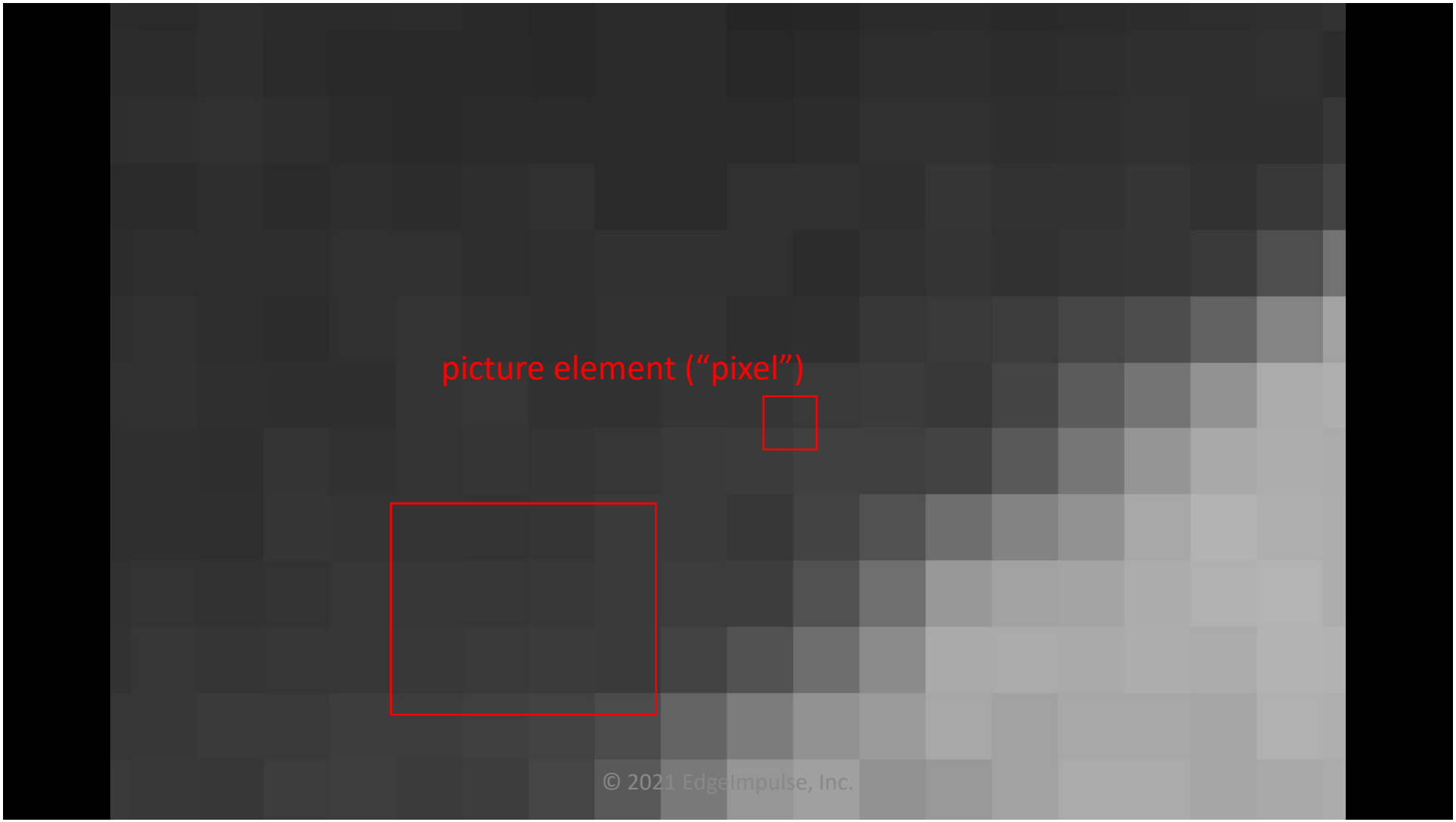
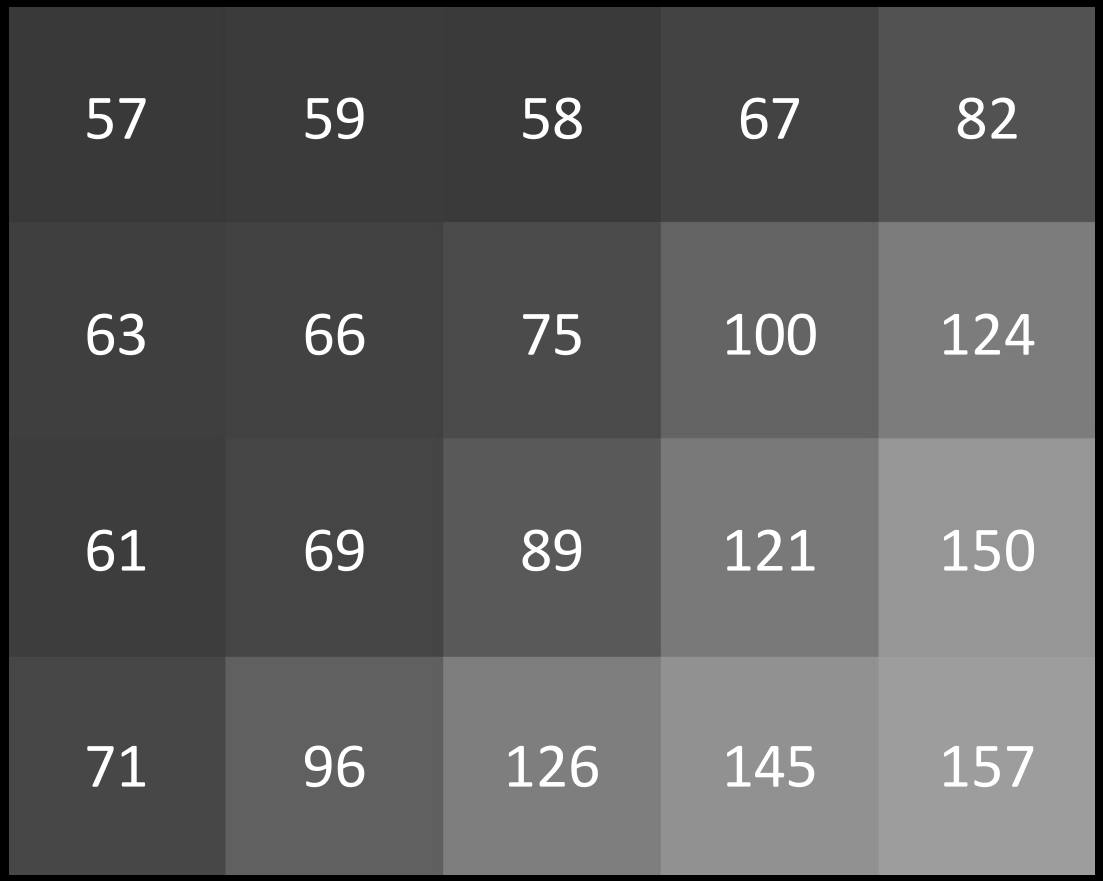
Computer Vision with Embedded Machine Learning

Review of Module 1

© 2021 EdgeImpulse, Inc.

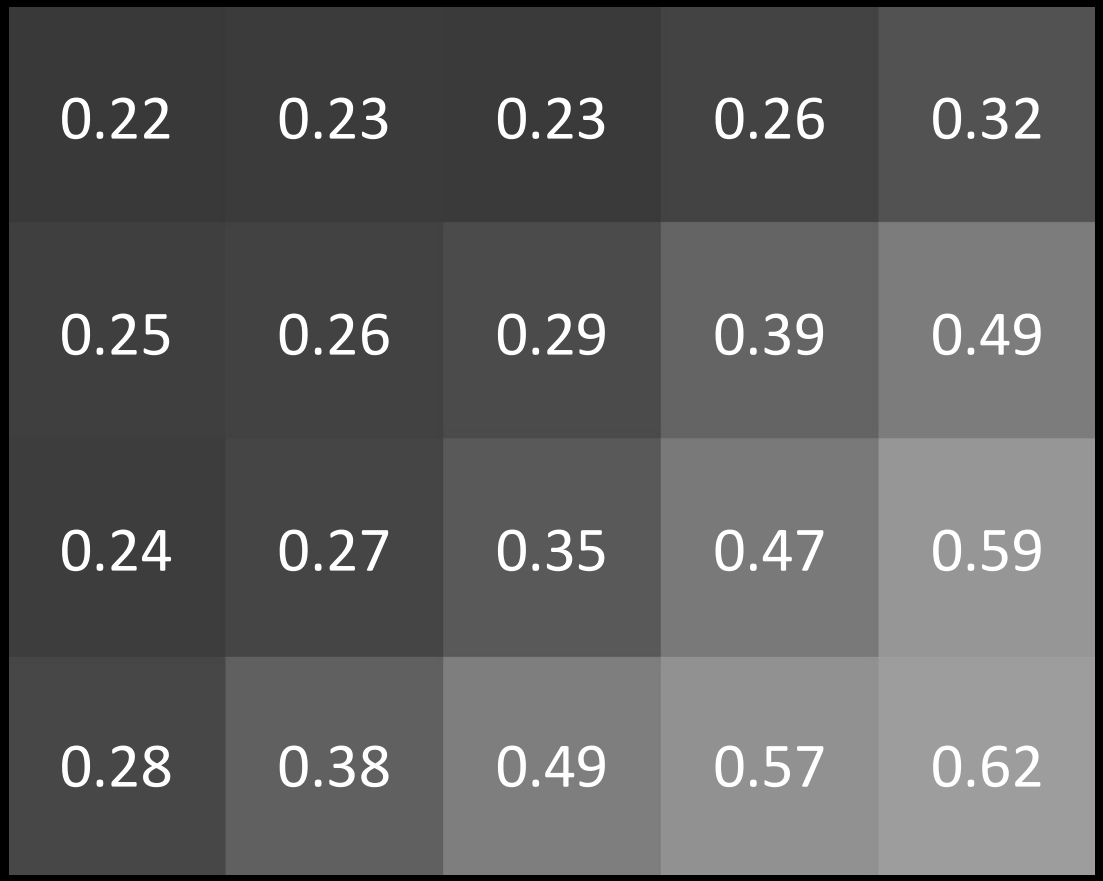


© 2021 EdgeImpulse, Inc.

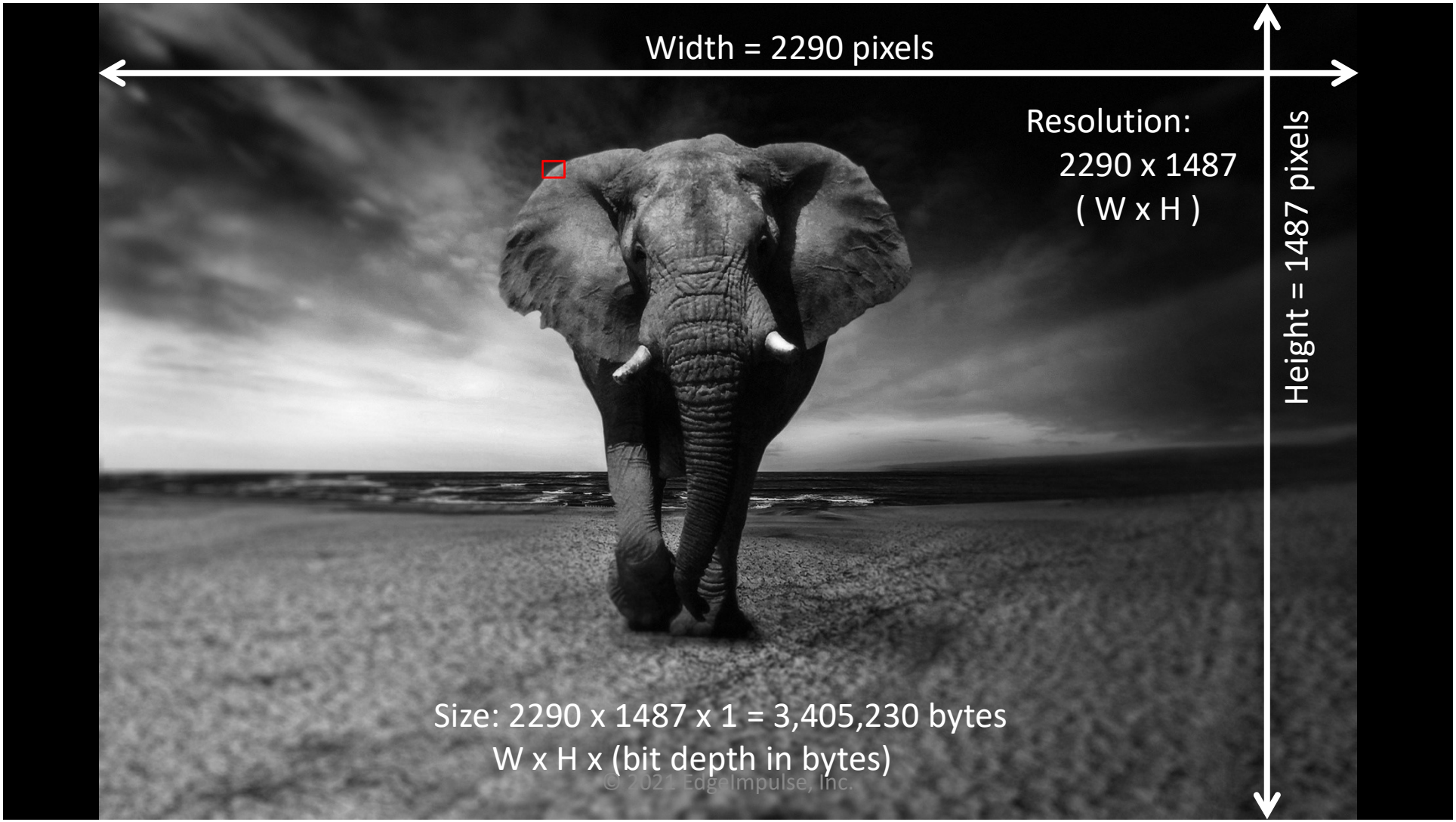


Bit depth: 8 bits
- 0 = black
- 255 = white

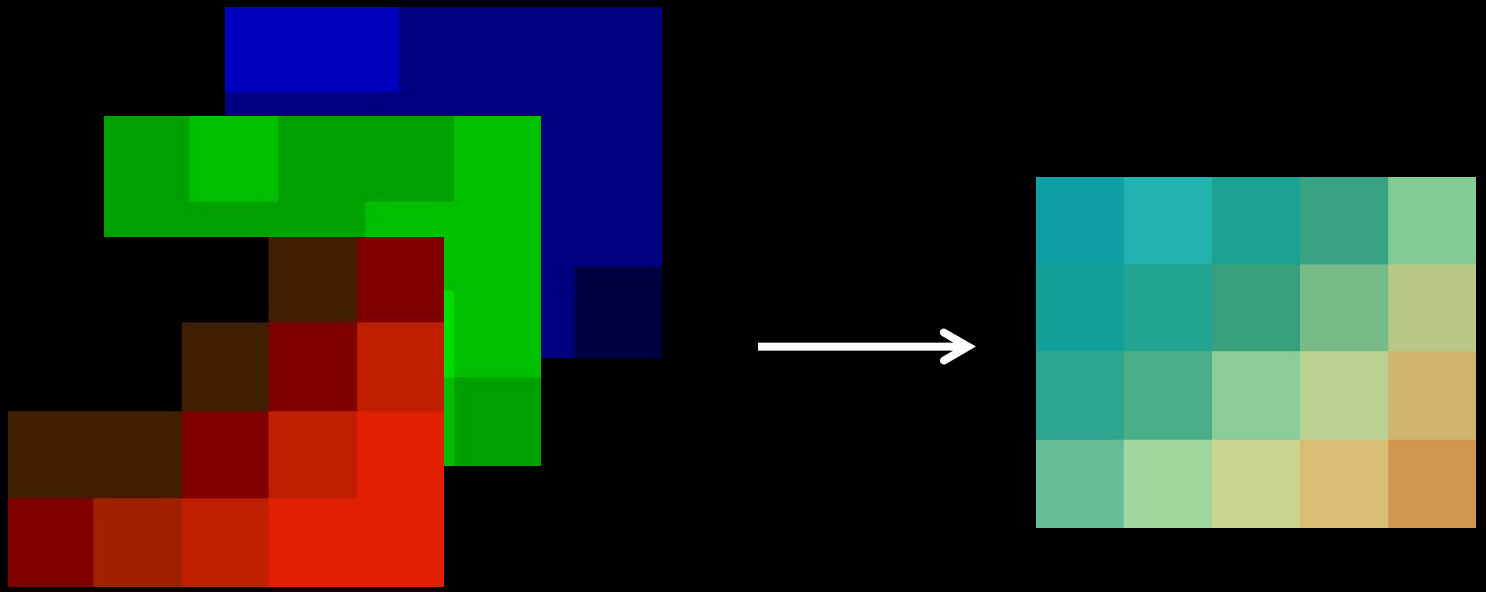
© 2021 EdgeImpulse, Inc.



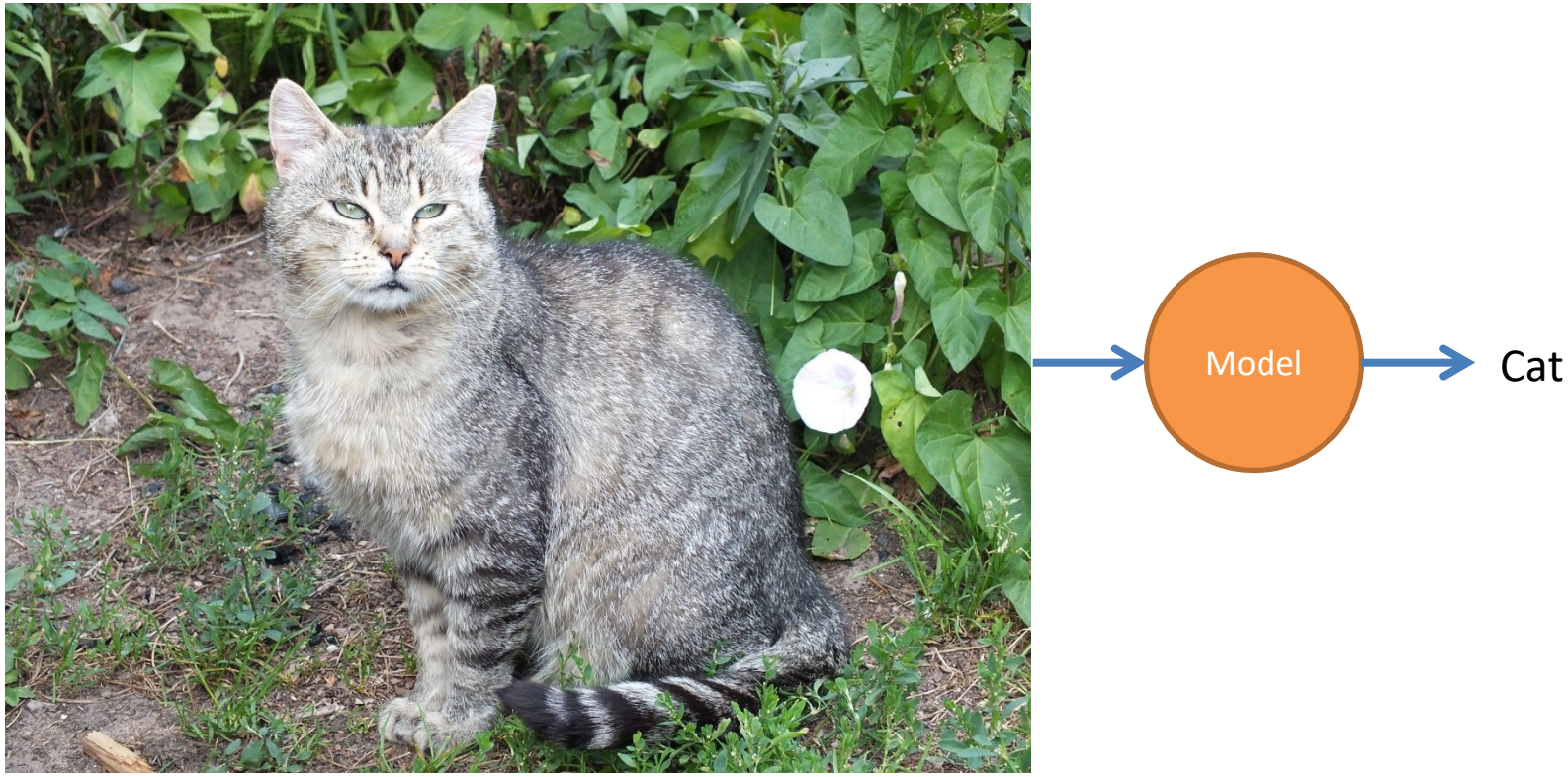
© 2021 EdgeImpulse, Inc.



© 2021 EdgeImpulse, Inc.



© 2021 EdgeImpulse, Inc.



© 2021 EdgeImpulse, Inc.

Binary Classification

One-vs-One

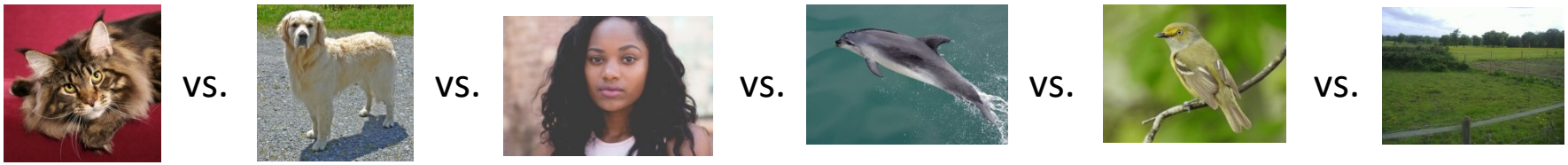
vs.

One-vs-Rest

vs.

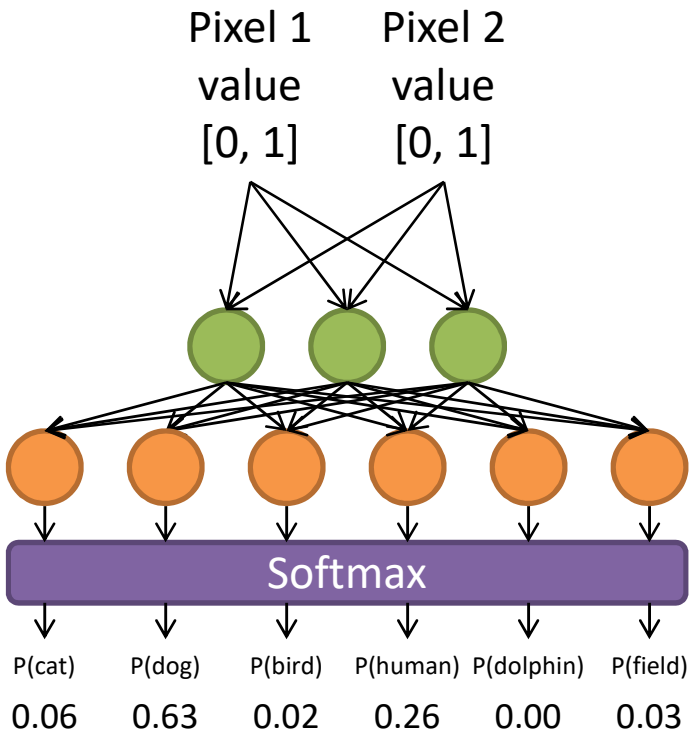
© 2021 EdgeImpulse, Inc.

Multiclass Classification



© 2021 EdgeImpulse, Inc.

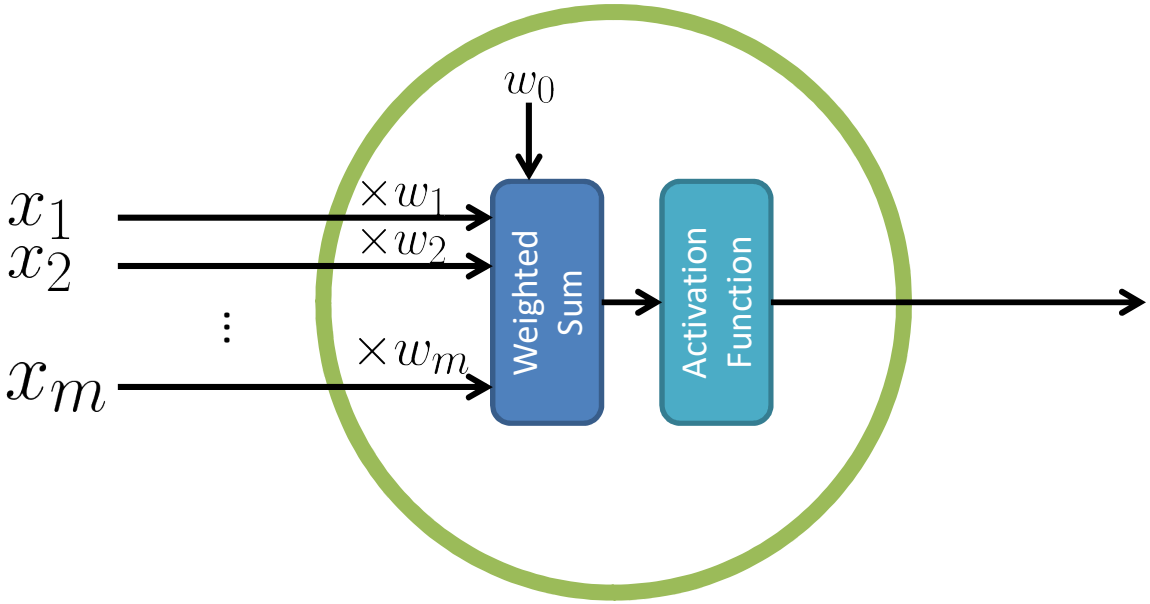
Neural Network (NN)



P(cat) + P(dog) + P(bird) + P(human) + P(dolphin) + P(field) = 1.0

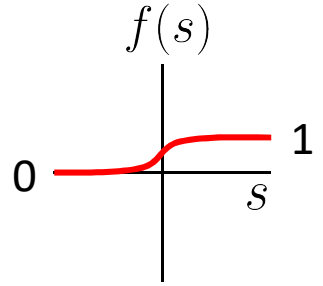
© 2021 EdgeImpulse, Inc.

Node (Neuron)

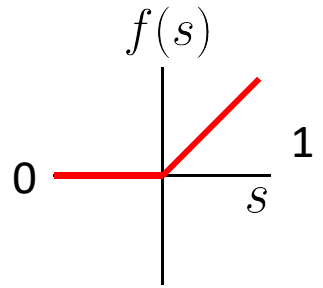


$$f(w_0 + w_1 x_1 + w_2 x_2 + ...)$$

Sigmoid function

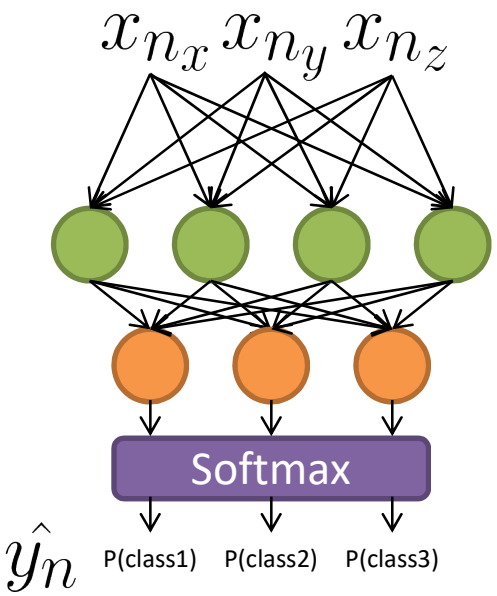


ReLU function



© 2021 EdgeImpulse, Inc.

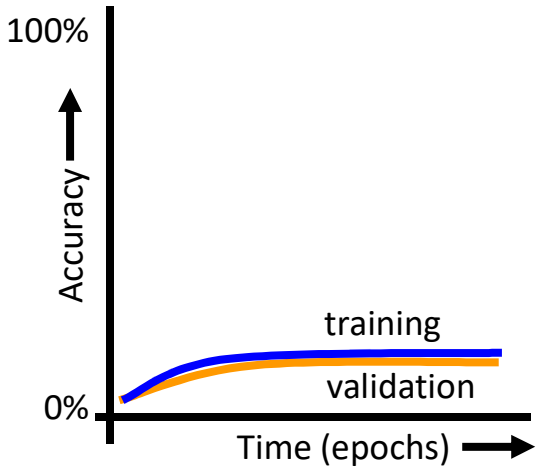
Training



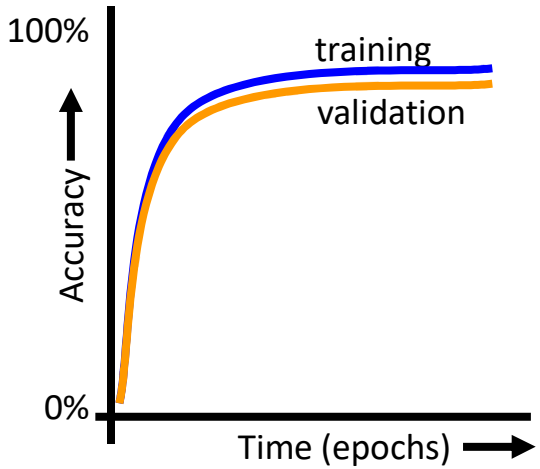
1. Initialize weights with random values
2. Input features from training sample
3. Perform forward pass
4. Calculate loss
5. Perform backpropagation
6. Repeat 2-5 until desired/acceptable performance

© 2021 EdgeImpulse, Inc.

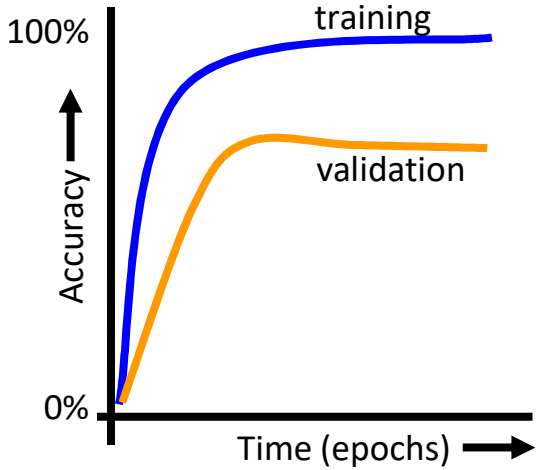
Spotting Underfitting and Overfitting



Underfit: Model performs poorly on training and validation data



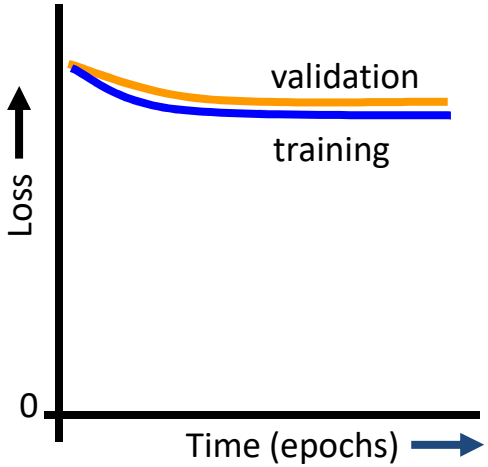
Good fit: Model generalizes well from training to validation data



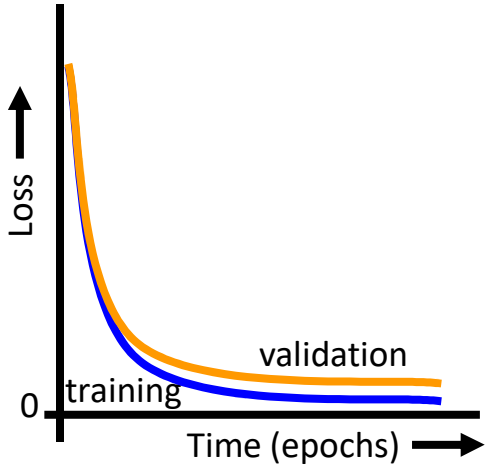
Overfit: Model predicts training data well but fails to generalize to validation data

© 2021 EdgeImpulse, Inc.

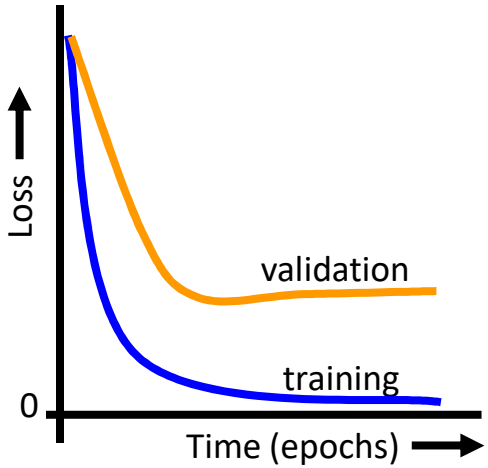
Spotting Underfitting and Overfitting



Underfit: Model performs poorly on training and validation data



Good fit: Model generalizes well from training to validation data



Overfit: Model predicts training data well but fails to generalize to validation data

© 2021 EdgeImpulse, Inc.

Confusion Matrix

Predicted Label

Actual Label	Cat	Dog	Bird	Human
Cat	205	10	1	46
Dog	6	199	0	32
Bird	9	17	223	34
Human	21	8	3	186

True Positive (TP): Predicted positive matches actual positive

True Negative (TN): Predicted negative matches actual negative

False Positive (FP) (“Type I Error”): Predicted positive does not match actual negative

False Negative (FN) (“Type II Error”): Predicted negative does not match actual positive

© 2021 EdgeImpulse, Inc.