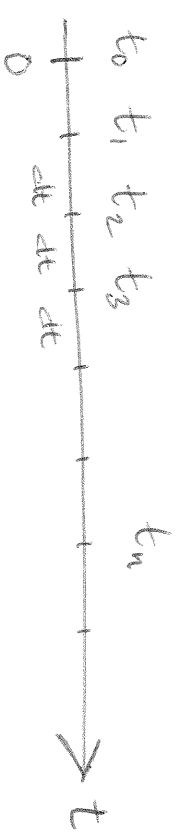


Newton's mechanics - particle model

- Time t
- Time step Δt (fixed)
- Discretized time $t^n = n \Delta t$



Particle

- mass m
- position $x^n = x(n \Delta t)$
- velocity $v^n = v(n \Delta t)$
- acceleration $a^n = a(n \Delta t)$
- force $F^n = F(n \Delta t)$
- Position layer $x^{n+1} = x^n + v^n \Delta t$
- Velocity layer $v^{n+1} = v^n + a^n \Delta t$

- Forwarding
$$\begin{aligned} dx^n &= x^{n+1} - x^n \\ dv^n &= v^{n+1} - v^n \end{aligned}$$

- Start values: $x^0 = x(0)$, $v^0 = v(0)$

- Neurons & layers: $F = M a$
- Neurons & reverse layer:
$$\begin{cases} v^{n+1} = v^n + F^n \Delta t \\ x^{n+1} = x^n + v^n \Delta t \end{cases}$$
 (assuming $M=1$)