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Basics of Neural Network Programming Computation Graph

Computation Graph

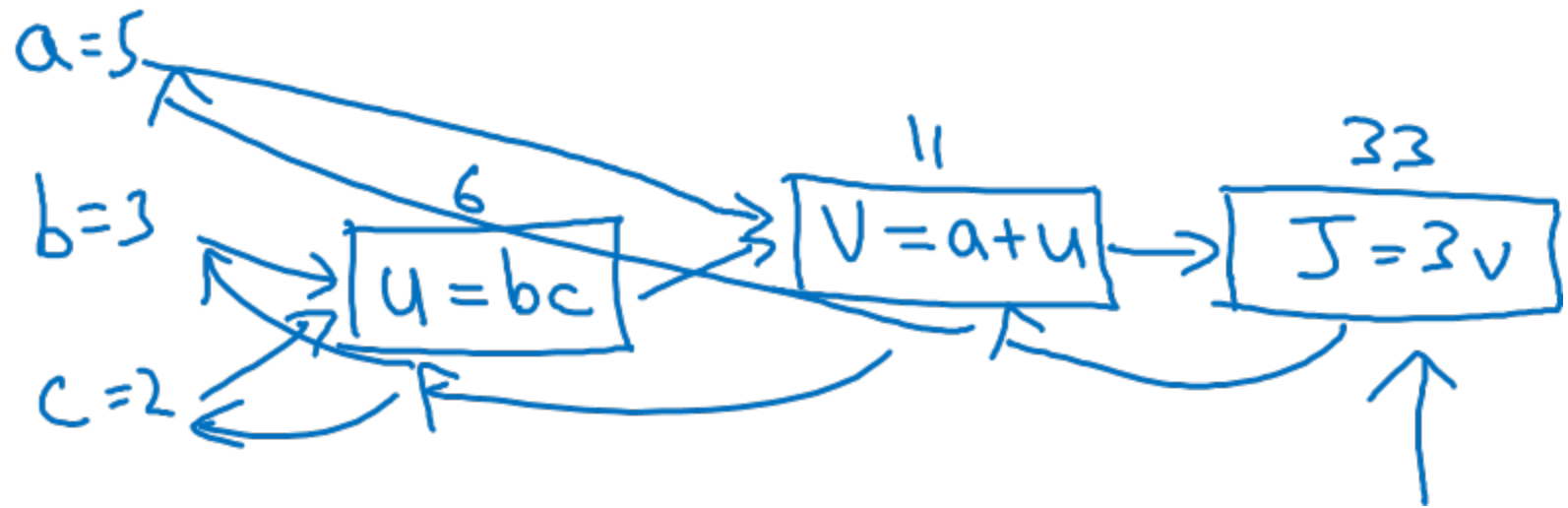
$$J(a,b,c) = 3(a + \underbrace{bc}_u) = 3(5 + \underbrace{3 \times 2}_v) = 33$$

$\underbrace{\hspace{1.5cm}}_J$

$$u = bc$$

$$V = a + u$$

$$J = 3v$$

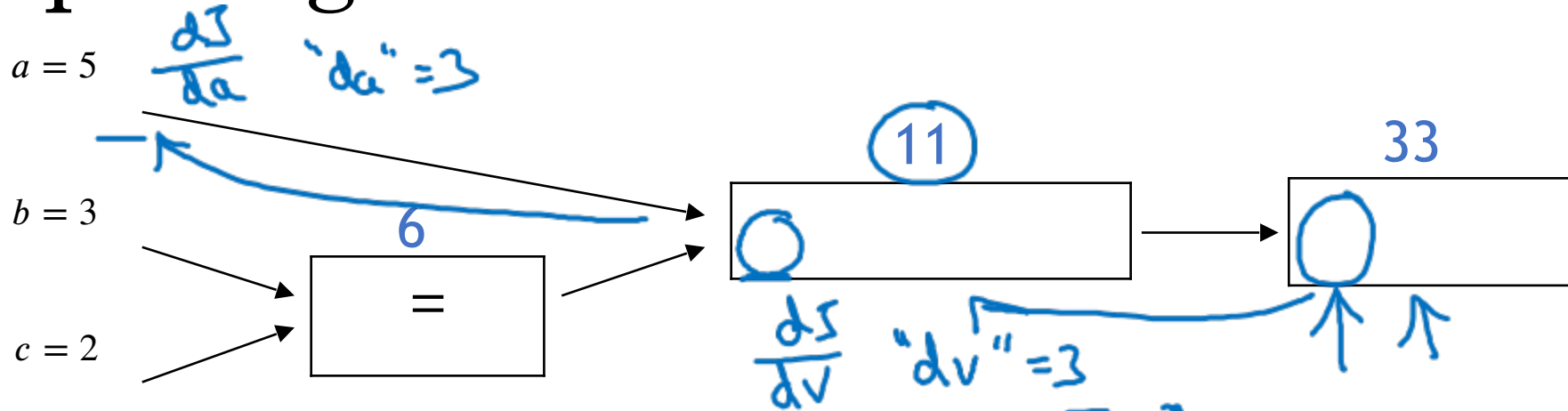




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Basics of Neural Network Programming Derivatives with a Computation Graph

Computing derivatives



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

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

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

3×1

$$a \rightarrow v \rightarrow J$$

$$J = 3v$$

$$v = 11 \rightarrow 11.001$$

$$J = 33 \rightarrow 33.003$$

$$a = 5 \rightarrow 5.001$$

$$\rightarrow v = 11 \rightarrow 11.001$$

$$J = 33 \rightarrow 33.003$$

$$\frac{d \text{ Final Output Var}}{d \text{ var}}$$

$\frac{dJ}{d \text{ var}}$
 "dvar"

$$f(a) = 3a$$

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

$$J = 3v$$

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

Computing derivatives

$$a = 5$$

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

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

$$\rightarrow \underline{\underline{dc=9}}$$

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

$$\frac{dJ}{db} = \left[\frac{dJ}{du} \right] \frac{du}{db} = 6$$

$$\frac{dJ}{da} = \left[\frac{dJ}{du} \right] \frac{du}{da} = 9$$

6

$$=$$

$$\underline{\underline{du=3}}$$

11

$$=$$

$$\underline{\underline{dv=3}}$$

$$\frac{dJ}{dv}$$

33

$$=$$

↑

$$\begin{aligned} u &= 6 \rightarrow \underline{\underline{6.001}} \\ v &= 11 \rightarrow \underline{\underline{11.001}} \\ J &= 33 \rightarrow \underline{\underline{33.003}} \end{aligned}$$

$$b = 3 \rightarrow \underline{\underline{3.001}}$$

$$\begin{aligned} u &= b \cdot c = 6 \rightarrow \underline{\underline{6.002}} \\ J &= 33.006 \end{aligned}$$

$$\begin{aligned} c &= 2 \\ &\quad \underline{\underline{1.006}} \end{aligned}$$

$$\begin{aligned} v &= 11.002 \\ J &= 3v \end{aligned}$$