Resampling in Sequential Monte Carlo

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Residual Resampling[1,2]

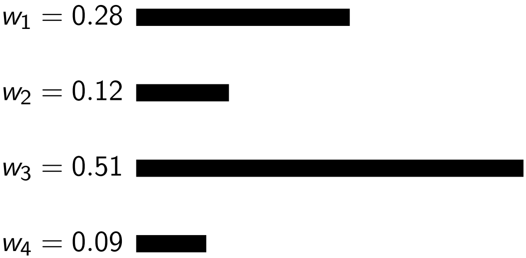
Definition

1. Deterministically assign $\lfloor Nw_i \rfloor$ offspring to particle i
2. There are $R := N - \sum_{i=1}^{N} \lfloor Nw_i \rfloor$ offspring still to be assigned
3. Assign these randomly according to the residual weights $r_i := w_i - \lfloor Nw_i \rfloor$

[1] Liu & Chen (1998) 'Sequential Monte Carlo Methods for Dynamic Systems'
[2] Whitley (1994) 'A Genetic Algorithm Tutorial'

Residual Resampling

Illustration



Residual Resampling

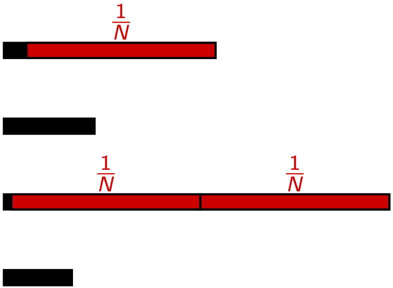
Illustration

$w_1 = 0.28$

$w_2 = 0.12$

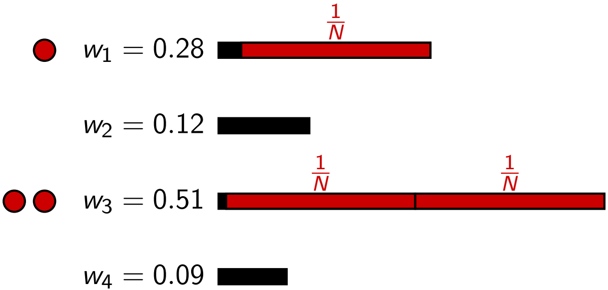
$w_3 = 0.51$

$w_4 = 0.09$



Residual Resampling

Illustration



Residual Resampling

Illustration

$r_1 \propto 0.03$

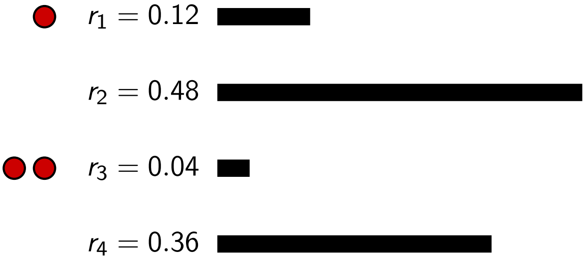
$r_2 \propto 0.12$

$r_3 \propto 0.01$

$r_4 \propto 0.09$

Residual Resampling

Illustration



References I

[1] Jun S Liu and Rong Chen. Sequential Monte Carlo methods for dynamic systems. *Journal of the American Statistical Association*, 93(443):1032–1044, 1998.

[2] Darrell Whitley. A genetic algorithm tutorial. *Statistics and Computing*, 4(2):65–85, 1994.