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Basics of Neural Network Programming

Computation Graph

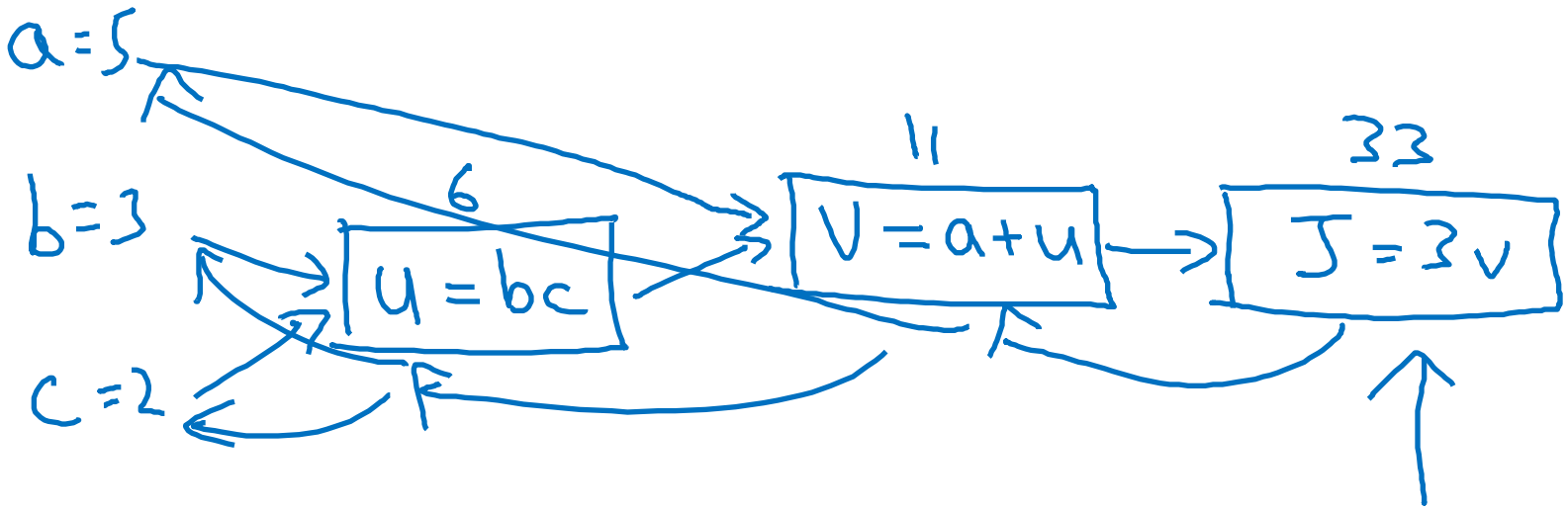
Computation Graph

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

$u = bc$

$v = a+u$

$J = 3v$



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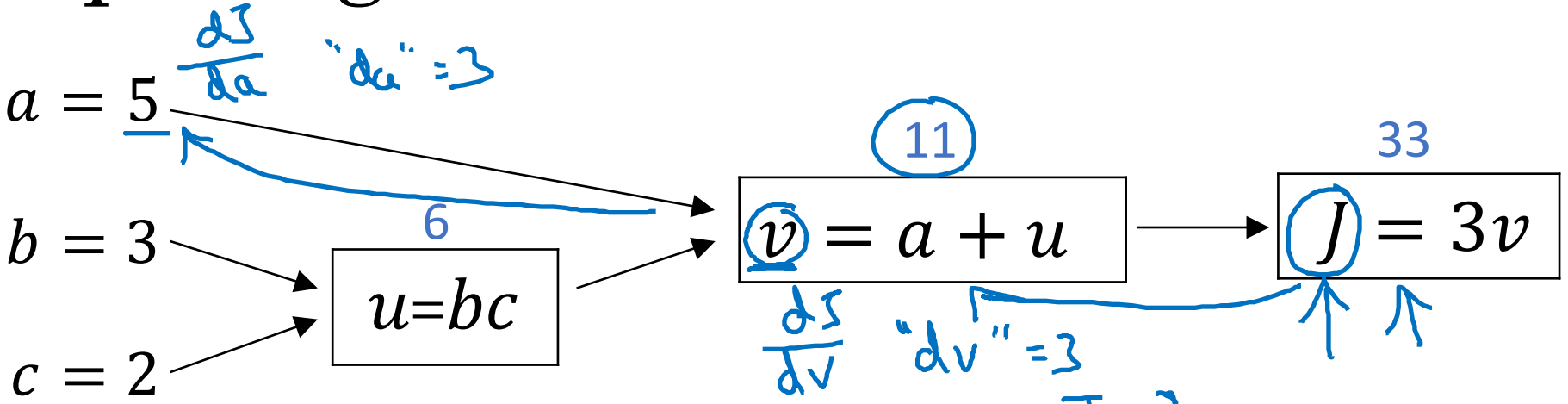
Basics of Neural Network Programming

Derivatives with a Computation Graph

Computing derivatives



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

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

3×1

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

$a \to v \to J$

$J = 3v$

$v = 11 \to 11 \cdot 001$

$J = 33 \to 33 \cdot 003$

$a = 5 \to 5 \cdot 001$

$\to v = 11 \to 11 \cdot 001$

$J = 33 \to 33 \cdot 003$

$\frac{d\,FinalOutputVar}{d\,var}$

dJdvar

"dvar"

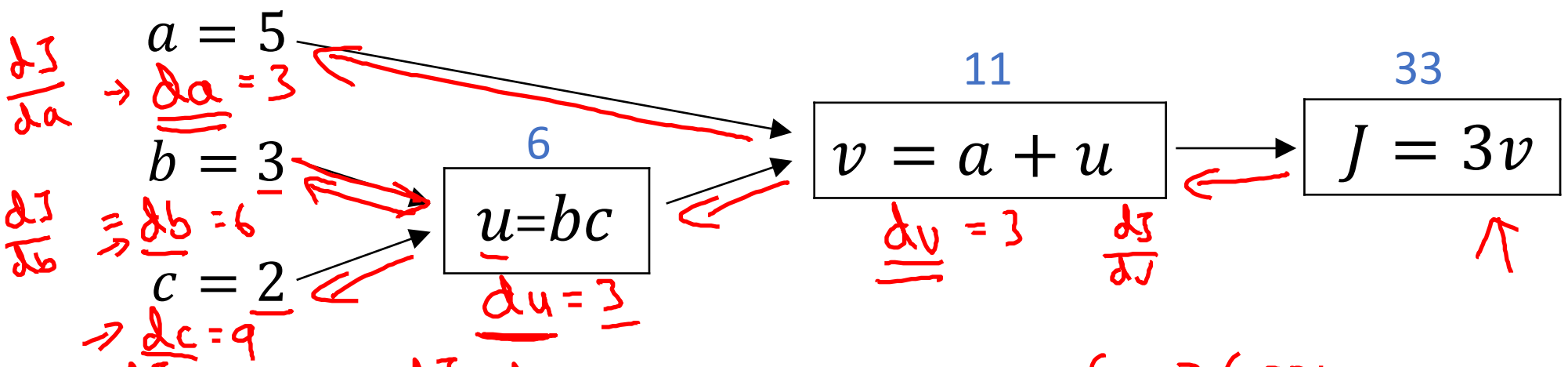
$f(a) = 3a$

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

$J = 3v$

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

Computing derivatives



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

$\frac{dJ}{db} \Rightarrow db = 6$

$\Rightarrow dc = 9$

$du = 3$

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

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

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

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

$u = 6 \rightarrow 6.001$

$v = 11 \rightarrow 11.001$

$J = 33 \rightarrow 33.003$

$b = 3 \rightarrow 3.001$

$u = b \cdot c = 6 \rightarrow 6.002$ $\quad c = 2$

$J = 33.006$ $\quad .006$

$v = 11.002$

$J = 3v$

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