



Tensors

Deep Learning Pre-Work

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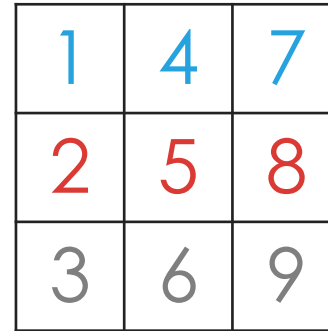
Tensors



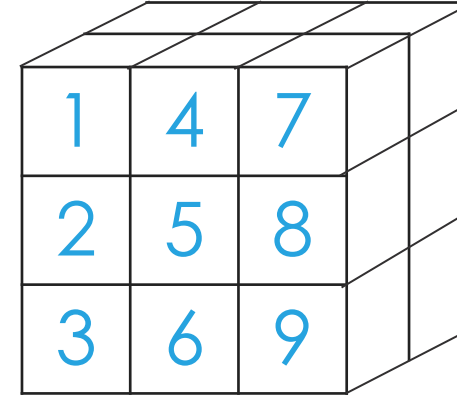
Scalar



Vector



Matrix



Cube

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Tensors



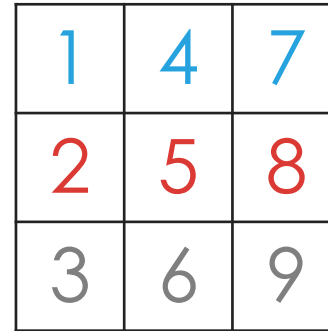
Scalar
Tensor
rank 0

e.g.,



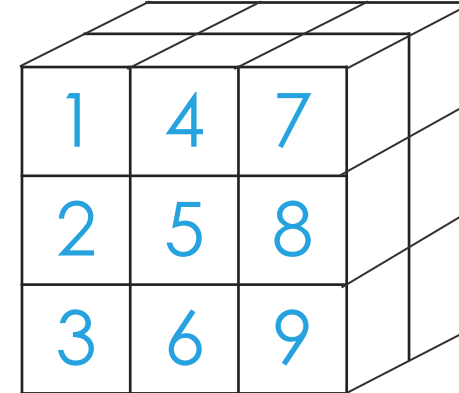
Vector
Tensor
rank 1

[3]



Matrix
Tensor
rank 2

[1,3]

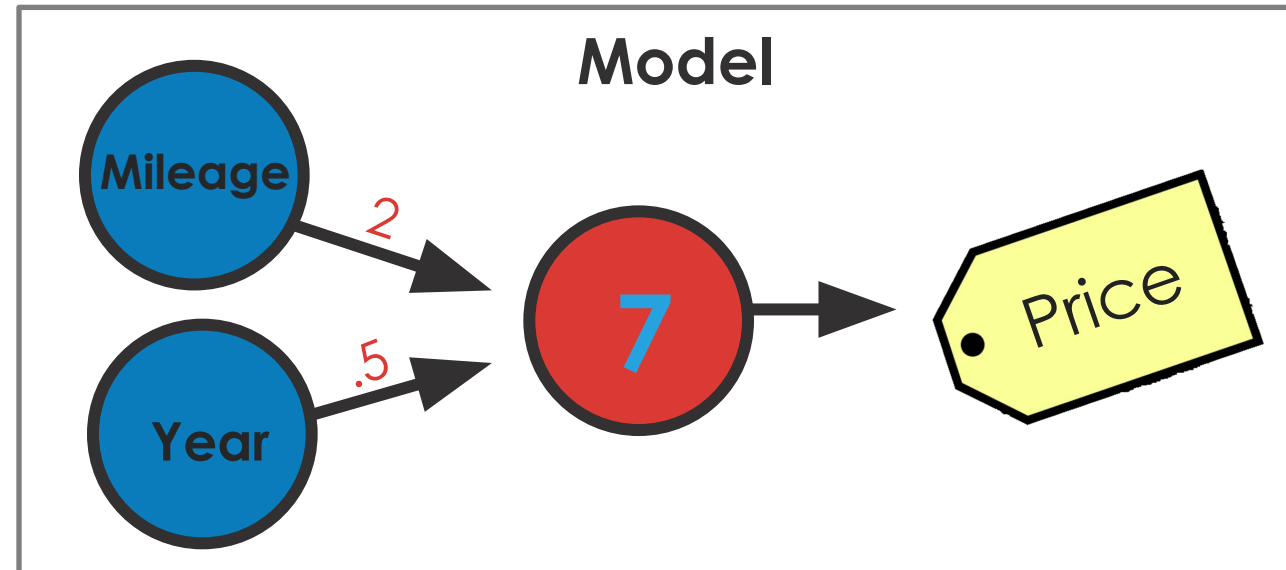


Cube
Tensor
rank 3

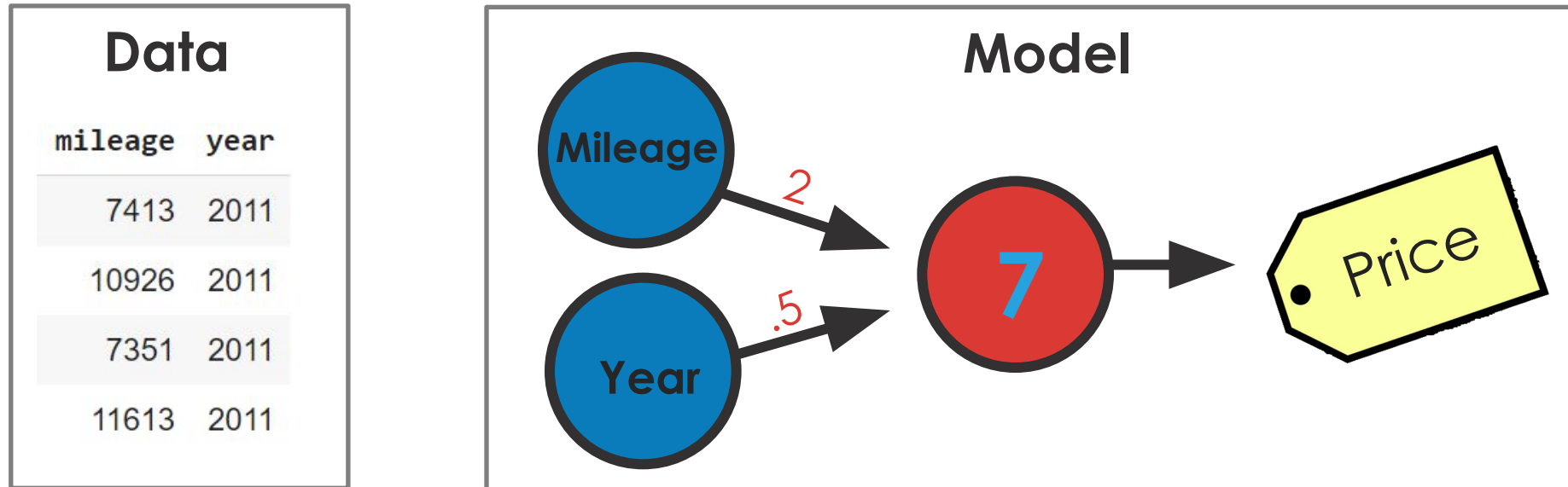
[1,3,1]

Tensors in Deep Learning

Data	
mileage	year
7413	2011
10926	2011
7351	2011
11613	2011



Tensors in Deep Learning



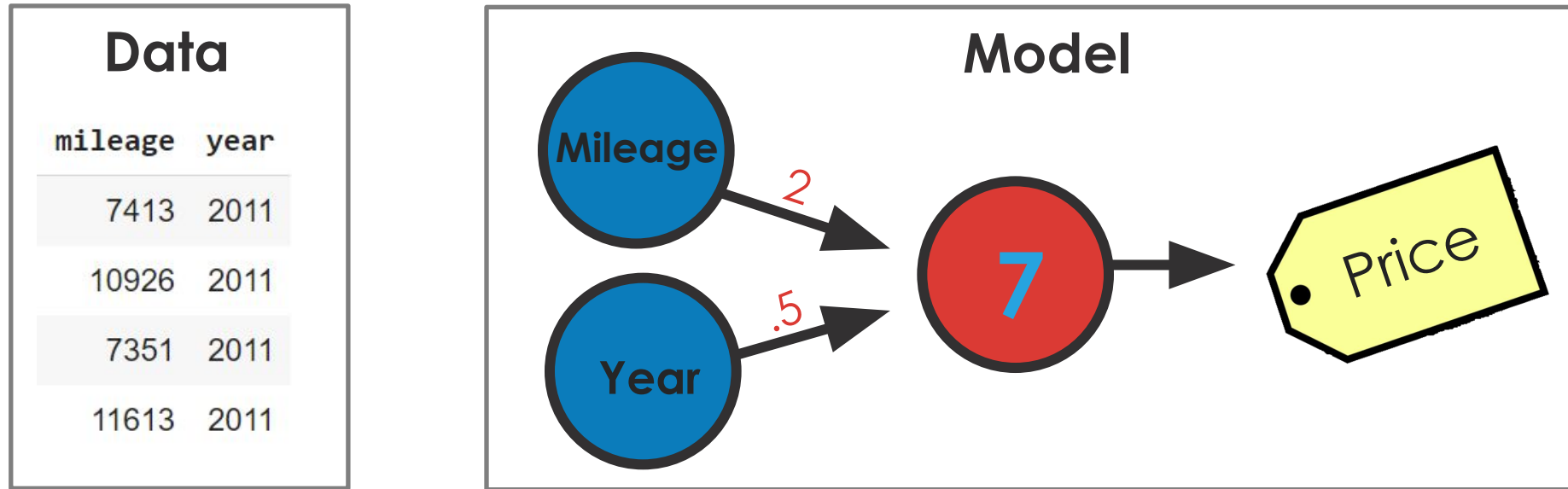
Equation

$$X * \text{Weight} + \text{Bias}$$

$$\begin{pmatrix} 7,413 & 2011 \\ 10,926 & 2011 \\ 7351 & 2011 \\ 11,613 & 2011 \end{pmatrix} * \begin{pmatrix} 2 \\ .5 \end{pmatrix} + 7 = \begin{pmatrix} 15,839 \\ 22,865 \\ 15,714 \\ 22,239 \end{pmatrix}$$

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Tensors in Deep Learning



Tensor rank 2

Tensor rank 1

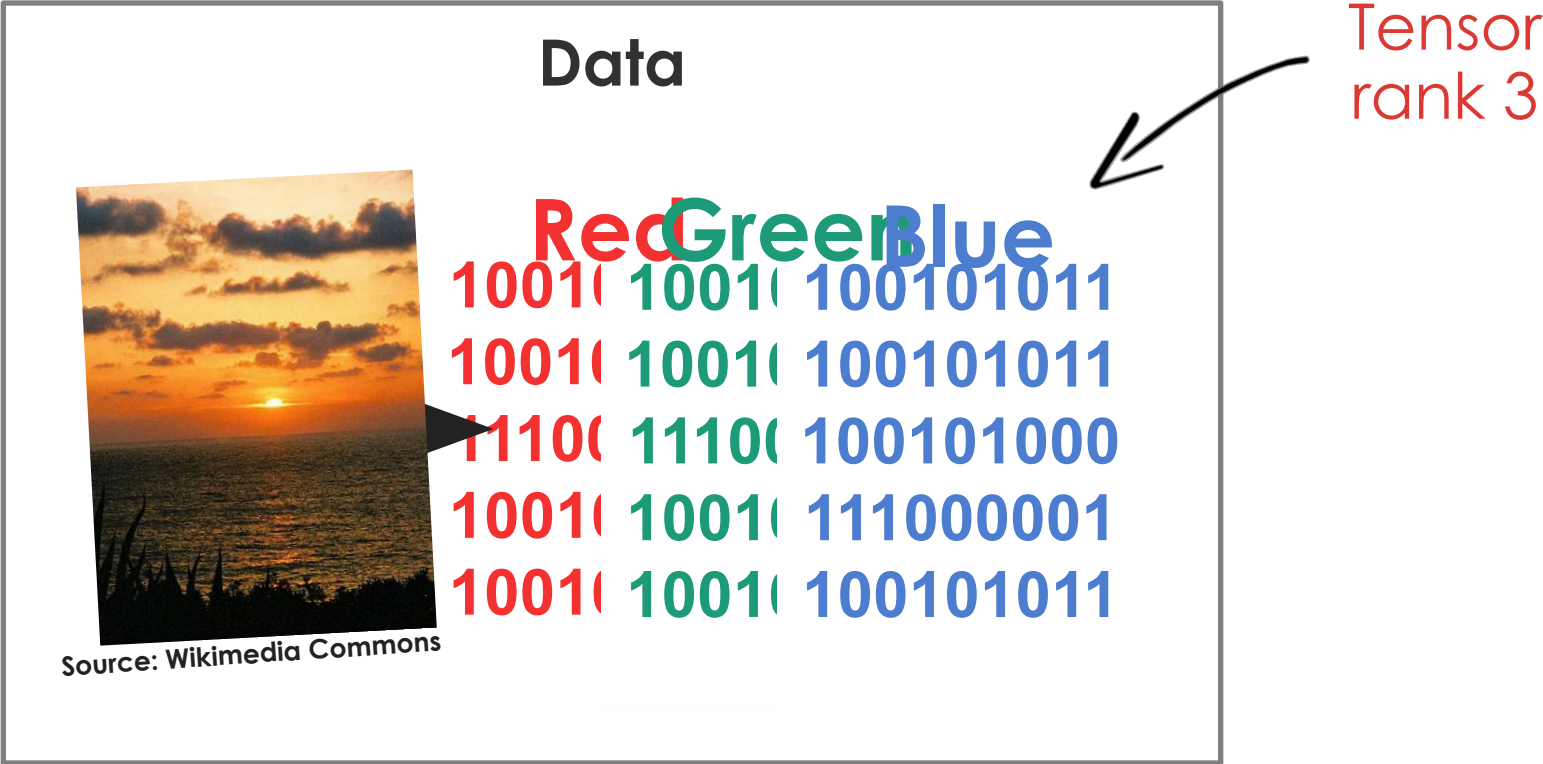
Tensor rank 0

Tensor rank 1

$$\begin{bmatrix} 7,413 & 2011 \\ 10,926 & 2011 \\ 7351 & 2011 \\ 11,613 & 2011 \end{bmatrix} * \begin{bmatrix} 2 \\ .5 \end{bmatrix} + 7 = \begin{bmatrix} 15,839 \\ 22,865 \\ 15,714 \\ 22,239 \end{bmatrix}$$

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Tensors in Deep Learning





TensorFlow

Tensor rank 2

Tensor rank 1

Tensor rank 0

Tensor rank 1

$$\begin{bmatrix} 7,413 & 2011 \\ 10,926 & 2011 \\ 7351 & 2011 \\ 11,613 & 2011 \end{bmatrix} * \begin{bmatrix} 2 \\ .5 \end{bmatrix} + 7 = \begin{bmatrix} 15,839 \\ 22,865 \\ 15,714 \\ 22,239 \end{bmatrix}$$

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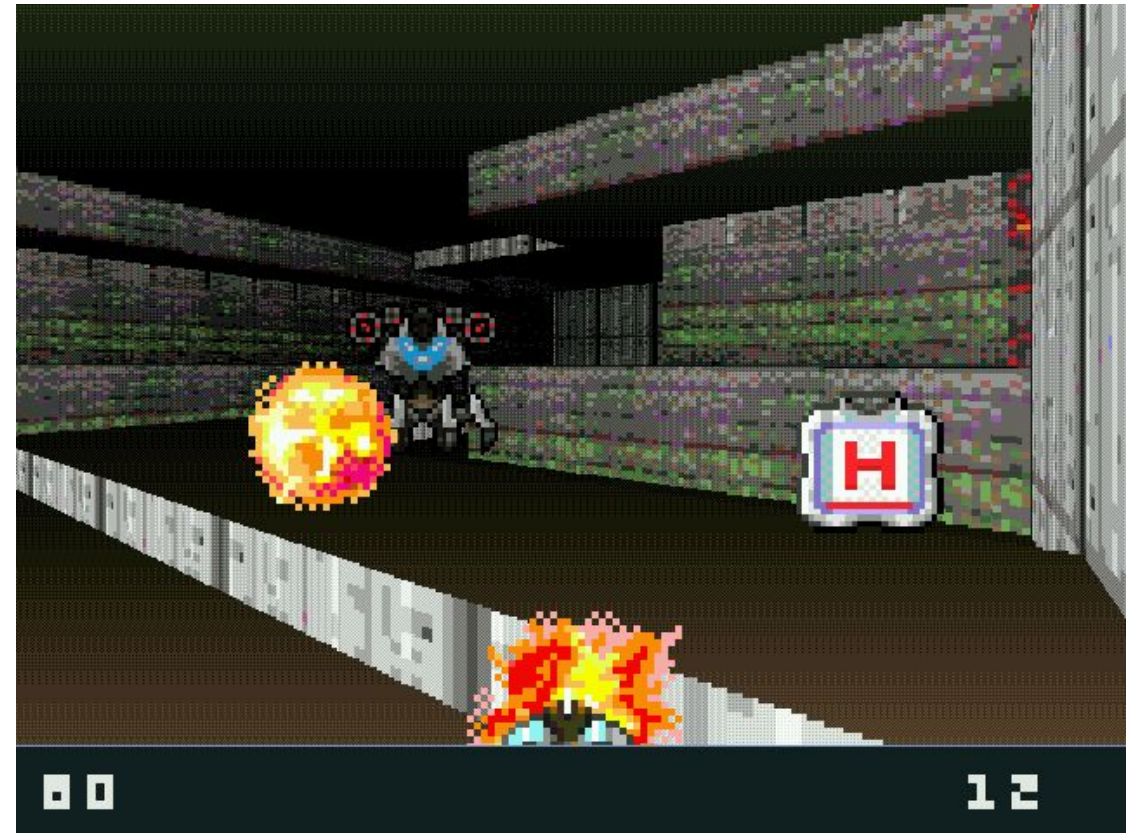
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Graphical Processing Units

GPUs



Source: Wikimedia commons



Source: Wikimedia commons

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