Basics of Neural Network Programming

Computation Graph

deeplearning.ai
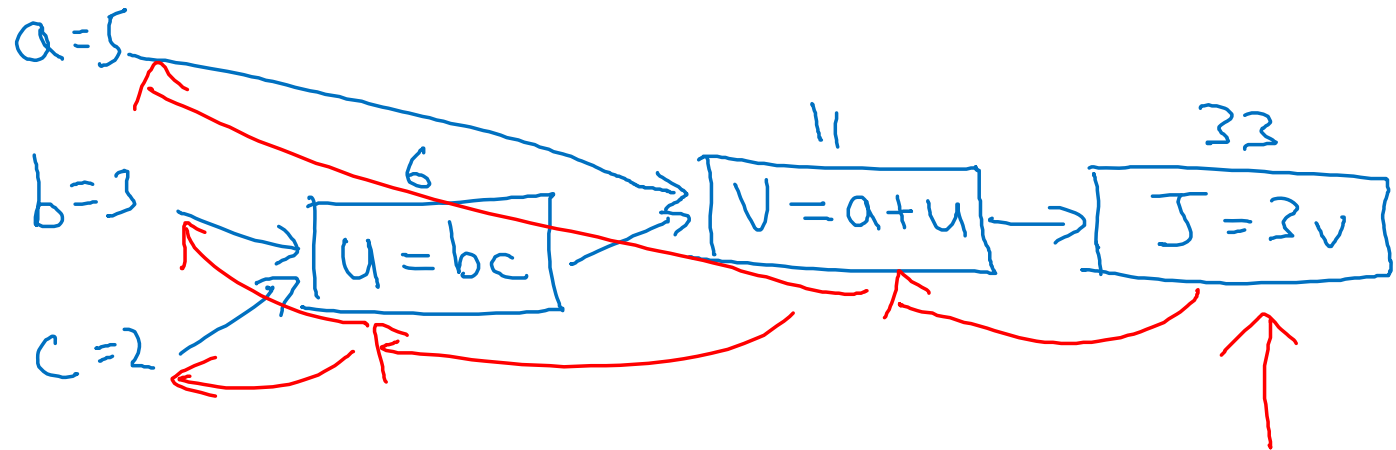
Computation Graph

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

u

v

J

$u = bc$

$v = a + u$

$J = 3v$

$a = 5$

$b = 3$

$c = 2$

6

$u = bc$

11

$v = a + u$

33

$J = 3v$

Andrew Ng

Computing derivatives

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

$a = 5$

11

33

$\boxed{v = a + u}$ → $\boxed{J = 3v}$

6

$\boxed{u = bc}$

$b = 3$

$c = 2$

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

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

$a \rightarrow v \rightarrow J$

$J = 3v$

$v = 11 \rightarrow 11.001$

$J = 33 \rightarrow 33.003$

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

3×1

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

$a = 5 \rightarrow 5.001$

$\rightarrow v = 11 \rightarrow 11.001$

$J = 33 \rightarrow 33.003$

$\boxed{\frac{d\,\text{FinalOutputVar}}{d\,\text{var}}}$ $\frac{dJ\,dvar}{}$ → "dvar"
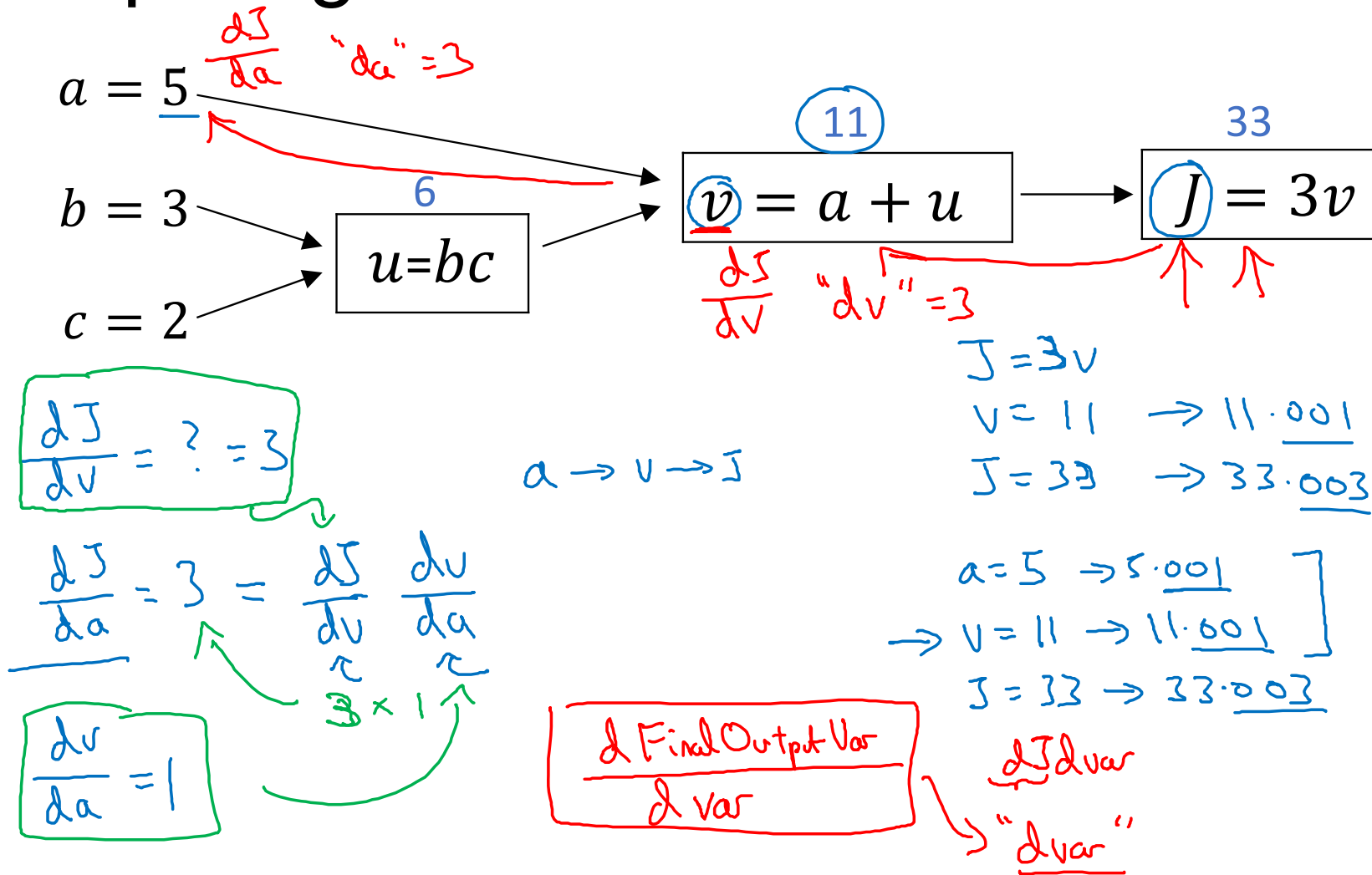
$\boxed{f(a) = 3a}$

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

$\boxed{J = 3v}$

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

Andrew Ng

Computing derivatives

$a = 5$

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

$b = 3$

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

$c = 2$

$\frac{dc}{} = 9$

6

$u=bc$

$du = 3$

11

$v = a + u$

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

33

$J = 3v$
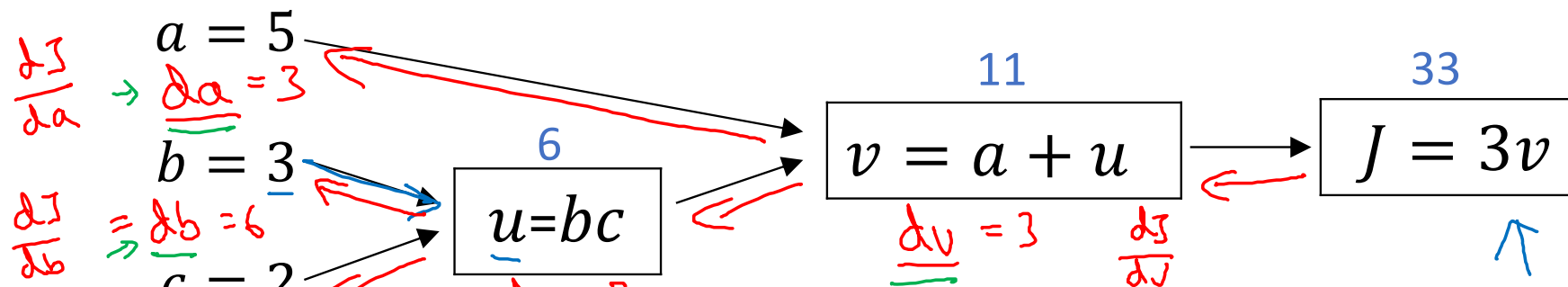
$\frac{dJ}{du} = 3 = \frac{dJ}{dv} \cdot \frac{dv}{du}$

$\quad\quad\quad\quad\quad\quad 3 \quad\quad 1$

$\frac{dJ}{db} = \boxed{\frac{dJ}{du}} \cdot \frac{du}{db} = 6$

$\quad\quad\quad\quad 3 \quad\quad =2$

$\frac{dJ}{da} = \boxed{\frac{dJ}{du}} \cdot \frac{du}{da} = 9$

$\quad\quad\quad\quad 3 \times 3$

$u = 6 \rightarrow 6.001$

$v = 11 \rightarrow 11.001$

$J = 33 \rightarrow 33.003$

$b = 3 \rightarrow 3.001$

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

$J = 33.006$ $.006$

$v = 11.002$

$J = 3v$

Andrew Ng