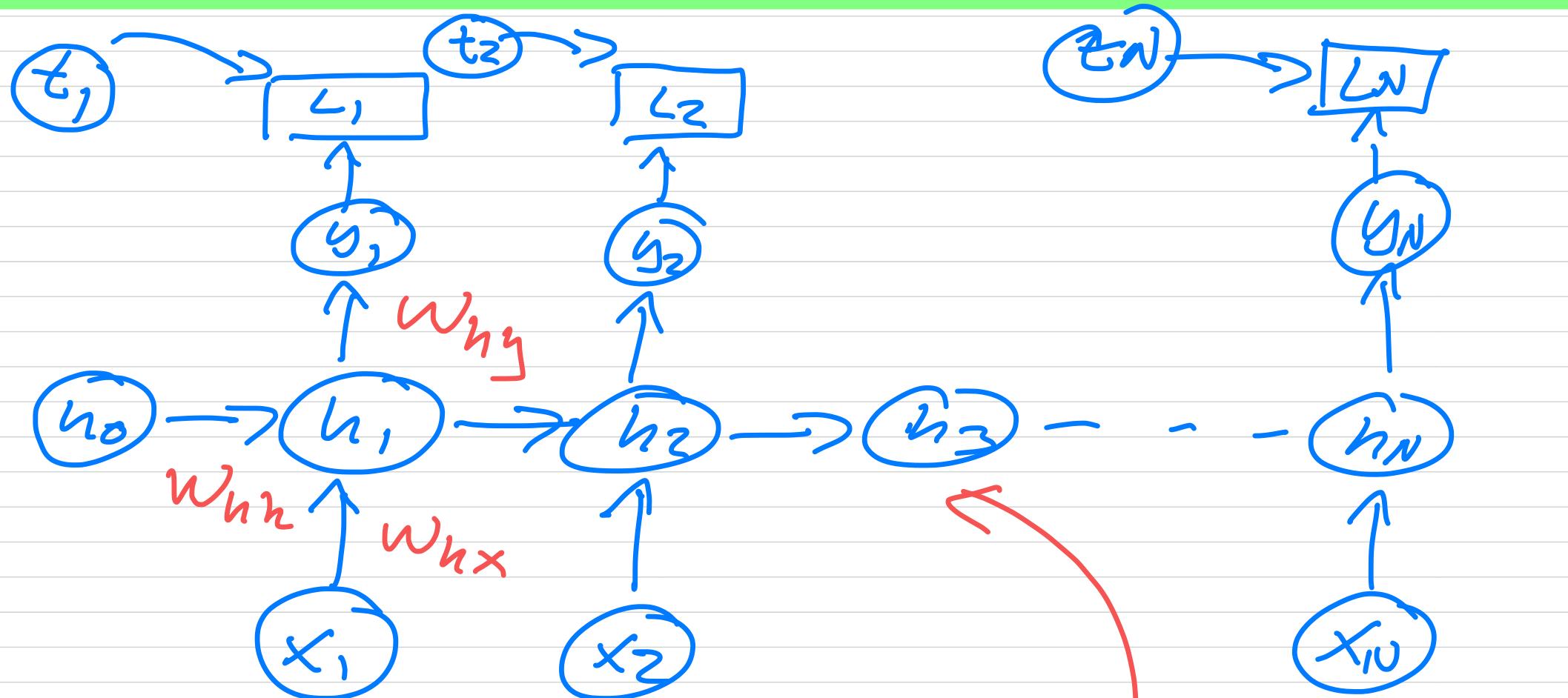


FYS-STK3155/4155, Lecture November 17

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$$C = \sum_{i=1}^N \mathcal{L}(y_i, t_i)$$

recurrent
units

Sliding window of length
sequence_length

Given a time series

$$[x_0, x_1, x_2, \dots, x_T]$$

Sequence_length = 3

$[x_0, x_1, x_2]$ each window

$[x_1, x_2, x_3]$ is an input

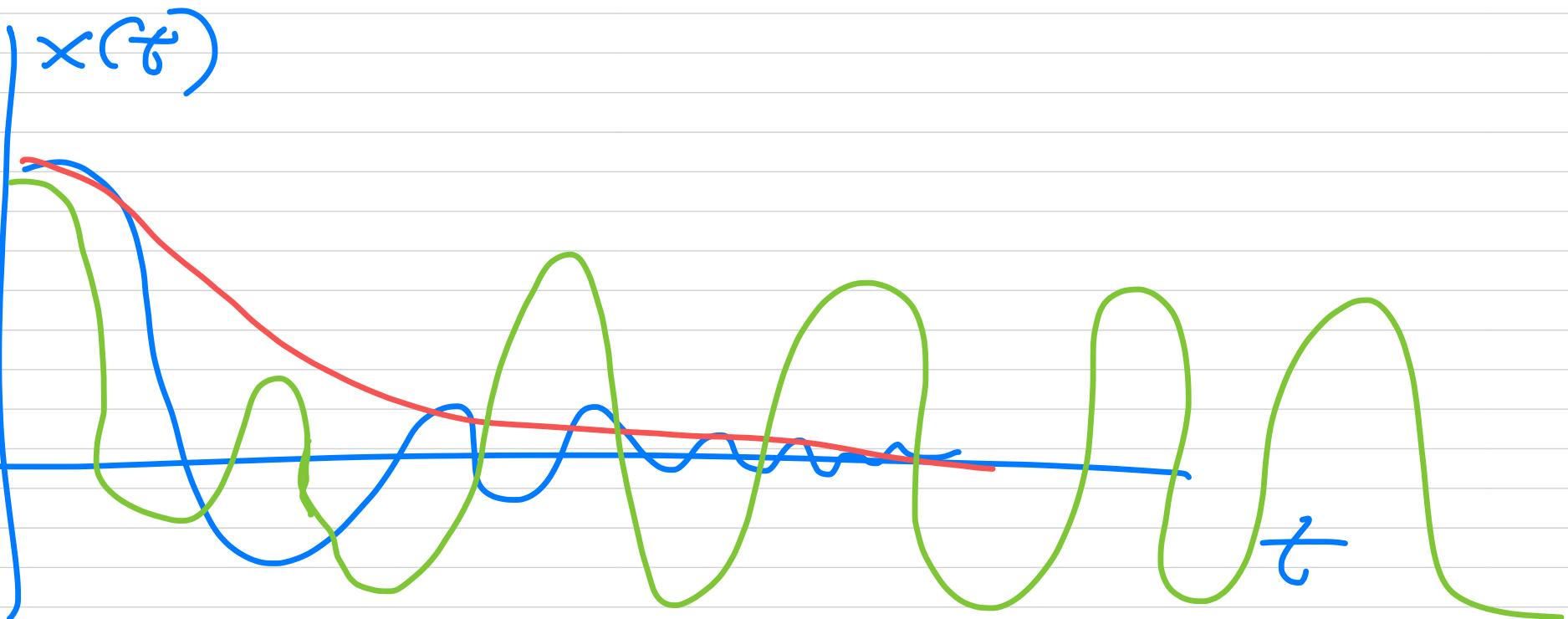
$[x_2, x_3, x_4]$ sequence to a

RNN

⋮

$$m \frac{d^2x}{dt^2} + \gamma \frac{dx}{dt} + x(t) = F(t)$$

$$F(t) = 0$$



Auto encoders

input

y_0
 y_1
 \vdots
 y_{m-1}

Encoder

o^{h_0}
 o^{h_1}
 \vdots
 $o^{h_{m-1}}$

\Rightarrow

latent feature representation

"Much smaller space"

output

\tilde{y}_0
 \tilde{y}_1
 \vdots
 \tilde{y}_{m-1}

Decoder

o^{g_0}
 o^{g_1}
 \vdots
 $o^{g_{l-1}}$

\Rightarrow

$$h = f(w, y) \quad (\text{encoder})$$

$$\tilde{y} = g(v, h) \quad (\text{decoder})$$

$$MSE = \frac{1}{n} \sum_{i=0}^{n-1} (y_i - \tilde{y}_i)^2$$

optimization

$$\hat{v}, \hat{w} = \underset{v, w}{\operatorname{arg\,min}} \frac{1}{n} \sum_{i=0}^{n-1} (y_i - \tilde{y}_i)^2$$

Suppose a linear model

$$h = w \cdot y \quad \wedge \quad g = v \cdot h$$

$$\hat{g} = v \cdot w \cdot y$$

$$\hat{v}, \hat{w} = \underset{v, w}{\operatorname{arg\,min}} \frac{1}{n} \sum_{i=1}^n \left[(1 - v \cdot w) y_i \right]^2$$