Understanding Forward Propagation Mathematically

Understanding the data

Gender	Age	Hypertension	Smoke	Stroke
1	3	0	0	0
1	58	1	1	1
0	8	0	0	0
0	70	0	1	1
1	14	0	0	0
1	10	0	0	0

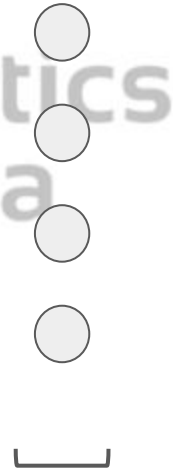
Understanding the data

Gender	Age	Hypertension	Smoke	Stroke
1	3	0	0	0
1	58	1	1	1
0	8	0	0	0
0	70	0	1	1
1	14	0	0	0
1	10	0	0	0

X = 4 X 6 **Y** = 1 X 6

Defining the architecture of Neural Network

Gender	Age	Hypertension	Smoke	Stroke
1	3	0	0	0
1	58	1	1	1
0	8	0	0	0
0	70	0	1	1
1	14	0	0	0
1	10	0	0	0

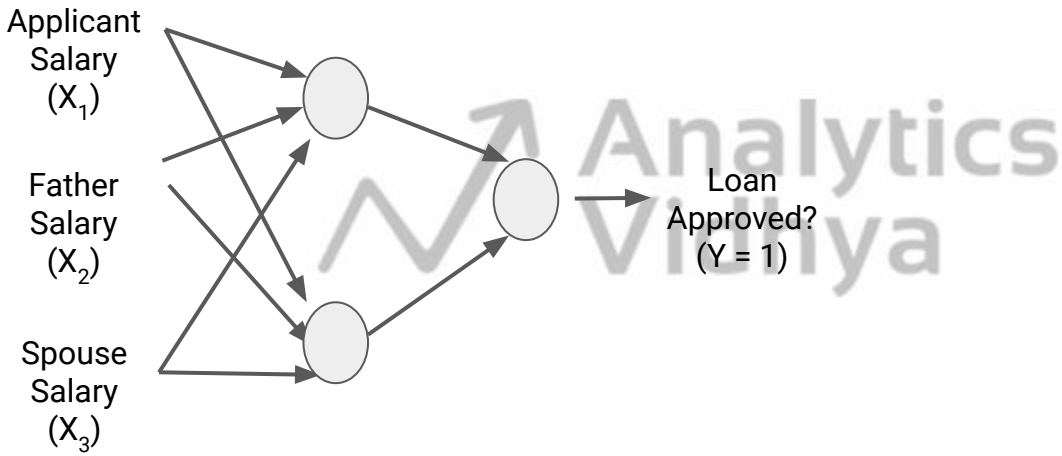


Input Layer

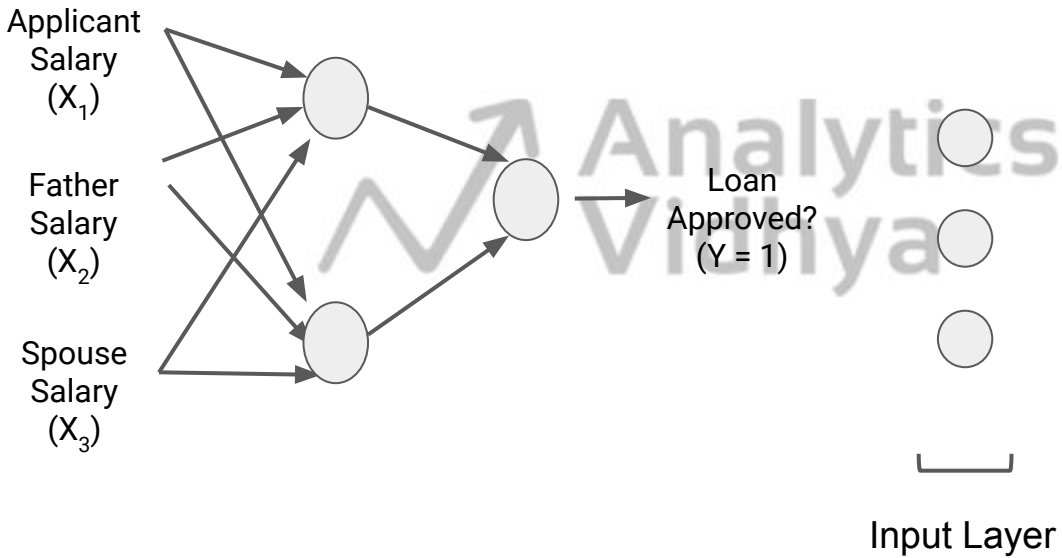
X = 4 X 6

Y = 1 X 6

Defining the architecture of Neural Network



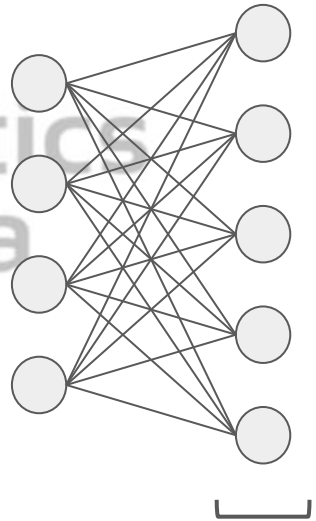
Defining the architecture of Neural Network



Defining the architecture of Neural Network

Gender	Age	Hypertension	Smoke	Stroke
1	3	0	0	0
1	58	1	1	1
0	8	0	0	0
0	70	0	1	1
1	14	0	0	0
1	10	0	0	0

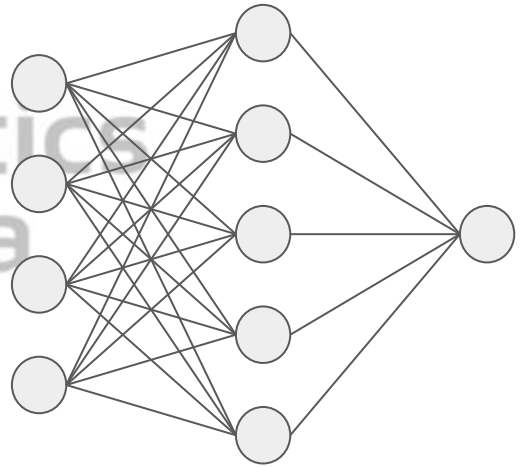
X = 4 X 6 **Y** = 1 X 6



Hidden Layer

Defining the architecture of Neural Network

Gender	Age	Hypertension	Smoke	Stroke
1	3	0	0	0
1	58	1	1	1
0	8	0	0	0
0	70	0	1	1
1	14	0	0	0
1	10	0	0	0



Output Layer

X = 4 X 6

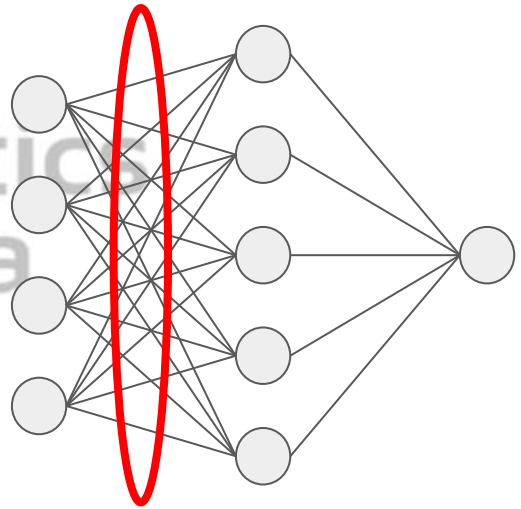
Y = 1 X 6

Understanding weight matrices

Gender	Age	Hypertension	Smoke	Stroke
1	3	0	0	0
1	58	1	1	1
0	8	0	0	0
0	70	0	1	1
1	14	0	0	0
1	10	0	0	0

X = 4 X 6

Y = 1 X 6

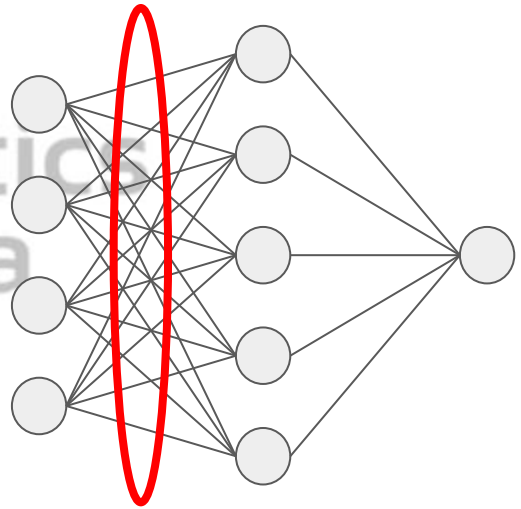


Understanding weight matrices

Gender	Age	Hypertension	Smoke	Stroke
1	3	0	0	0
1	58	1	1	1
0	8	0	0	0
0	70	0	1	1
1	14	0	0	0
1	10	0	0	0

X = 4 X 6

Y = 1 X 6



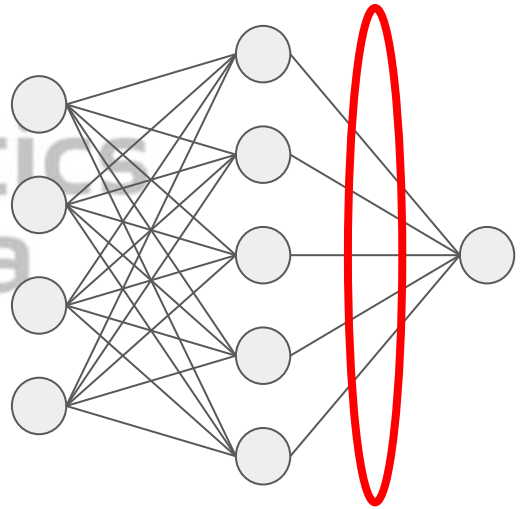
W_{ih} = 4 X 5

Understanding weight matrices

Gender	Age	Hypertension	Smoke	Stroke
1	3	0	0	0
1	58	1	1	1
0	8	0	0	0
0	70	0	1	1
1	14	0	0	0
1	10	0	0	0

X = 4 X 6

Y = 1 X 6



W_{ho} = 5 X 1

Understanding weight matrices

Gender	Age	Hypertension	Smoke	Stroke
1	3	0	0	0
1	58	1	1	1
0	8	0	0	0
0	70	0	1	1
1	14	0	0	0
1	10	0	0	0

X = 4 X 6

Understanding weight matrices

Gender	Age	Hypertension	Smoke	Stroke
1	3	0	0	0
1	58	1	1	1
0	8	0	0	0
0	70	0	1	1
1	14	0	0	0
1	10	0	0	0

1	1	0	0	1	1
3	58	8	70	14	10
0	1	0	0	0	0
0	1	0	1	0	0

X = 4 X 6

Understanding Forward Propagation Mathematically

Input (X)

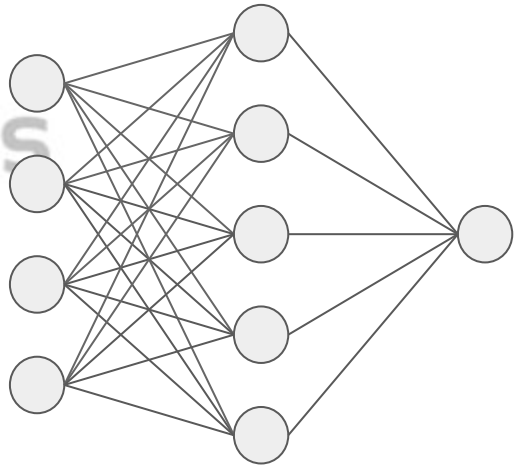
1	1	0	0	1	1
3	58	8	70	14	10
0	1	0	0	0	0
0	1	0	1	0	0

4 X 6

Weights (W)

.3	.8	.8	.7	.2
.6	.3	.8	.1	.2
.8	1	1	.6	.7
1	1	.2	.7	1

4 X 5



Understanding Forward Propagation Mathematically

Input (X)

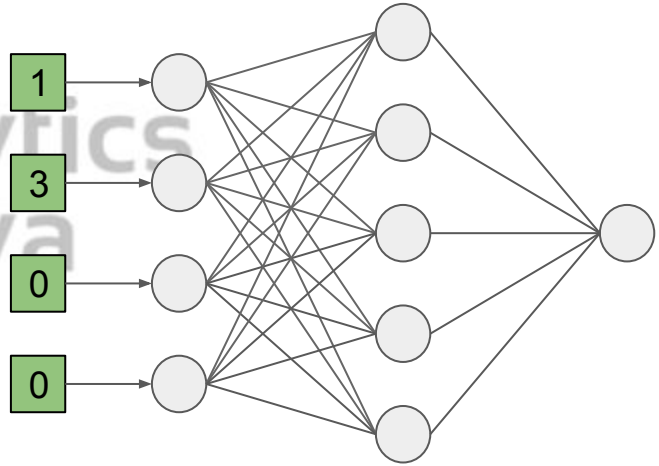
1	1	0	0	1	1
3	58	8	70	14	10
0	1	0	0	0	0
0	1	0	1	0	0

4 X 6

Weights (W)

.3	.8	.8	.7	.2
.6	.3	.8	.1	.2
.8	1	1	.6	.7
1	1	.2	.7	1

4 X 5



Understanding Forward Propagation Mathematically

Input (X)

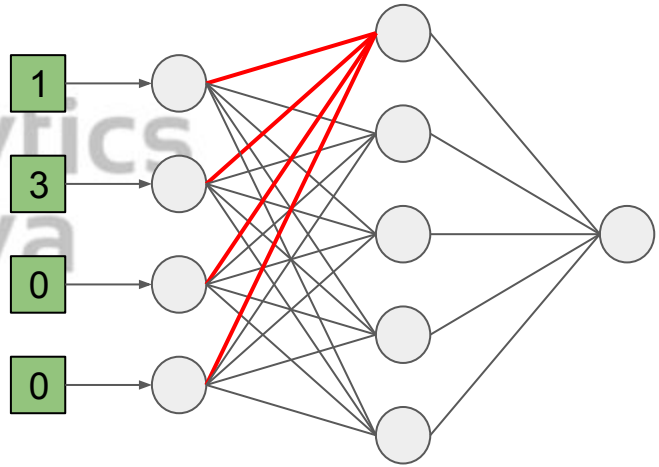
1	1	0	0	1	1
3	58	8	70	14	10
0	1	0	0	0	0
0	1	0	1	0	0

4 X 6

Weights (W)

.3	.8	.8	.7	.2
.6	.3	.8	.1	.2
.8	1	1	.6	.7
1	1	.2	.7	1

4 X 5



Understanding Forward Propagation Mathematically

1*.3 + 3*.6 + 0*.8 + 0*1 = 2.1

Input (X)

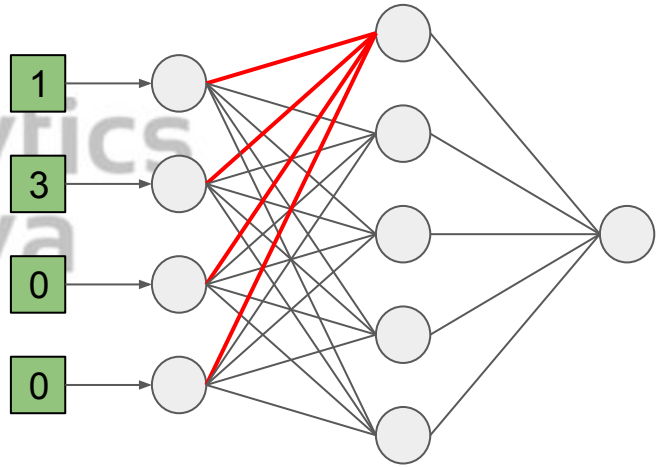
1	1	0	0	1	1
3	58	8	70	14	10
0	1	0	0	0	0
0	1	0	1	0	0

4 X 6

Weights (W)

.3	.8	.8	.7	.2
.6	.3	.8	.1	.2
.8	1	1	.6	.7
1	1	.2	.7	1

4 X 5



Understanding Forward Propagation Mathematically

1*.3 + 3*.6 + 0*.8 + 0*1 = 2.1

σ(2.1) = 0.89

Input (X)

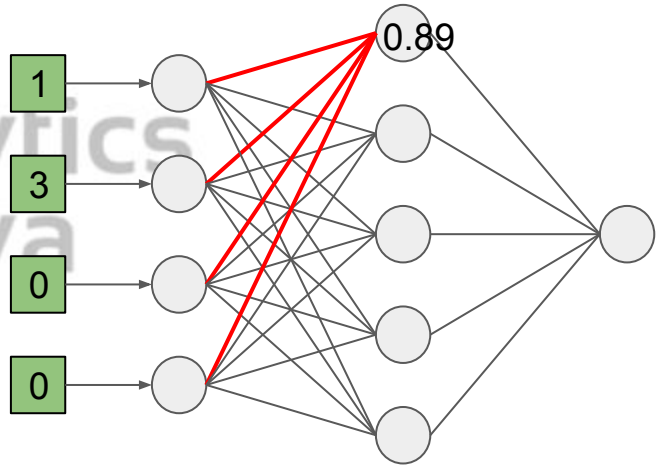
1	1	0	0	1	1
3	58	8	70	14	10
0	1	0	0	0	0
0	1	0	1	0	0

4 X 6

Weights (W)

.3	.8	.8	.7	.2
.6	.3	.8	.1	.2
.8	1	1	.6	.7
1	1	.2	.7	1

4 X 5



Understanding Forward Propagation Mathematically

1*.8 + 3*.3 + 0*1 + 0*1 = 1.7

σ(1.7) = 0.84

Input (X)

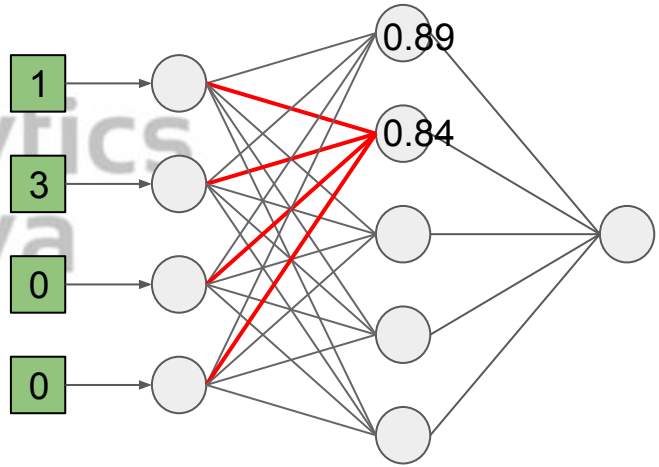
1	1	0	0	1	1
3	58	8	70	14	10
0	1	0	0	0	0
0	1	0	1	0	0

4 X 6

Weights (W)

.3	.8	.8	.7	.2
.6	.3	.8	.1	.2
.8	1	1	.6	.7
1	1	.2	.7	1

4 X 5



Understanding Forward Propagation Mathematically

1*.8 + 3*.8 + 0*1 + 0*.2 = 3.2

σ(3.2) = 0.96

Input (X)

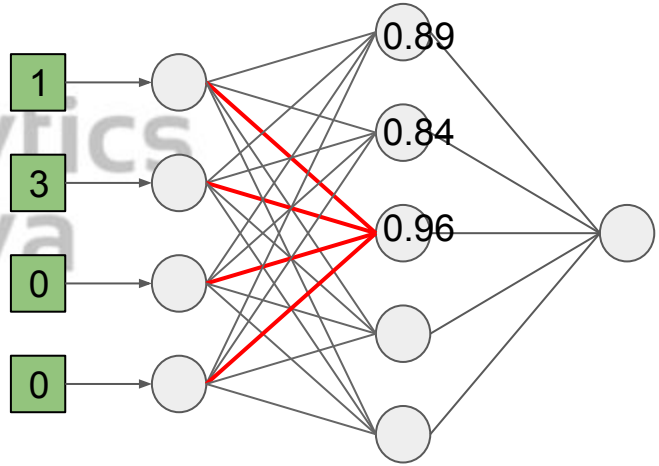
1	1	0	0	1	1
3	58	8	70	14	10
0	1	0	0	0	0
0	1	0	1	0	0

4 X 6

Weights (W)

.3	.8	.8	.7	.2
.6	.3	.8	.1	.2
.8	1	1	.6	.7
1	1	.2	.7	1

4 X 5



Understanding Forward Propagation Mathematically

1*.7 + 3*.1 + 0*.6 + 0*.7 = 1.0

σ(1) = 0.73

Input (X)

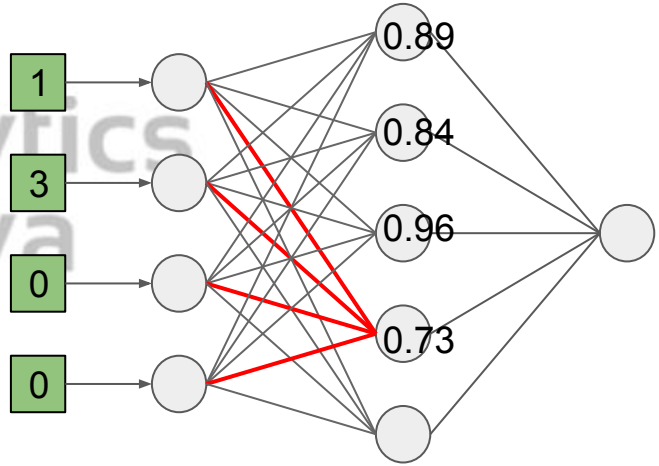
1	1	0	0	1	1
3	58	8	70	14	10
0	1	0	0	0	0
0	1	0	1	0	0

4 X 6

Weights (W)

.3	.8	.8	.7	.2
.6	.3	.8	.1	.2
.8	1	1	.6	.7
1	1	.2	.7	1

4 X 5



Understanding Forward Propagation Mathematically

1*.2 + 3*.2 + 0*.7 + 0*1 = 0.8

σ(0.8) = 0.69

Input (X)

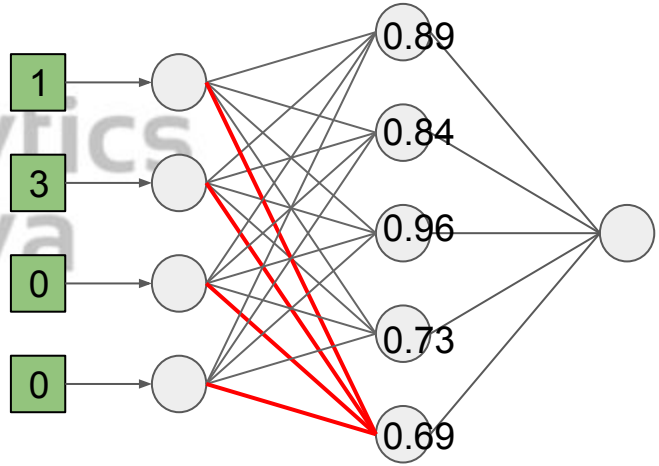
1	1	0	0	1	1
3	58	8	70	14	10
0	1	0	0	0	0
0	1	0	1	0	0

4 X 6

Weights (W)

.3	.8	.8	.7	.2
.6	.3	.8	.1	.2
.8	1	1	.6	.7
1	1	.2	.7	1

4 X 5



Understanding Forward Propagation Mathematically

Input (X)

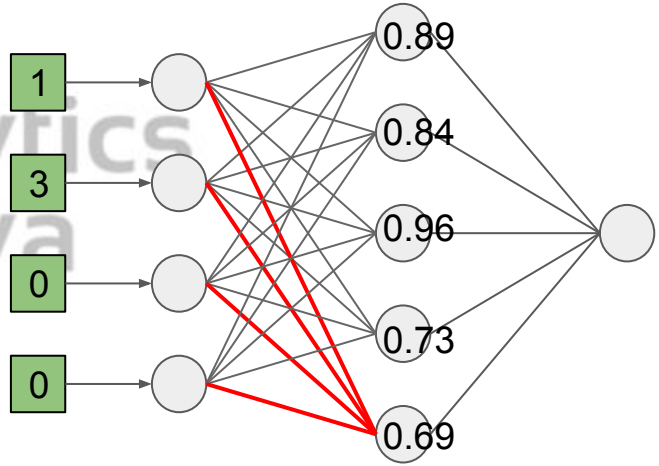
1	1	0	0	1	1
3	58	8	70	14	10
0	1	0	0	0	0
0	1	0	1	0	0

4 X 6

Weights (W)

.3	.8	.8	.7	.2
.6	.3	.8	.1	.2
.8	1	1	.6	.7
1	1	.2	.7	1

4 X 5



5 X 1

Understanding Forward Propagation Mathematically

Input (X)

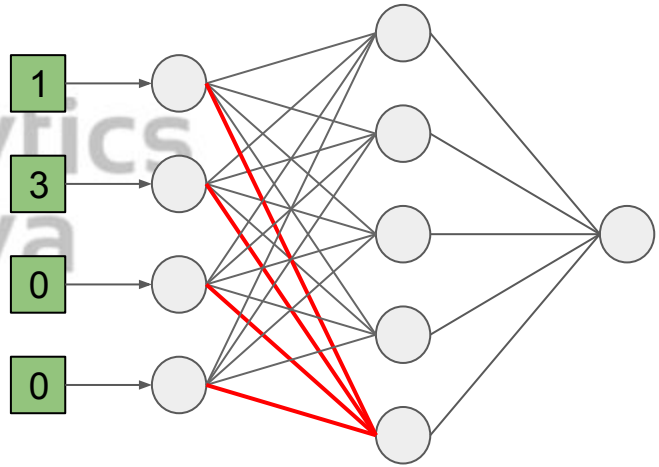
1	1	0	0	1	1
3	58	8	70	14	10
0	1	0	0	0	0
0	1	0	1	0	0

4 X 6

Weights (W)

.3	.8	.8	.7	.2
.6	.3	.8	.1	.2
.8	1	1	.6	.7
1	1	.2	.7	1

4 X 5



5 X 6

Understanding Forward Propagation Mathematically

Input (X)

1	1	0	0	1	1
3	58	8	70	14	10
0	1	0	0	0	0
0	1	0	1	0	0

4 X 6

Weights (W)

.3	.8	.8	.7	.2
.6	.3	.8	.1	.2
.8	1	1	.6	.7
1	1	.2	.7	1

4 X 5

5 X 6

Understanding Forward Propagation Mathematically

Input (X)

1	1	0	0	1	1
3	58	8	70	14	10
0	1	0	0	0	0
0	1	0	1	0	0

4 X 6

✖

Weights (W)

.3	.8	.8	.7	.2
.6	.3	.8	.1	.2
.8	1	1	.6	.7
1	1	.2	.7	1

4 X 5

5 X 6

Understanding Forward Propagation Mathematically

Input (X)

1	1	0	0	1	1
3	58	8	70	14	10
0	1	0	0	0	0
0	1	0	1	0	0

4 X 6

Weights (W)

.3	.8	.8	.7	.2
.6	.3	.8	.1	.2
.8	1	1	.6	.7
1	1	.2	.7	1

4 X 5

5 X 6

Understanding Forward Propagation Mathematically

Input (X)

1	1	0	0	1	1
3	58	8	70	14	10
0	1	0	0	0	0
0	1	0	1	0	0

4 X 6

Weights (W)

.3	.8	.8	.7	.2
.6	.3	.8	.1	.2
.8	1	1	.6	.7
1	1	.2	.7	1

4 X 5

$$Y = W^T X$$

5 X 6

Understanding Forward Propagation Mathematically

W^T

.3	.6	.8	1
.8	.3	1	1
.8	.8	1	.2
.7	.1	.6	.7
.2	.2	.7	1

5 X 4

X

1	1	0	0	1	1
3	58	8	70	14	10
0	1	0	0	0	0
0	1	0	1	0	0

4 X 6

$Y = W^T X$

5 X 6

Understanding Forward Propagation Mathematically

W^T

.3	.6	.8	1
.8	.3	1	1
.8	.8	1	.2
.7	.1	.6	.7
.2	.2	.7	1

5 X 4

✖

X

1	1	0	0	1	1
3	58	8	70	14	10
0	1	0	0	0	0
0	1	0	1	0	0

4 X 6

=

$Y = W^T X$

2.1	36.9	4.8	43	8.7	6.3
1.7	20.2	2.4	22	5	3.8
3.2	48.4	6.4	56.2	12	8.8
1.0	7.8	0.8	7.7	2.1	1.7
0.8	13.5	1.6	15	3	2.2

5 X 6

Understanding Forward Propagation Mathematically

W^T

.3	.6	.8	1
.8	.3	1	1
.8	.8	1	.2
.7	.1	.6	.7
.2	.2	.7	1

5 X 4

×

X

1	1	0	0	1	1
3	58	8	70	14	10
0	1	0	0	0	0
0	1	0	1	0	0

4 X 6

=

$\sigma(W^TX)$

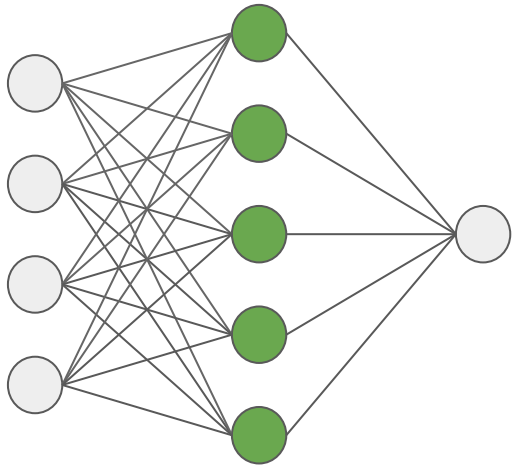
0.89	1	0.99	1	0.99	0.99
0.84	1	0.91	1	0.99	0.97
0.96	1	0.99	1	0.99	0.99
0.73	0.99	0.69	0.99	0.89	0.84
0.69	0.99	0.83	1	0.95	0.90

5 X 6

Understanding Forward Propagation Mathematically

0.89	1	0.99	1	0.99	0.99
0.84	1	0.91	1	0.99	0.97
0.96	1	0.99	1	0.99	0.99
0.73	0.99	0.69	0.99	0.89	0.84
0.69	0.99	0.83	1	0.95	0.90

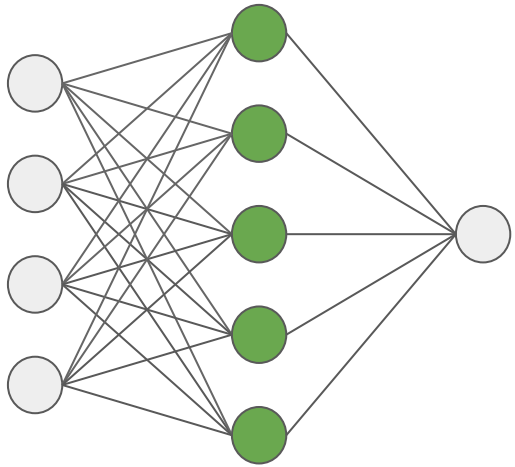
5 X 6



Understanding Forward Propagation Mathematically

0.89	1	0.99	1	0.99	0.99
0.84	1	0.91	1	0.99	0.97
0.96	1	0.99	1	0.99	0.99
0.73	0.99	0.69	0.99	0.89	0.84
0.69	0.99	0.83	1	0.95	0.90

5 X 6



5 X 1

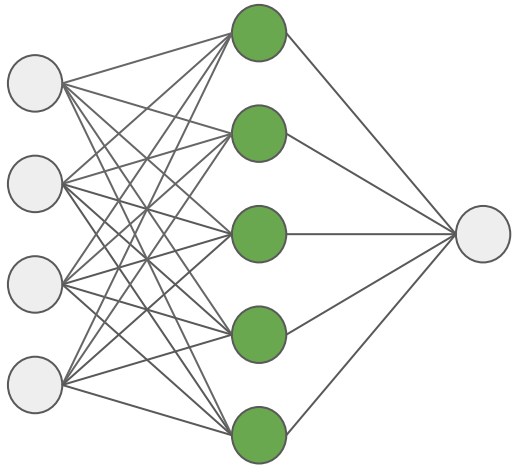
Understanding Forward Propagation Mathematically

0.89	1	0.99	1	0.99	0.99
0.84	1	0.91	1	0.99	0.97
0.96	1	0.99	1	0.99	0.99
0.73	0.99	0.69	0.99	0.89	0.84
0.69	0.99	0.83	1	0.95	0.90

5 X 6

0.2
0.5
0.1
0.2
0.7

5 X 1



5 X 1

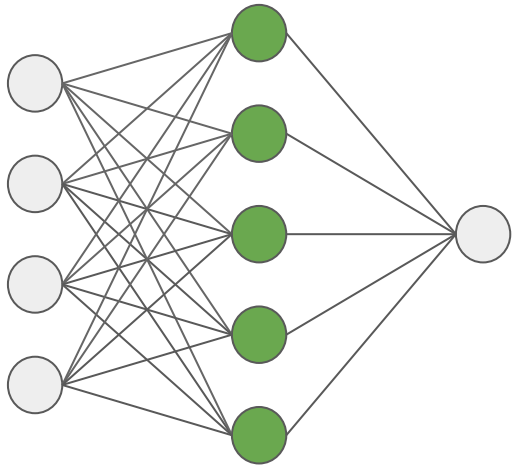
Understanding Forward Propagation Mathematically

0.89	1	0.99	1	0.99	0.99
0.84	1	0.91	1	0.99	0.97
0.96	1	0.99	1	0.99	0.99
0.73	0.99	0.69	0.99	0.89	0.84
0.69	0.99	0.83	1	0.95	0.90

5 X 6

0.2
0.5
0.1
0.2
0.7

5 X 1



5 X 1

1 X 6

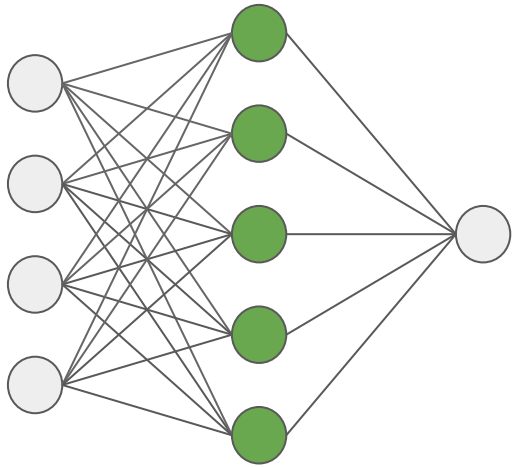
Understanding Forward Propagation Mathematically

0.89	1	0.99	1	0.99	0.99
0.84	1	0.91	1	0.99	0.97
0.96	1	0.99	1	0.99	0.99
0.73	0.99	0.69	0.99	0.89	0.84
0.69	0.99	0.83	1	0.95	0.90

5 X 6

0.2
0.5
0.1
0.2
0.7

5 X 1



5 X 1

1 X 6

Understanding Forward Propagation Mathematically

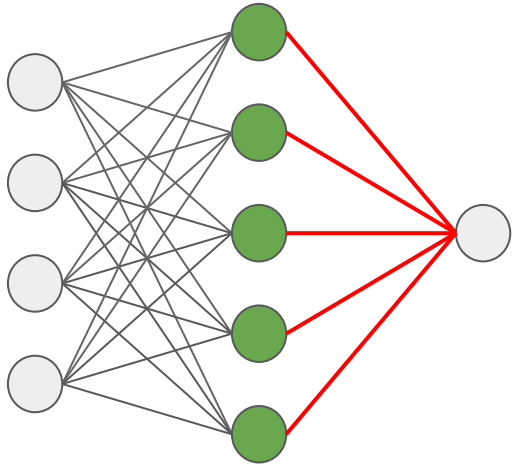
0.2	0.5	0.1	0.2	0.7

1 X 5

✖

0.89	1	0.99	1	0.99	0.99
0.84	1	0.91	1	0.99	0.97
0.96	1	0.99	1	0.99	0.99
0.73	0.99	0.69	0.99	0.89	0.84
0.69	0.99	0.83	1	0.95	0.90

5 X 6



5 X 1

1 X 6

Understanding Forward Propagation Mathematically

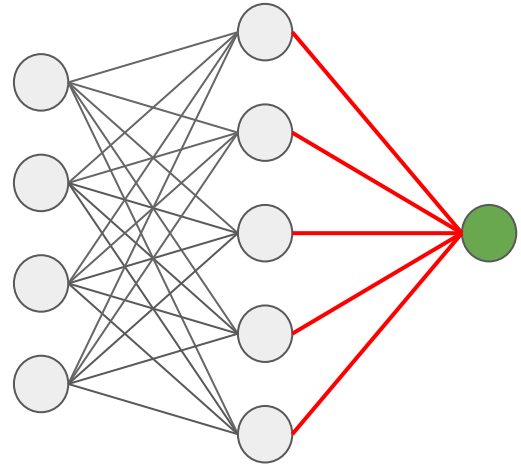
0.2	0.5	0.1	0.2	0.7

1 X 5

✖

0.89	1	0.99	1	0.99	0.99
0.84	1	0.91	1	0.99	0.97
0.96	1	0.99	1	0.99	0.99
0.73	0.99	0.69	0.99	0.89	0.84
0.69	0.99	0.83	1	0.95	0.90

5 X 6



5 X 1

1.32	1.69	1.47	1.69	1.63	1.58

1 X 6

Understanding Forward Propagation Mathematically

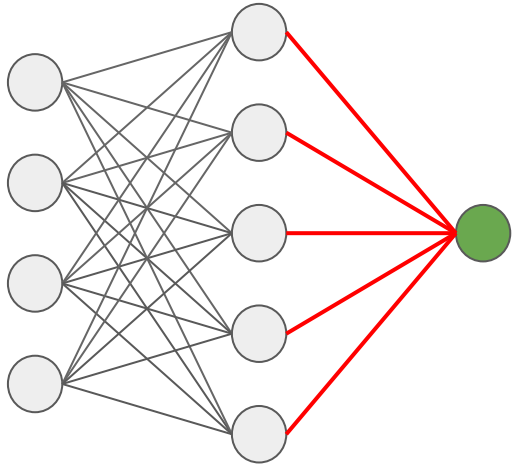
0.2	0.5	0.1	0.2	0.7

1 X 5

✖

0.89	1	0.99	1	0.99	0.99
0.84	1	0.91	1	0.99	0.97
0.96	1	0.99	1	0.99	0.99
0.73	0.99	0.69	0.99	0.89	0.84
0.69	0.99	0.83	1	0.95	0.90

5 X 6



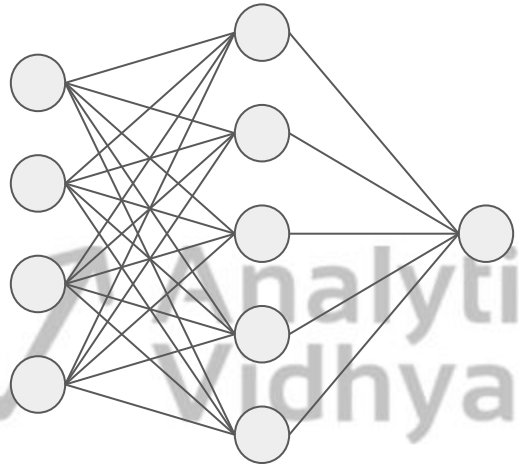
5 X 1

σ

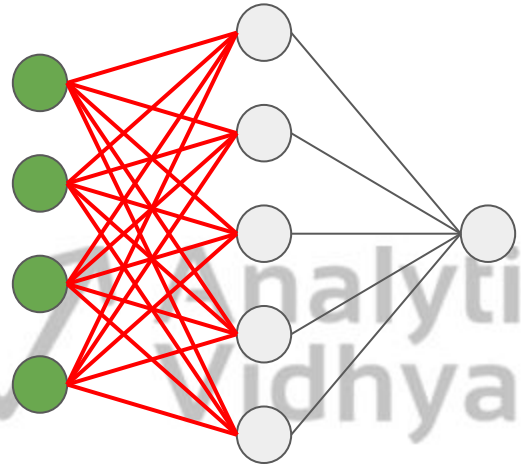
0.79	0.84	0.81	0.84	0.83	0.82

1 X 6

Forward Propagation using Computation Graph



Forward Propagation using Computation Graph

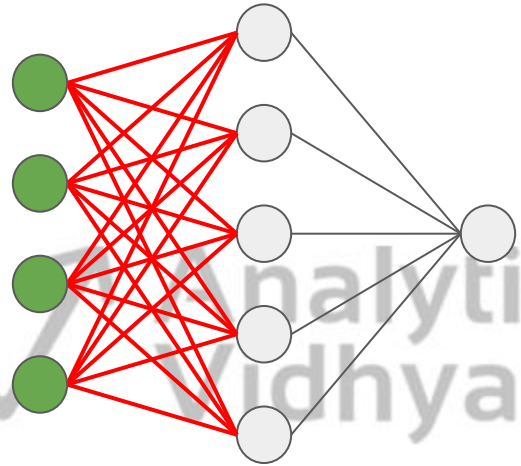


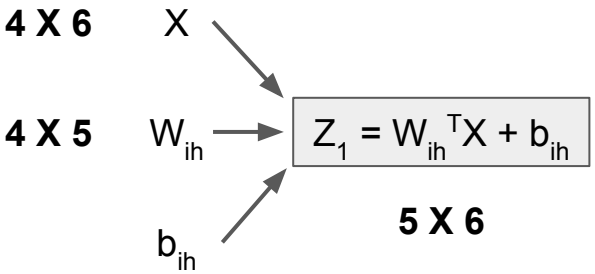
4 X 6 X

4 X 5 W_{ih}

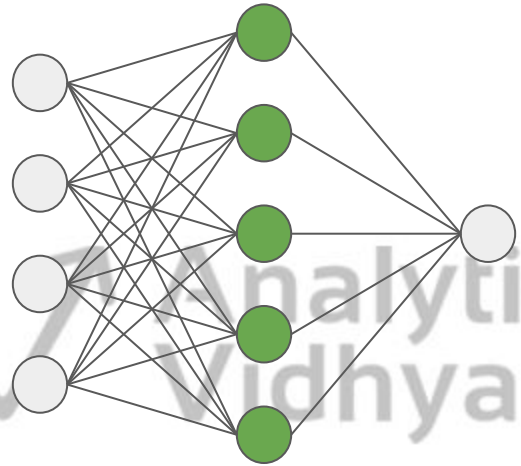
b_{ih}

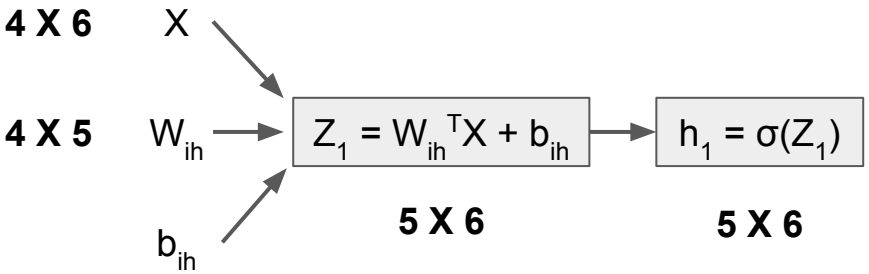
Forward Propagation using Computation Graph



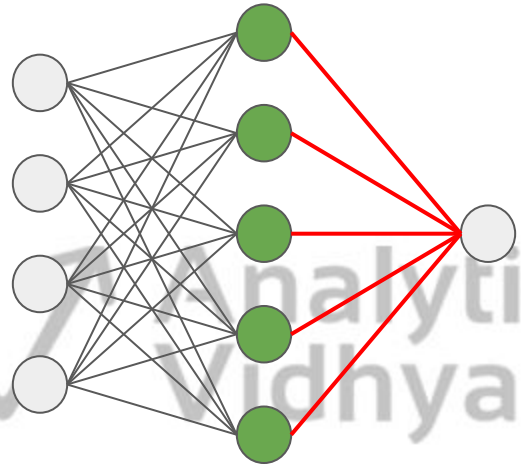


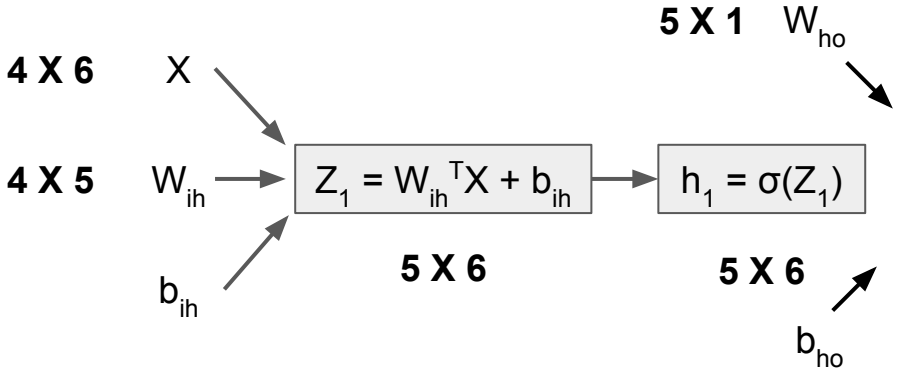
Forward Propagation using Computation Graph



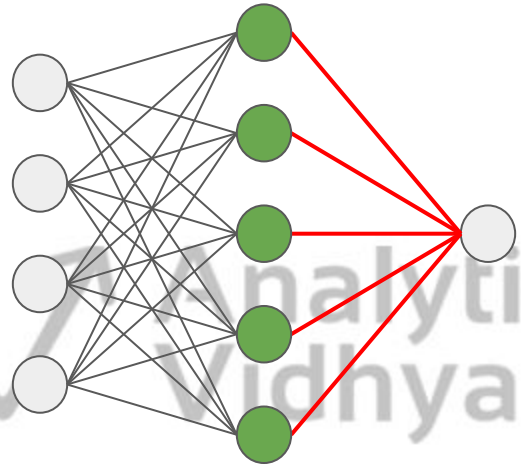


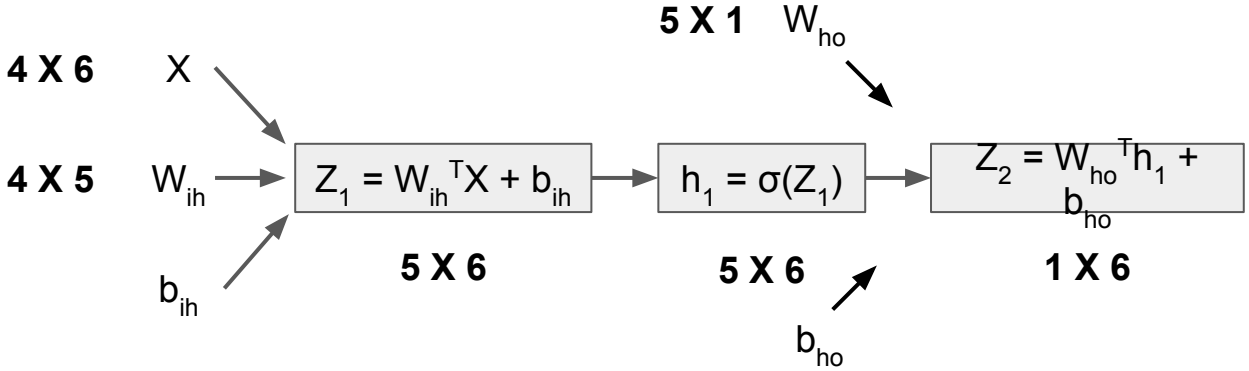
Forward Propagation using Computation Graph



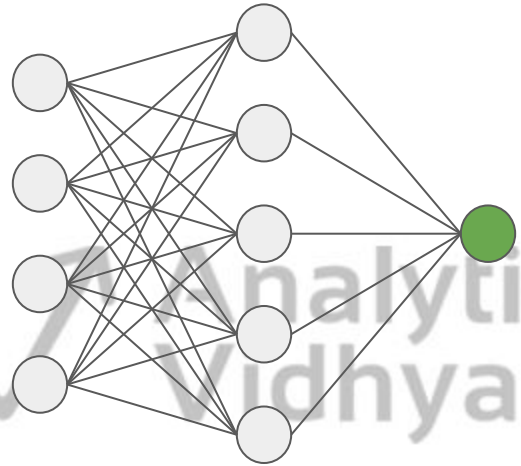


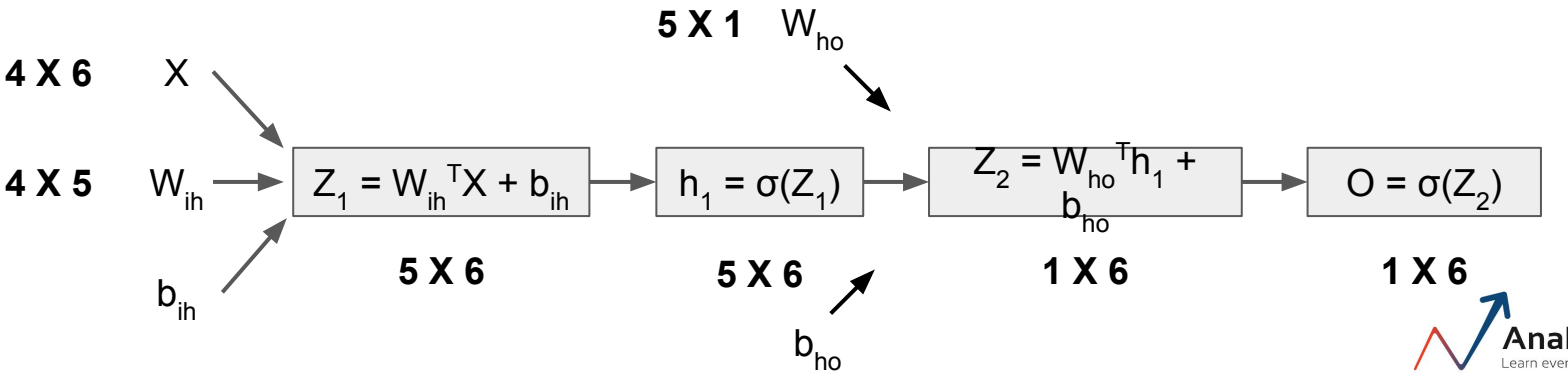
Forward Propagation using Computation Graph





Forward Propagation using Computation Graph





Thank You