Example Mult. Res., 3 samples x_1, x_2, x_3 with weights

$w_1, w_2, w_3 = \frac{1}{2}, \frac{1}{4}, \frac{1}{4}$

→ Sample $\bar{x}_1, \bar{x}_2, \bar{x}_3$ from the distribution

$$\mathbb{P}[\bar{x}_i = x_i] = \begin{cases} 1/2 & x_1 \\ 1/4 & x_2 \\ 1/4 & x_3 \end{cases}$$

Residual resampling

We have $M = 3$ new samples

And calculate

$$\lfloor M w_1 \rfloor = \lfloor 1.5 \rfloor = 1$$

$$\lfloor M w_2 \rfloor = \lfloor 3/4 \rfloor = 0$$

$$\lfloor M w_3 \rfloor = \lfloor 3/4 \rfloor = 0$$

→ Deterministically set $\bar{x}_1 = x_1$

Make new weights (since one sample is already there)

$$\bar{w}_1 = \frac{1.5 - 1}{2} = \frac{2}{8} \qquad \bar{w}_2 = \frac{3/4 - 0}{2} = \frac{3}{8} \qquad \bar{w}_3 = \frac{3/4 - 0}{2} = \frac{3}{8}$$

→ Multinomial resampling for the left over 2 samples with weights $\bar{w}_i$

Some weights $\tilde{w}_i$ (in case of 6.28 $\tilde{w}_i = w_i \cdot \text{likelihood}$)

but $\sum \tilde{w}_i \neq 1$

$\rightsquigarrow$ redefine $\overline{w}_i := \tilde{w}_i \Big/ \sum_{e=1}^{n} \tilde{w}_e$

$\sum \overline{w}_i = 1$