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Basics of Neural Network Programming

Computation Graph

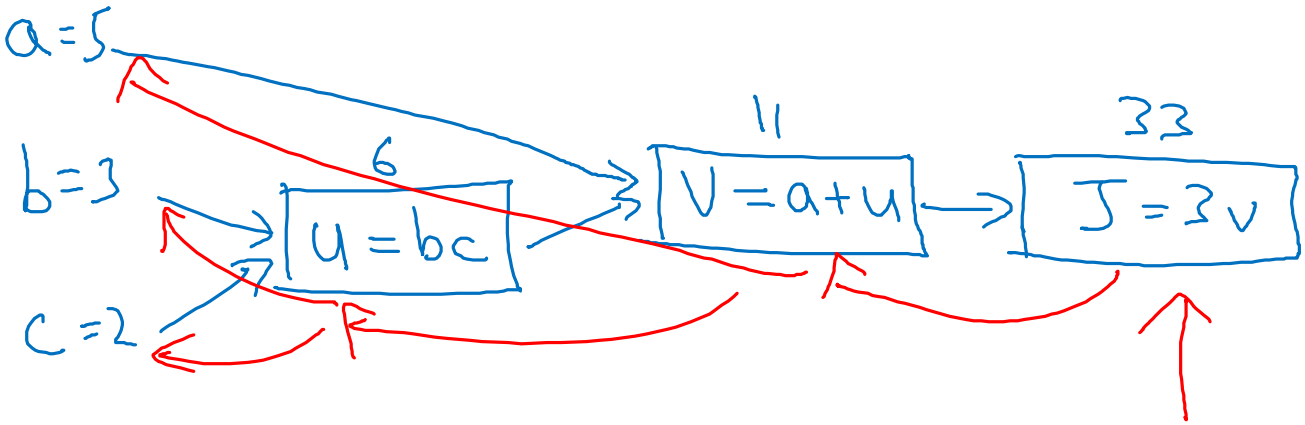
Computation Graph

$J(a,b,c) = 3(a+bc) = 3(5+3\times 2) = 33$

$u = bc$

$v = a+u$

$J = 3v$



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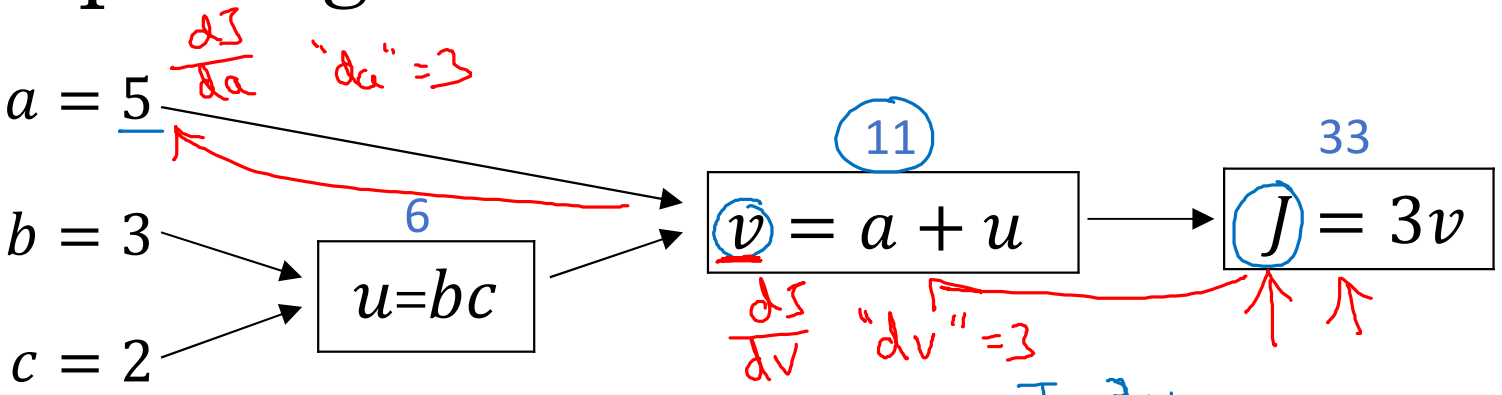
Basics of Neural Network Programming

Derivatives with a Computation Graph

Computing derivatives



$\frac{dJ}{da}$ "da" = 3

$\frac{dJ}{dv}$ "dv" = 3

$J = 3v$

$v = 11 \rightarrow 11.001$

$J = 33 \rightarrow 33.003$

$a \rightarrow v \rightarrow J$

$f(a) = 3a$

$\frac{df(a)}{da} = \frac{df}{da} = 3$

$J = 3v$

$\frac{dJ}{dv} = 3$

$\frac{dJ}{dv} = ? = 3$

$\frac{dJ}{da} = 3 = \frac{dJ}{dv} \frac{dv}{da}$

3×1

$\frac{dv}{da} = 1$

$a = 5 \rightarrow 5.001$

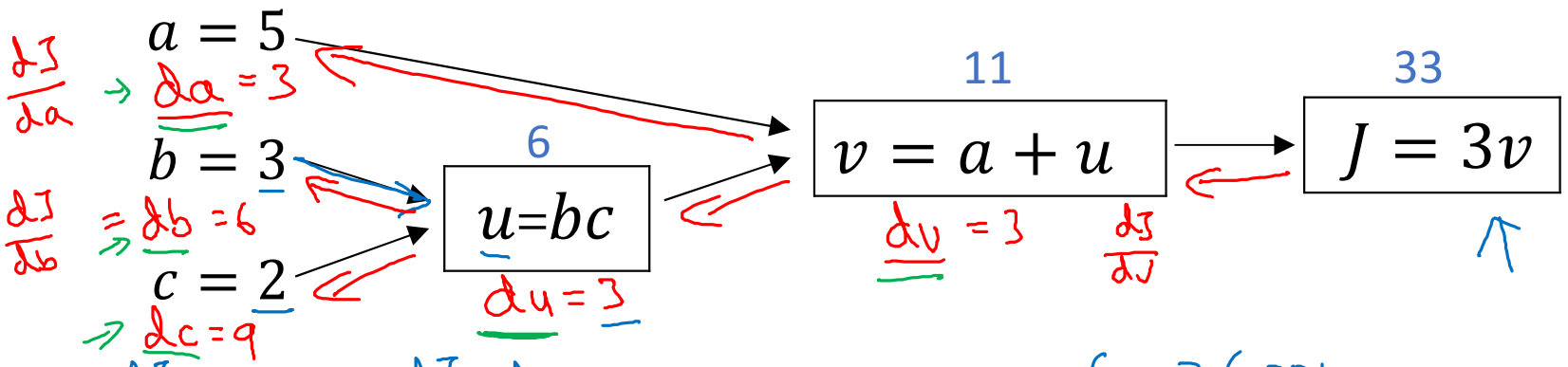
$\rightarrow v = 11 \rightarrow 11.001$

$J = 33 \rightarrow 33.003$

$\frac{d\,\text{FinalOutputVar}}{d\,\text{var}}$ → "dvar"

dJdvar

Computing derivatives



$\frac{dJ}{da} = 3$ $\frac{dJ}{db} = 6$ $\frac{dJ}{dc} = 9$ $\frac{dJ}{du} = 3$ $\frac{dJ}{dv} = 3$

$\frac{dJ}{du} = \frac{dJ}{dv} \cdot \frac{dv}{du}$ (3×1)

$\frac{dJ}{db} = \frac{dJ}{du} \cdot \frac{du}{db} = 6$ (3×2)

$\frac{dJ}{da} = \frac{dJ}{du} \cdot \frac{du}{da} = 9$ (3×3)

$u = 6 \rightarrow 6.001$

$v = 11 \rightarrow 11.001$

$J = 33 \rightarrow 33.003$

$b = 3 \rightarrow 3.001$

$u = b \cdot c = 6 \rightarrow 6.002$

$J = 33.006$

$c = 2$

$.006$

$v = 11.002$

$J = 3v$