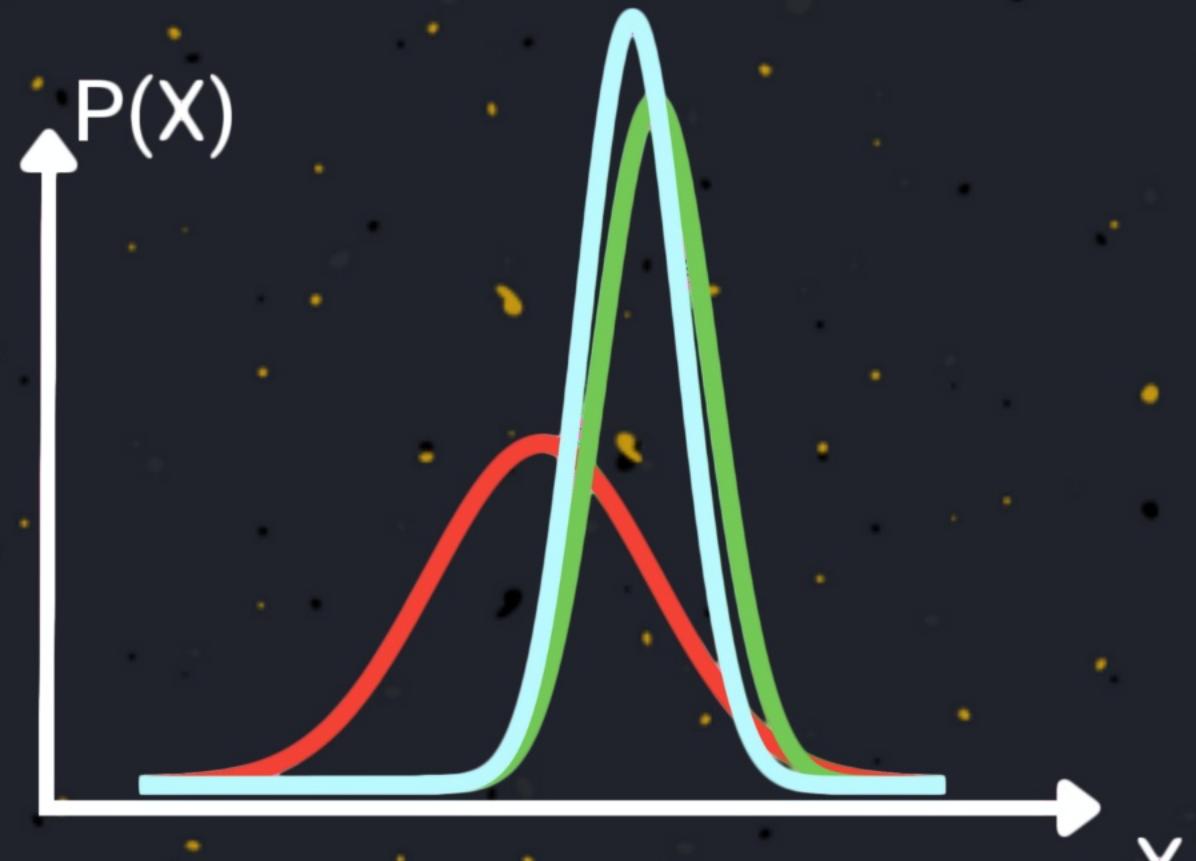
$$\mu_C = \frac{\sigma_B^2 \cdot \mu_A + \sigma_A^2 \cdot \mu_B}{\sigma_B^2 + \sigma_A^2} \quad \sigma_C^2 = \frac{1}{\frac{1}{\sigma_B^2} + \frac{1}{\sigma_A^2}}$$

Gaussian Distributions



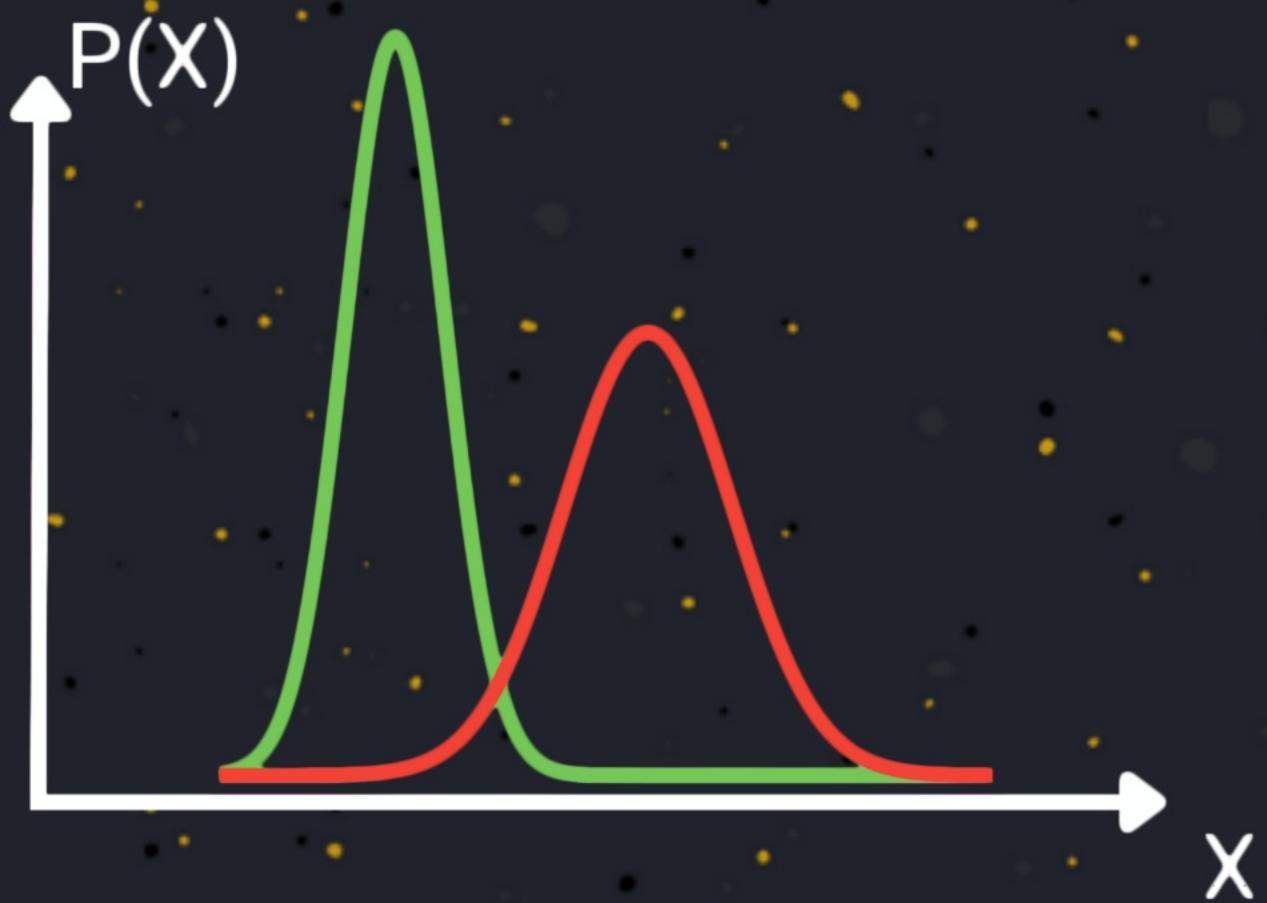
$$\mu_C = \frac{\sigma_B^2 \cdot \mu_A + \sigma_A^2 \cdot \mu_B}{\sigma_B^2 + \sigma_A^2}$$

$$\sigma_C^2 = \frac{1}{\frac{1}{\sigma_B^2} + \frac{1}{\sigma_A^2}}$$

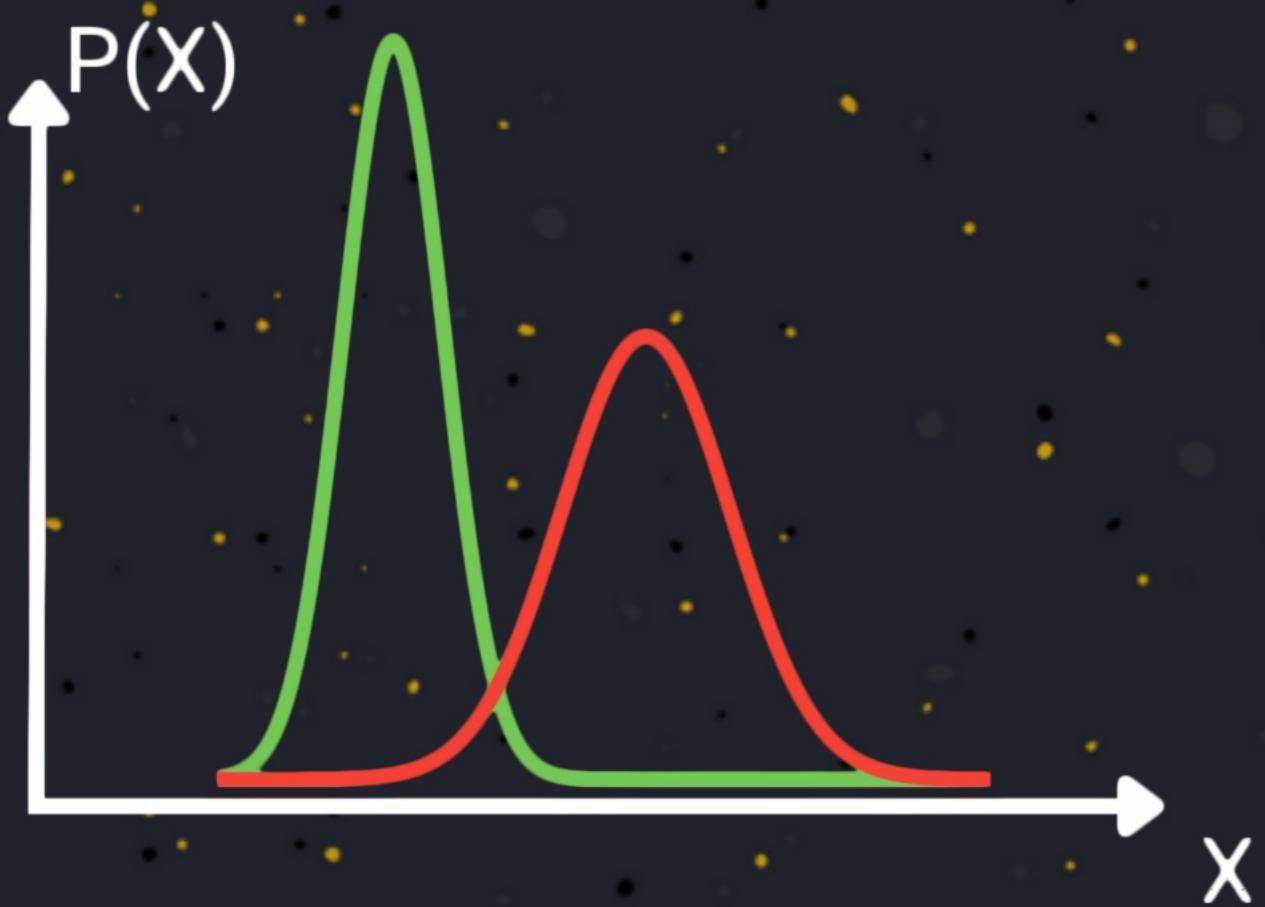


Gaussian Distributions

Gaussian Distributions

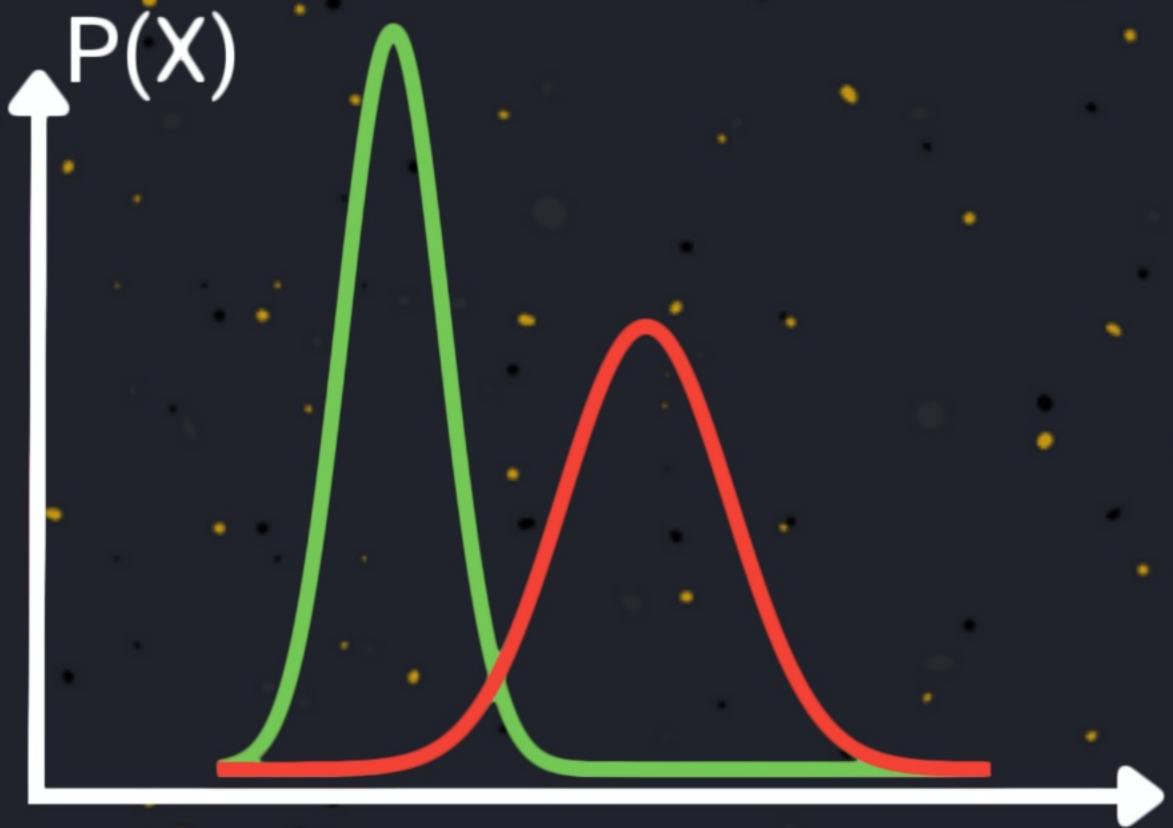


Gaussian Distributions



$$\mu_C = \mu_A + \mu_B \quad \sigma_2^C = \sigma_2^A + \sigma_2^B$$

Gaussian Distributions



$$\mu_C = \mu_A + \mu_B$$

$$\sigma_2^C = \sigma_2^A + \sigma_2^B$$

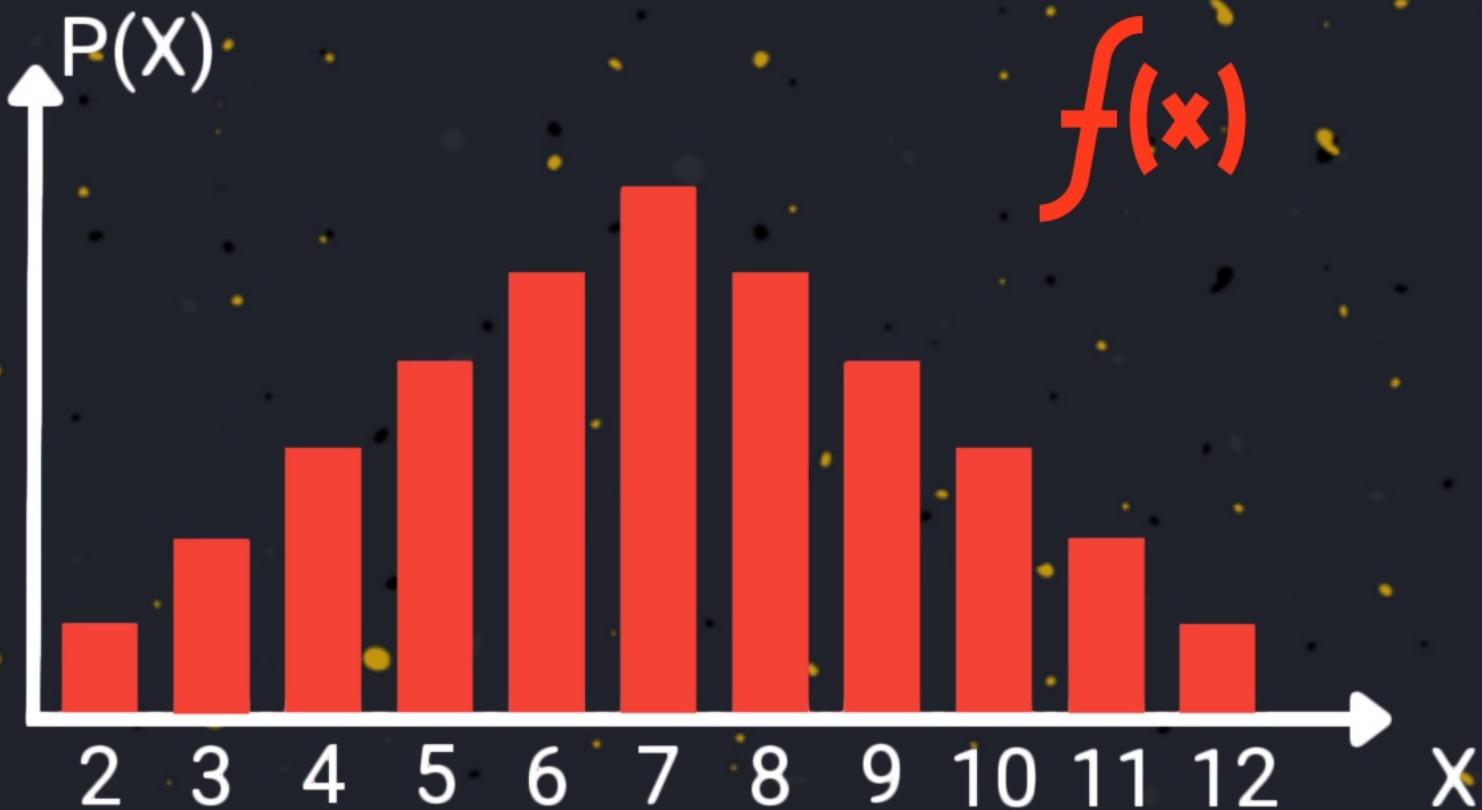




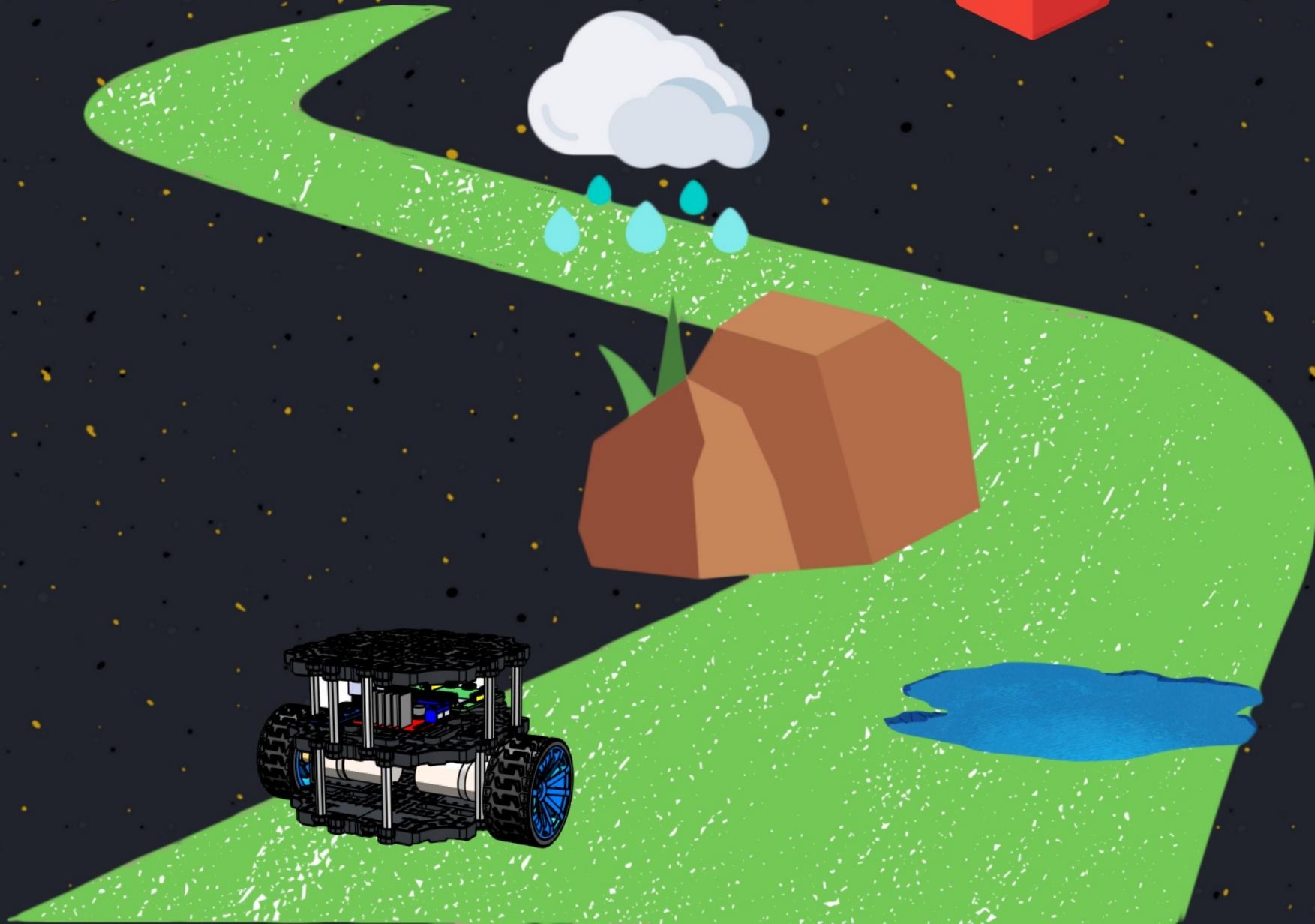
Probability Distributions

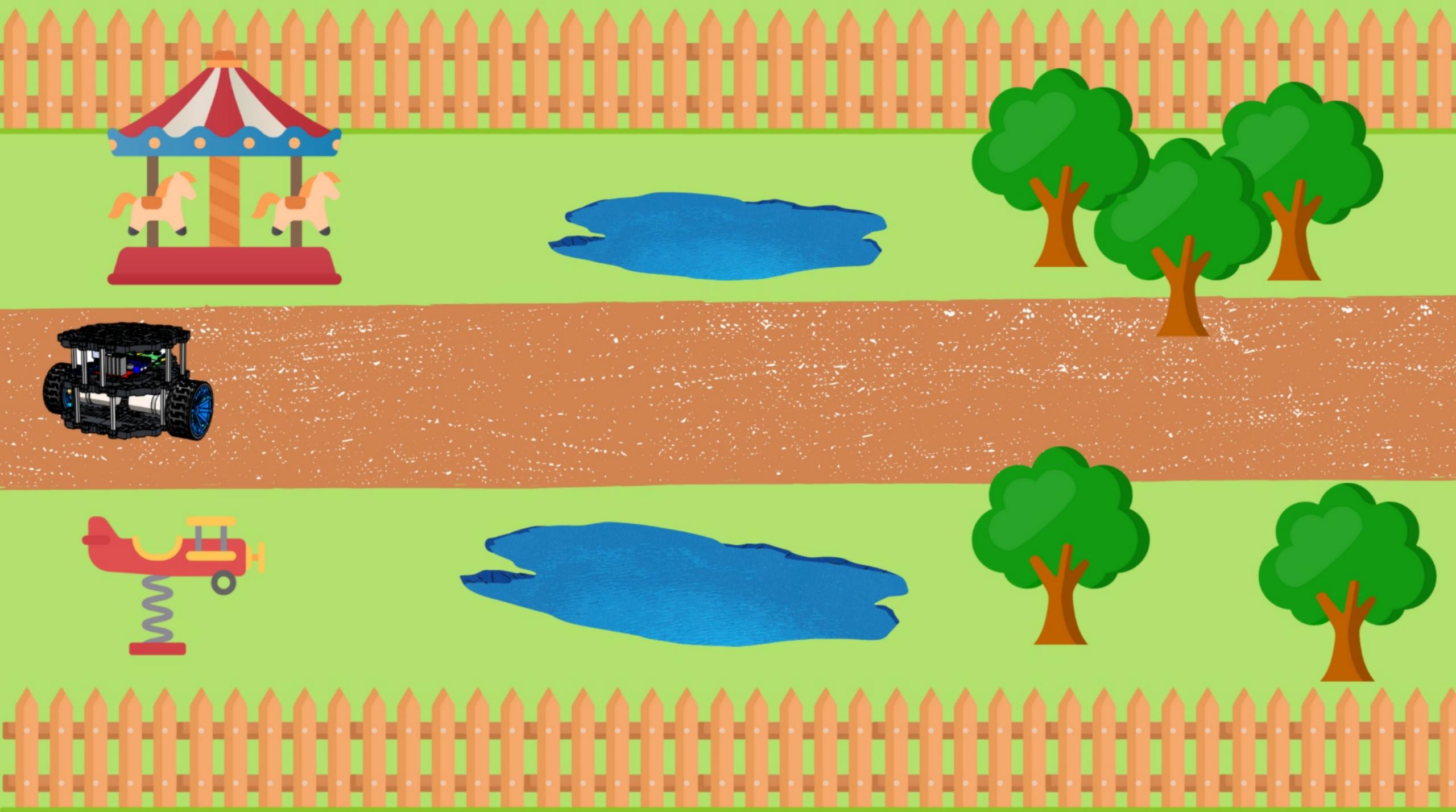


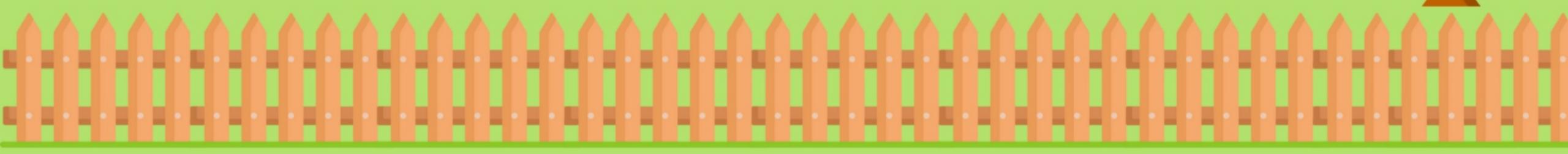
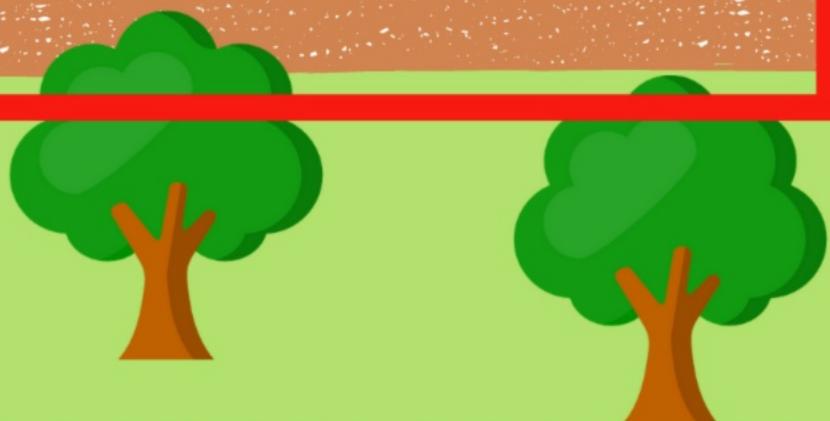
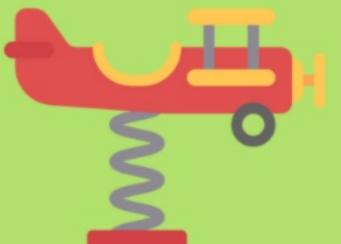
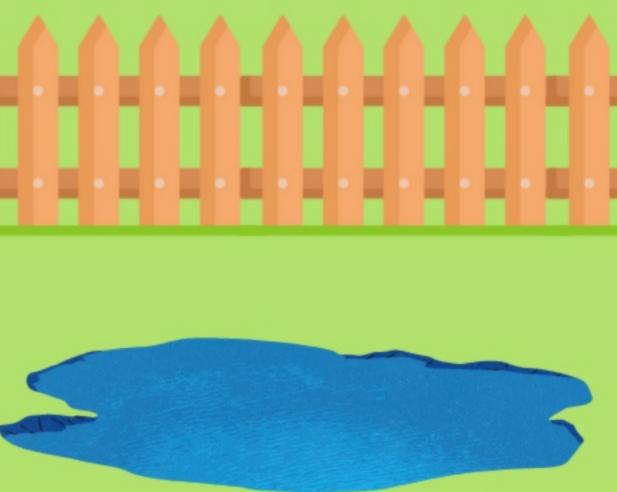
$$X = \{2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$$



Probability for Robotics



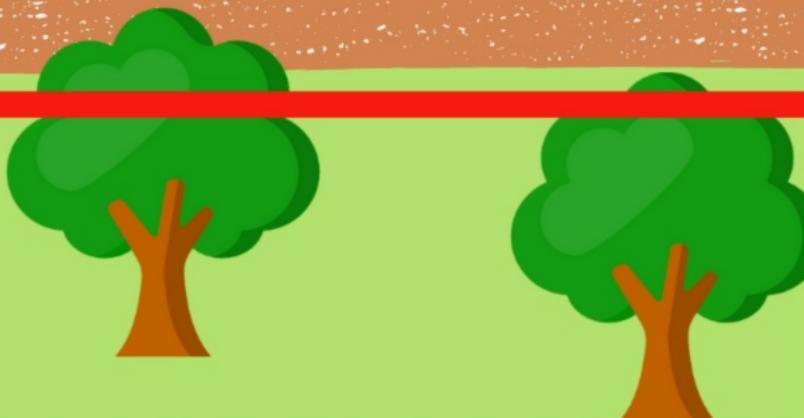
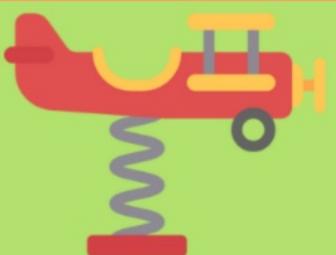




B



A



B



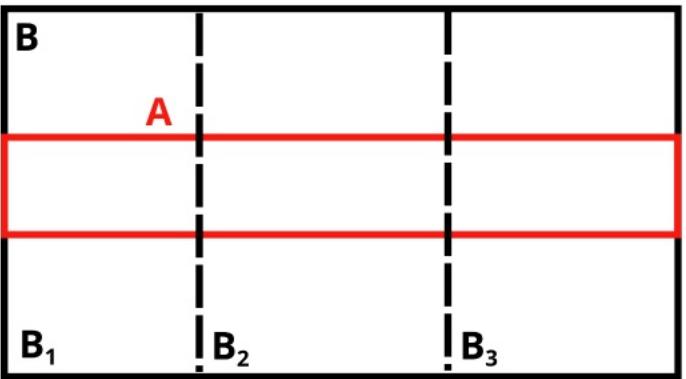
A



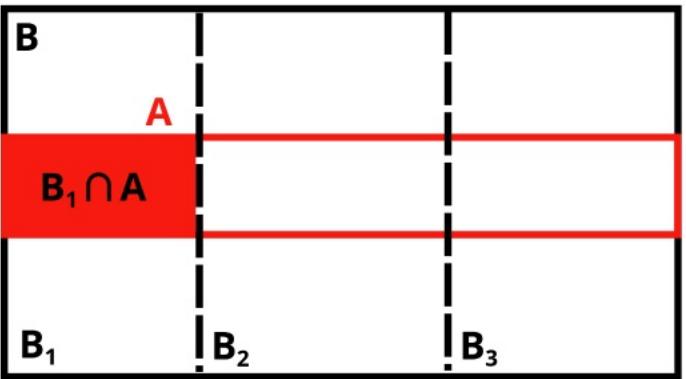
B₁

B₂

B₃

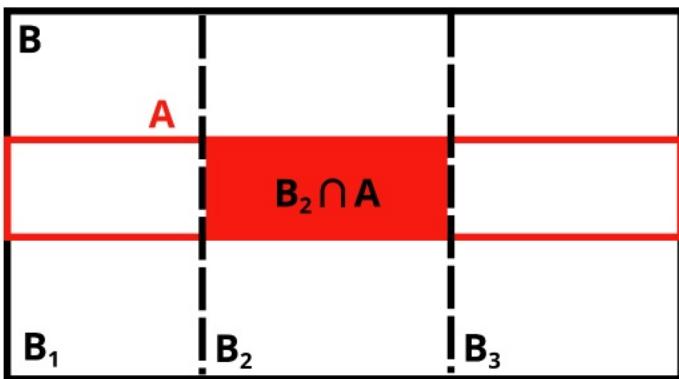
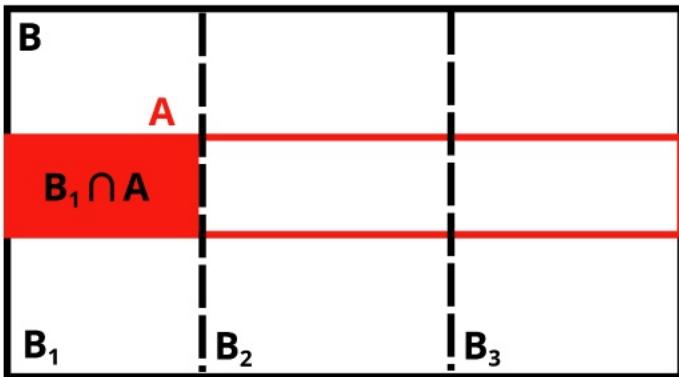


Total Probability Law

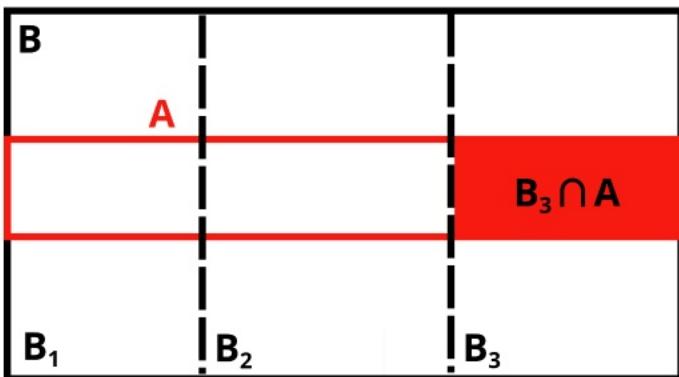
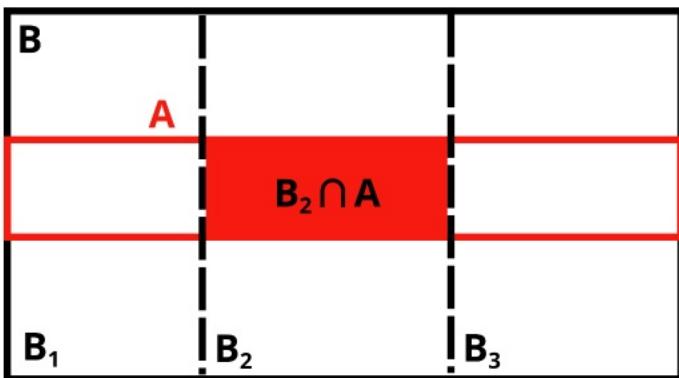
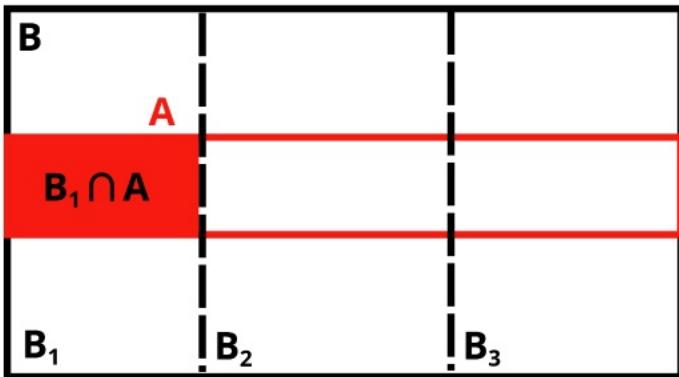


Total Probability Law

Total Probability Law



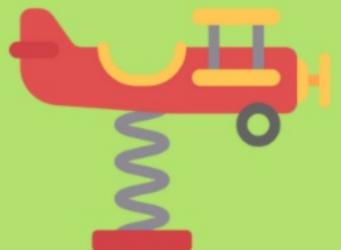
Total Probability Law



B



A

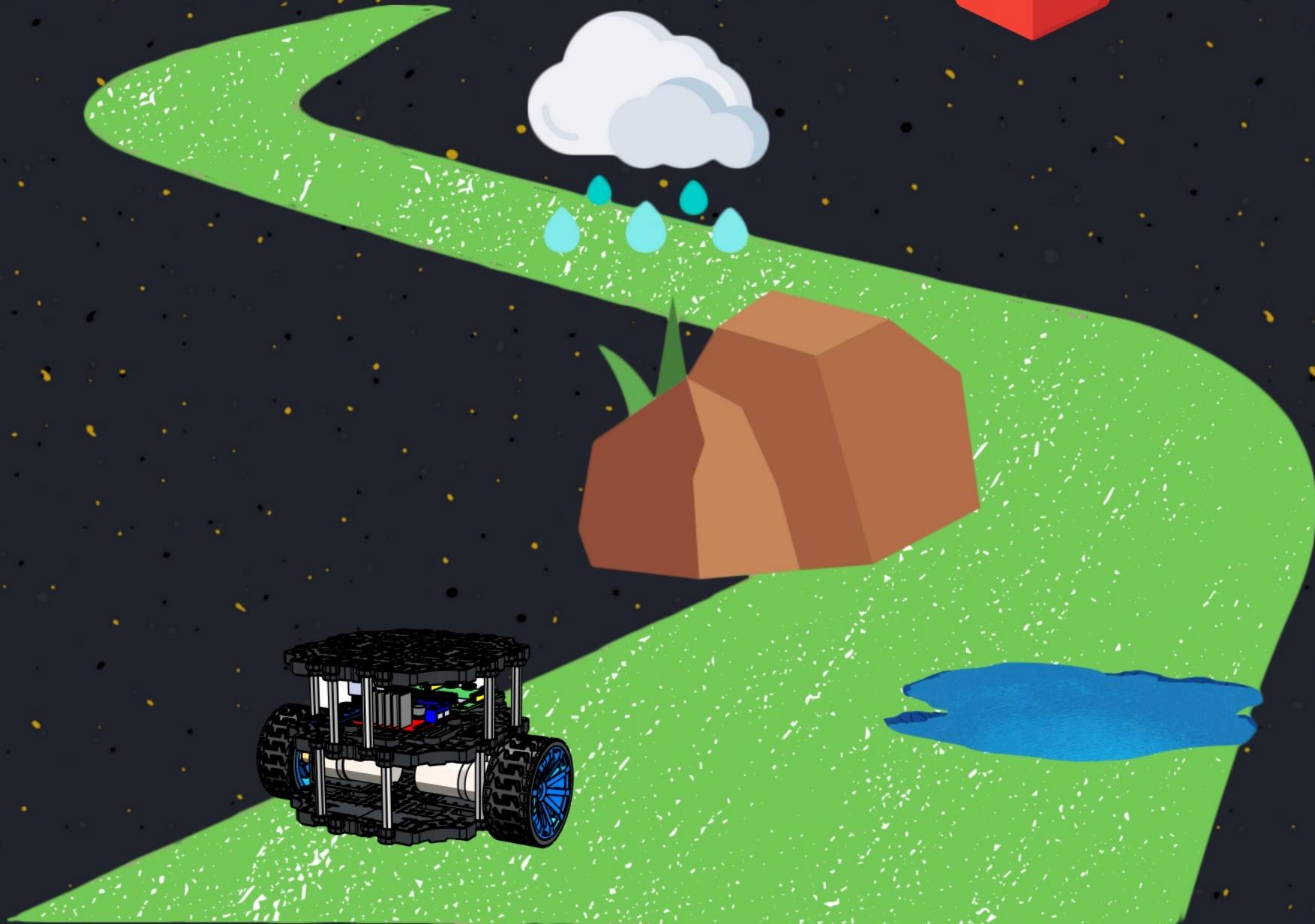


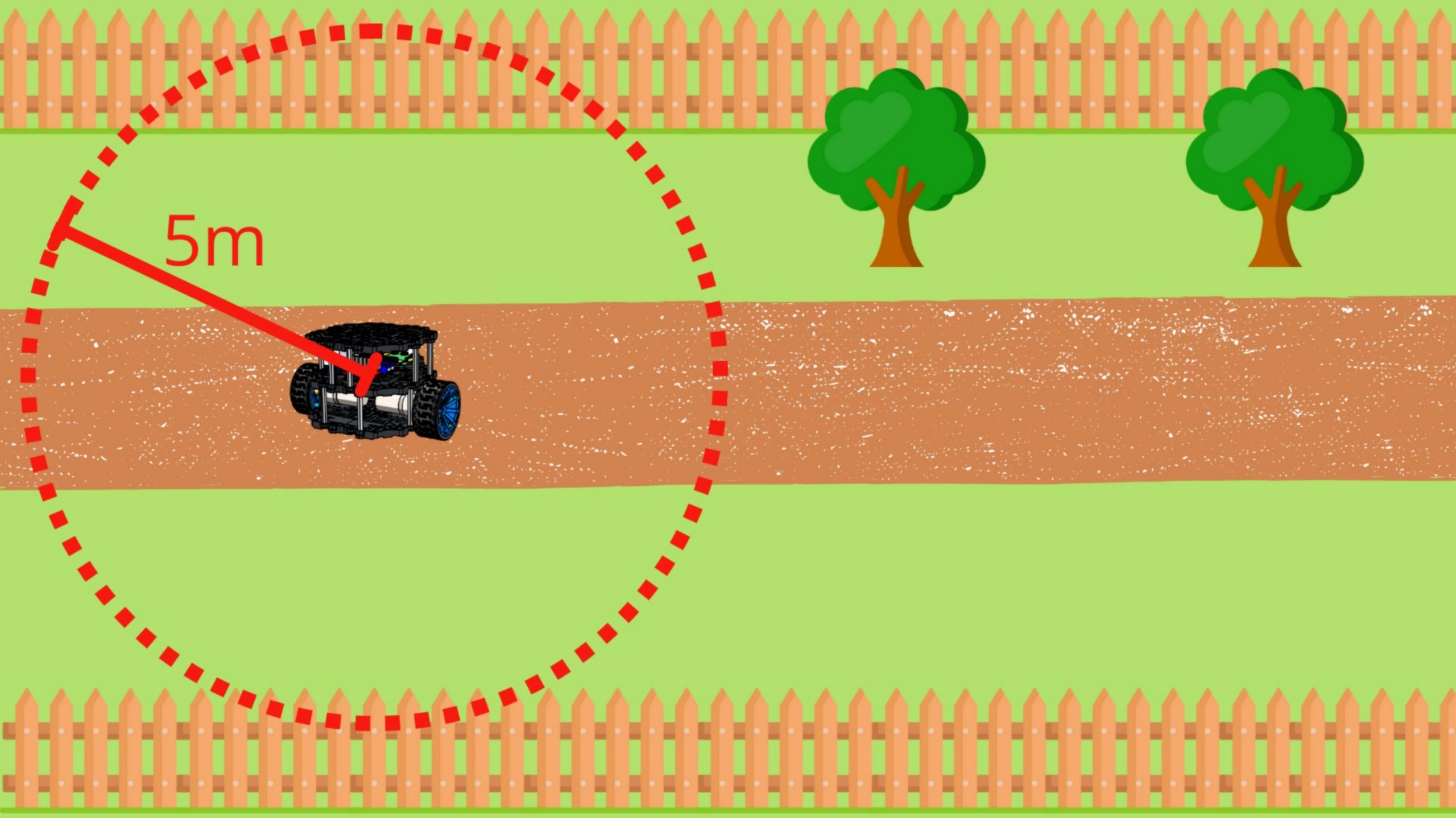
B₁

B₂

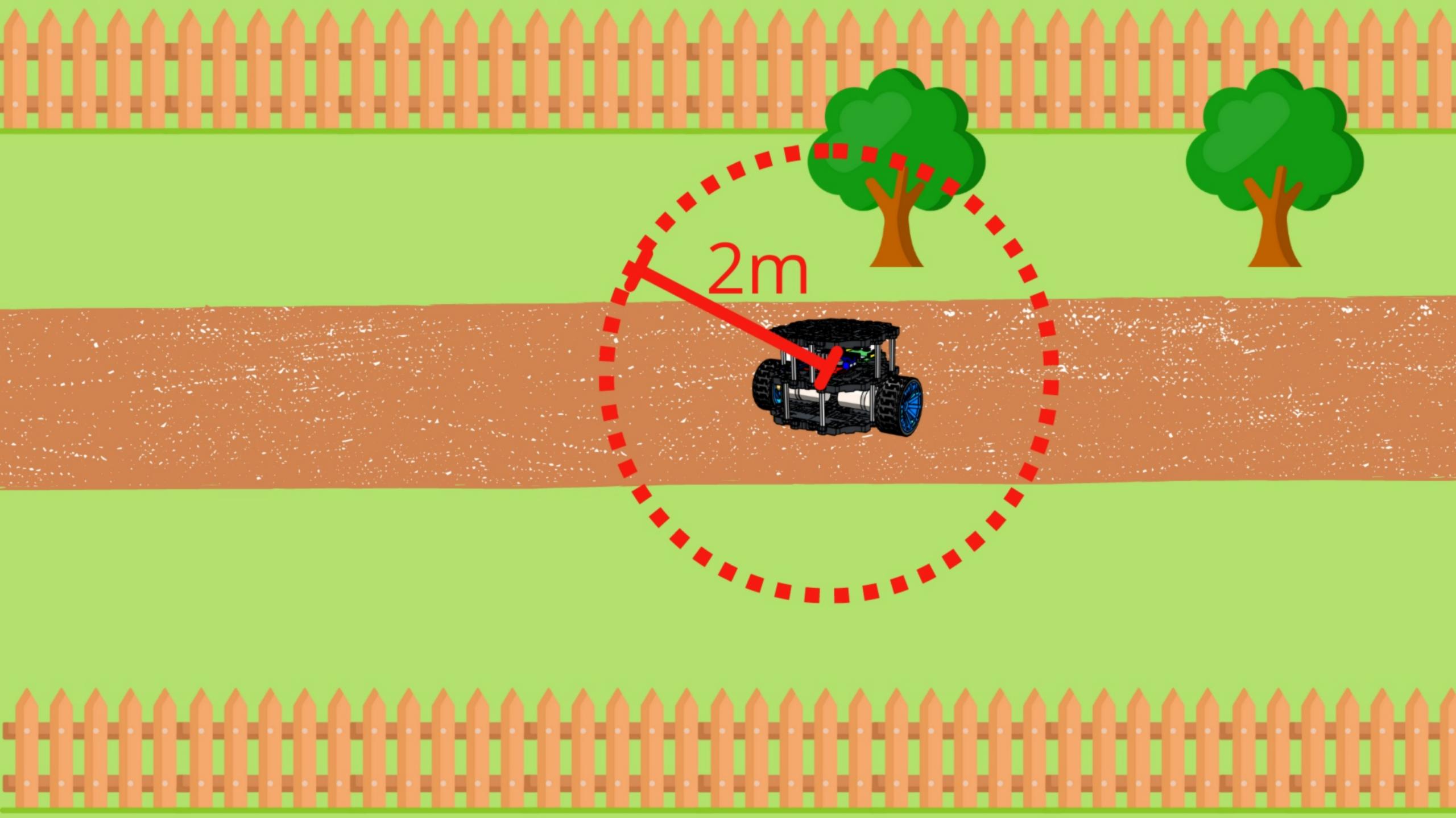
B₃

Probability for Robotics



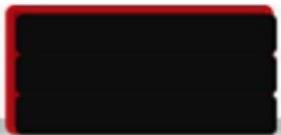


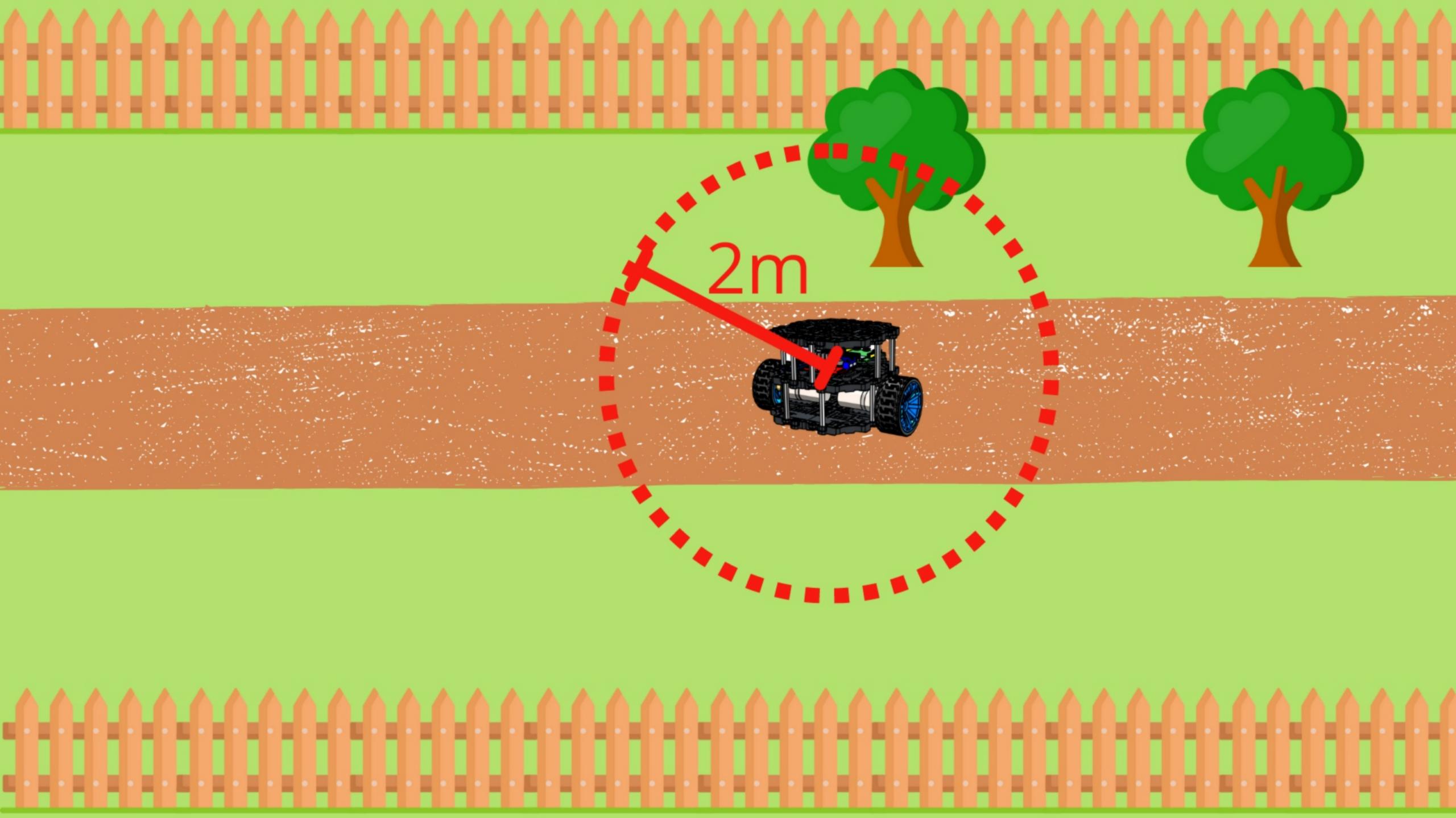
5m



2m

Bayes Rule





2m

Probability for Robotics

