

Tópico 04 - Deep Learning - Redes Recorrentes

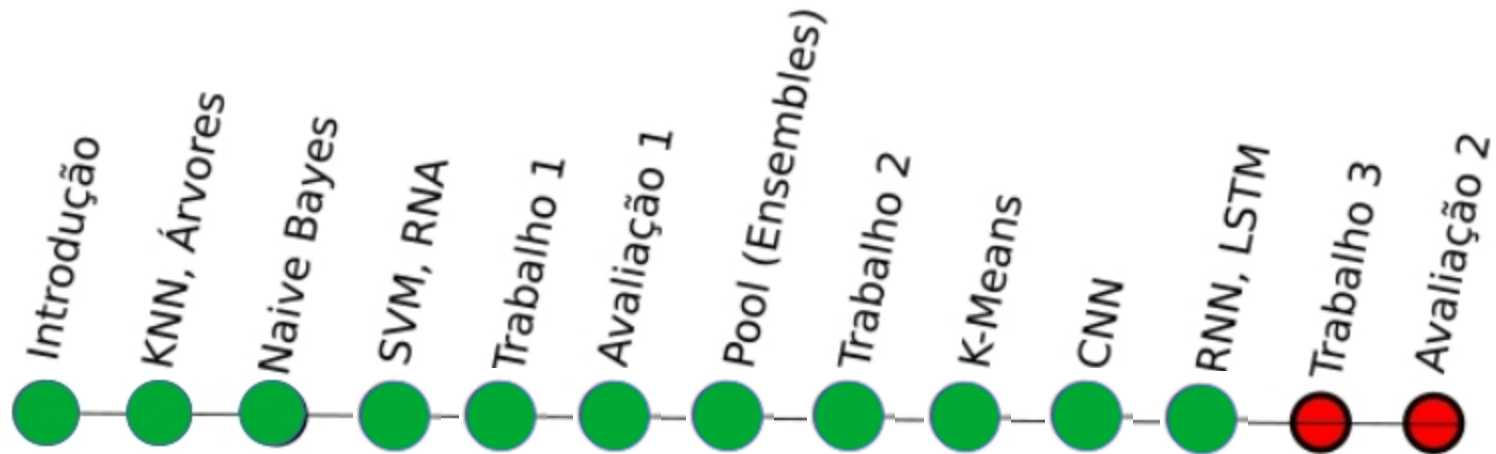
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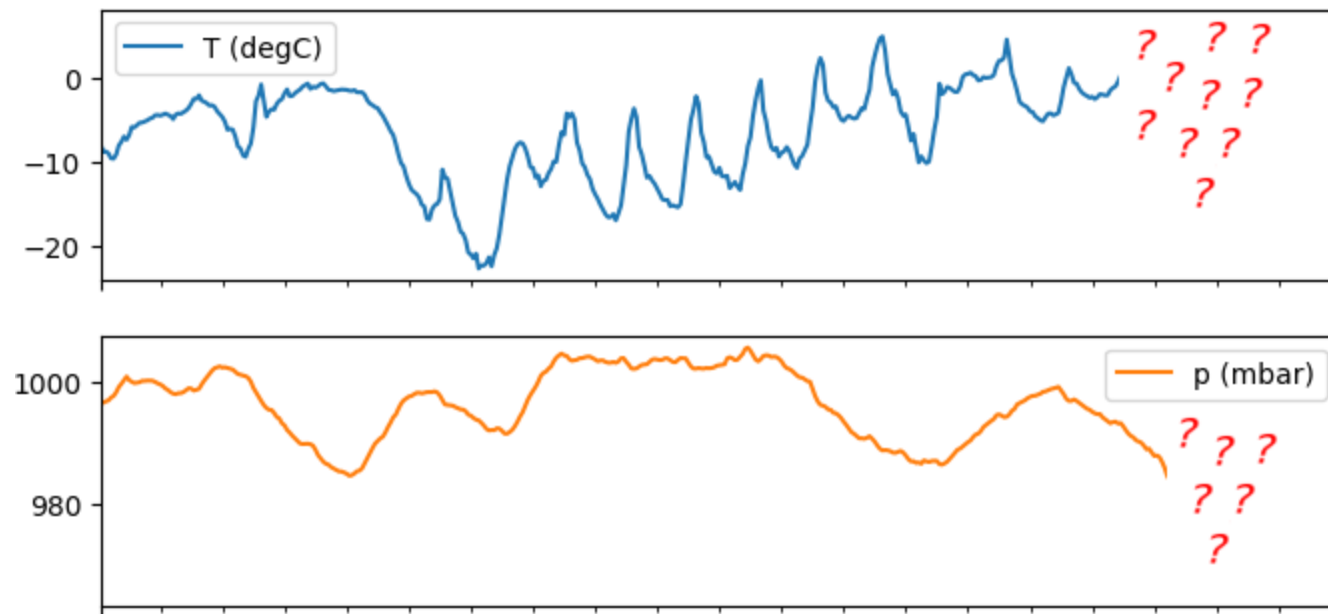
Tópicos

- Discussão Inicial
- Redes Recorrentes
 - RNN
 - LSTM
- Exercício



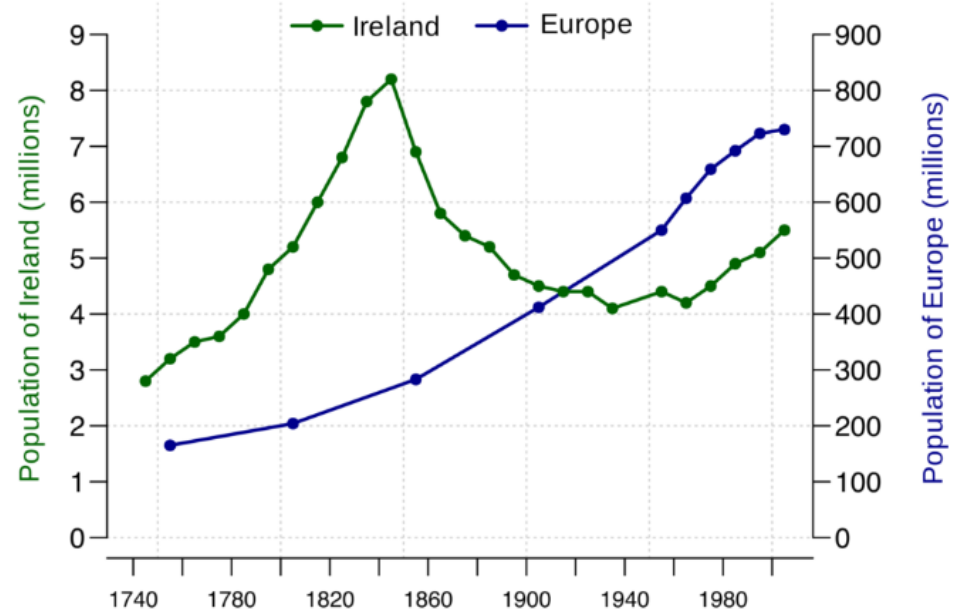
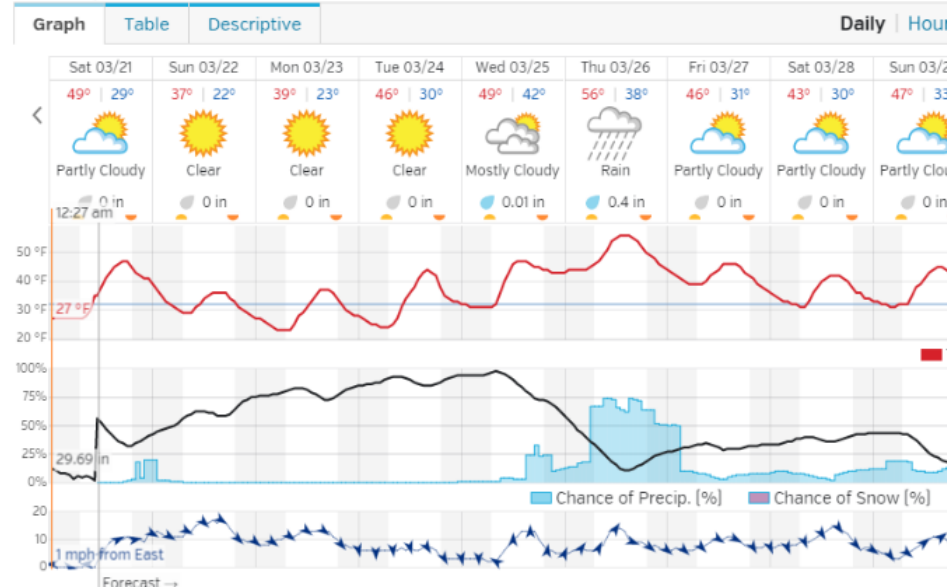
Discussão Inicial

- E quando temos uma informação temporal ?
 - Ex: previsão do tempo, variação de preços, etc ?
- Em certas aplicações, uma dependência temporal afeta a classe da instância



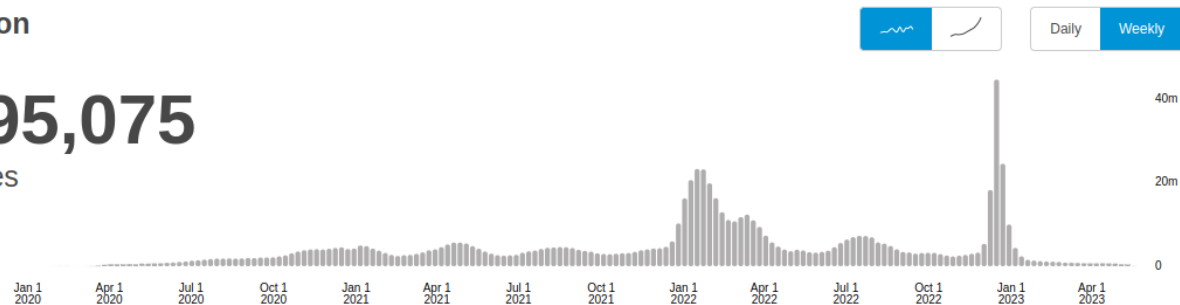
Discussão Inicial

10-Day Weather Forecast

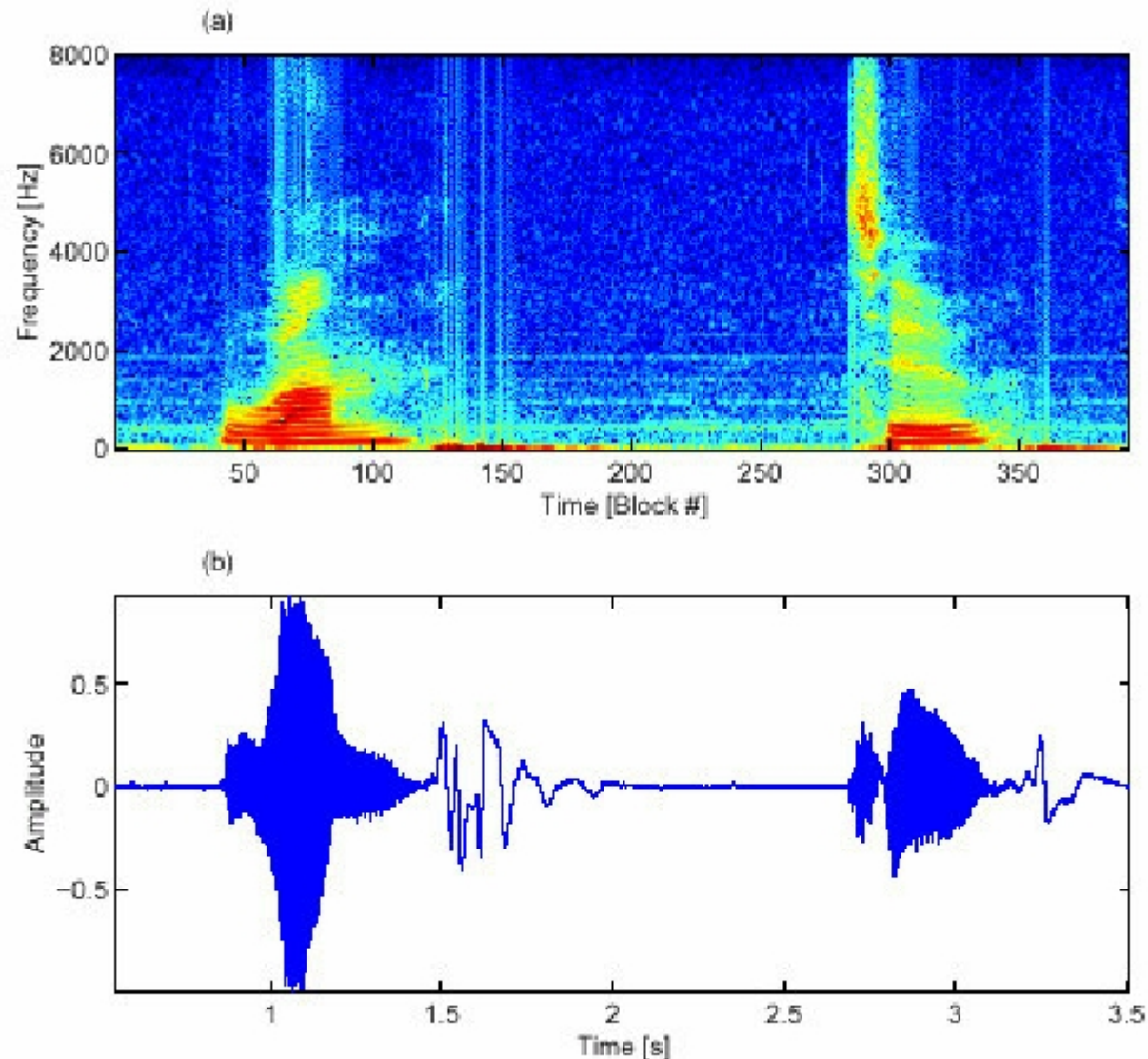


Global Situation

766,895,075
confirmed cases

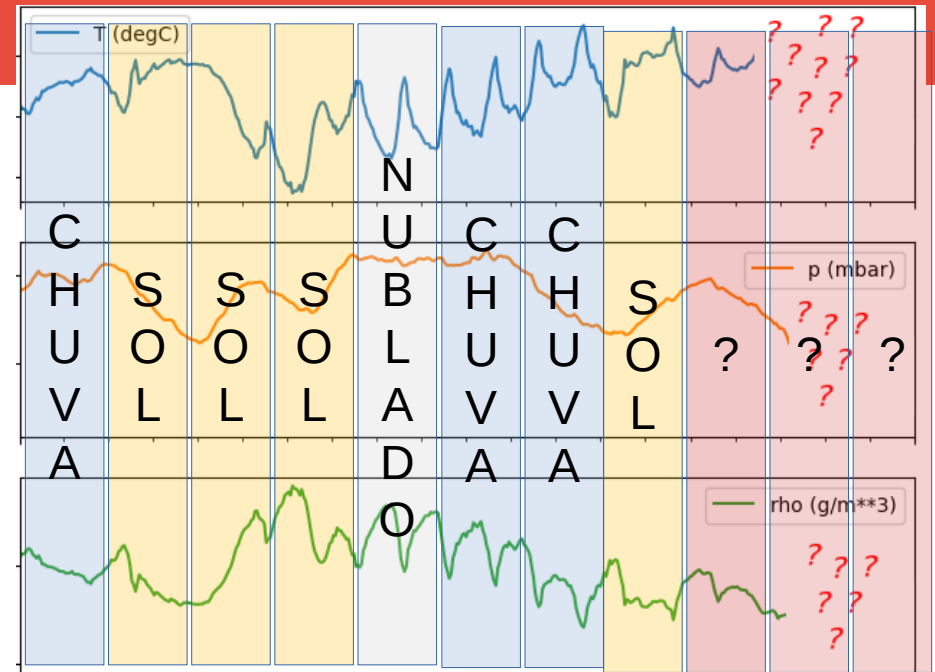


Discussão Inicial



Discussão Inicial

- Classificação “Estática”
 - Instâncias são interpretadas isoladamente
- Classificação Recorrente
 - A classe da instância anterior é importante para interpretação da instância atual
- Exemplos
 - Imagem vs Vídeo



Redes Neurais Recorrentes

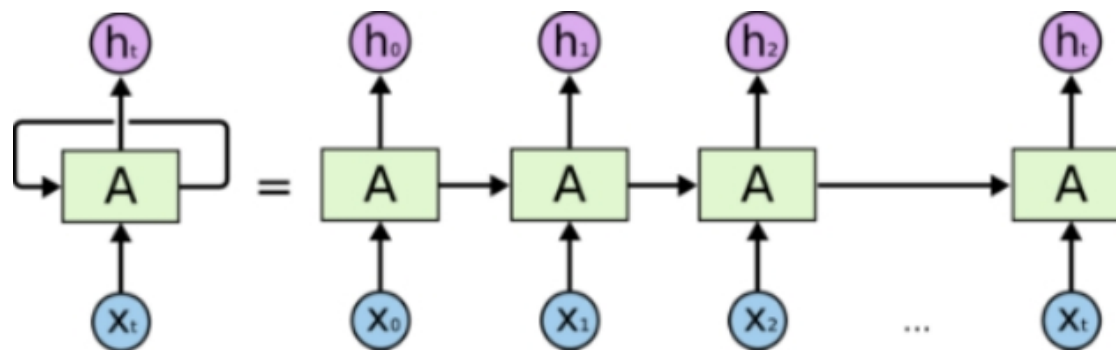
Redes Neurais Recorrentes

- Modelos capazes de interpretar sequência de dados
- Um conjunto de eventos determina a classe

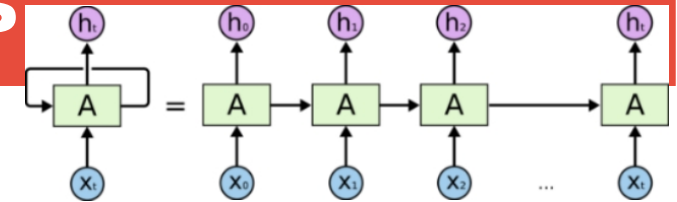


Redes Neurais Recorrentes

- Modelos 'estáticos' não codificam adequadamente a informação contextual de instâncias anteriores (série temporal)
- Solução: Recurrent Neural Networks
 - RNA propagando pesos + atributos
 - O estado H_t é produzido com base em $X_t + W_{t-1}$
 - Aprende a relação entre as instâncias e classes

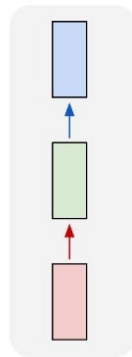


Redes Neurais Recorrentes

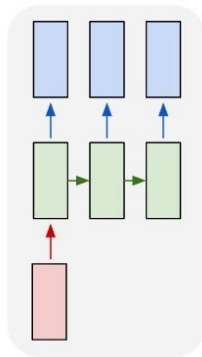


Abordagens:

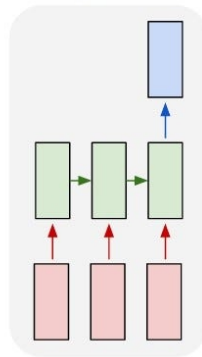
one to one



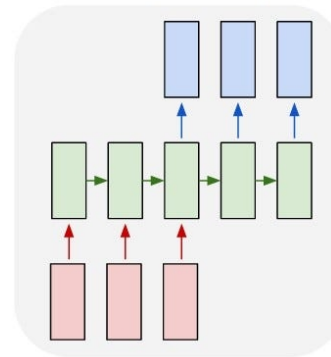
one to many



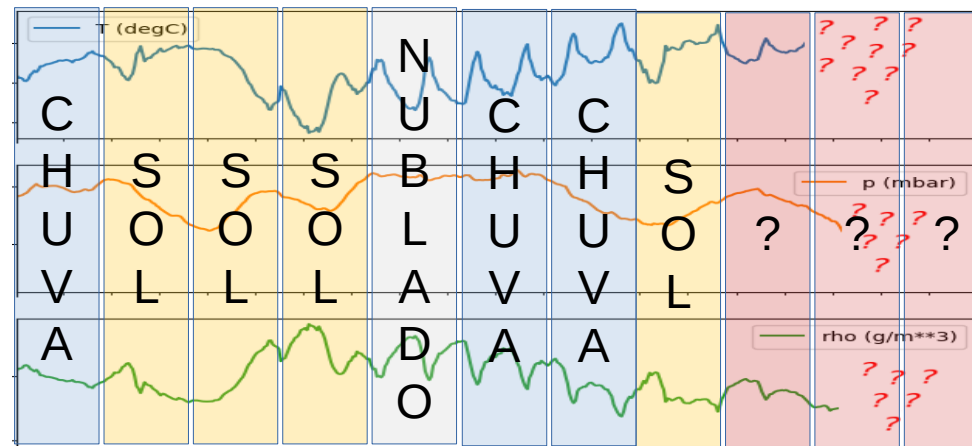
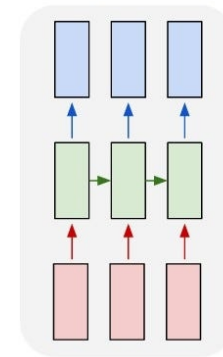
many to one



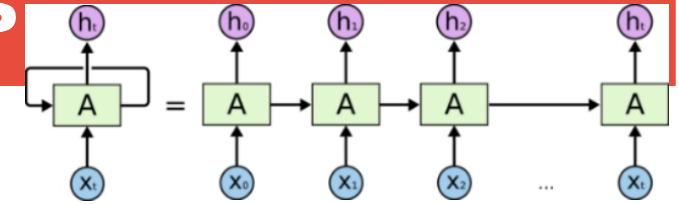
many to many



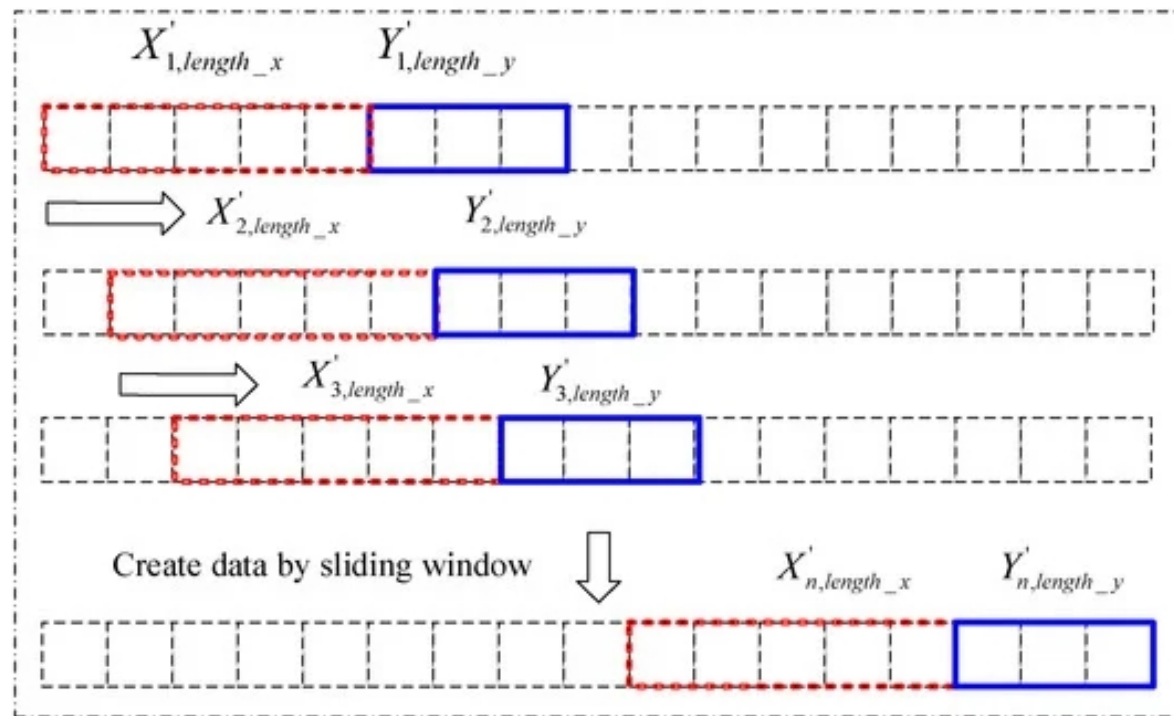
many to many



Redes Neurais Recorrentes

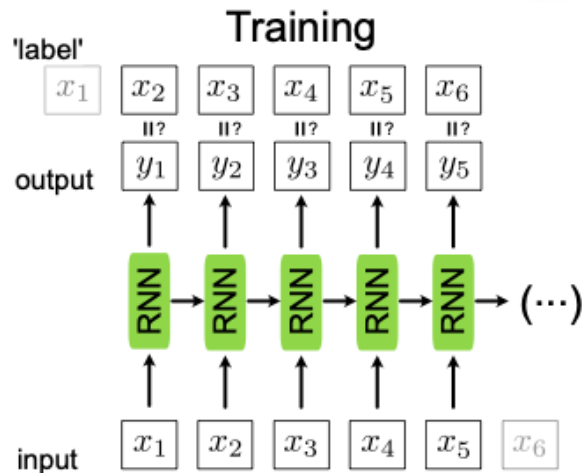
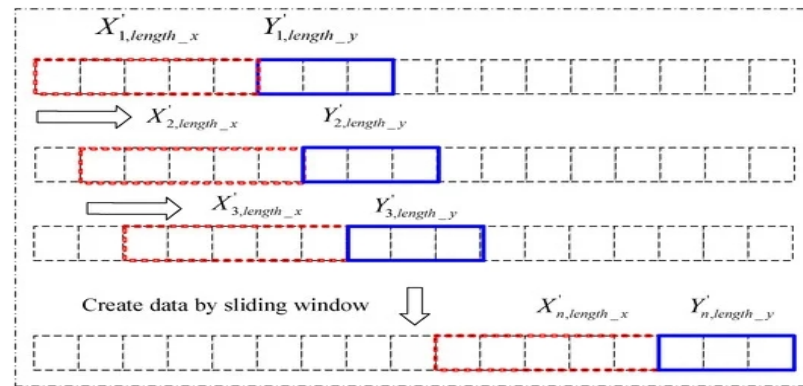
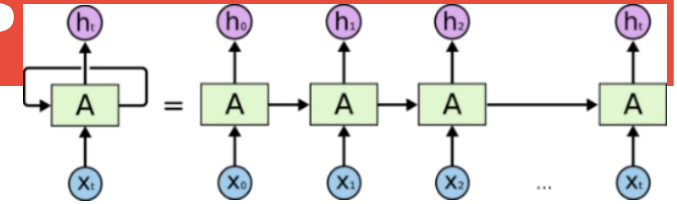


- Parâmetro: Tamanho da Janela
- Determina a relação entre observação e predição

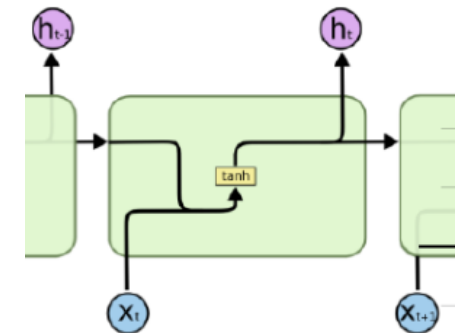
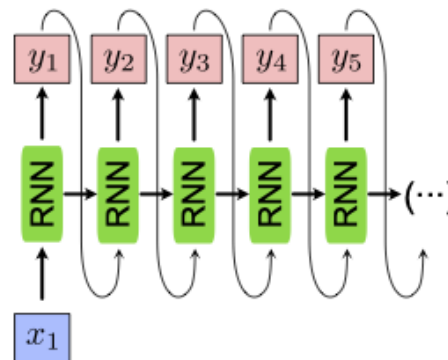


Redes Neurais Recorrentes

- Treinamento / Teste
 - Base de amostras são geradas deslizando a janela

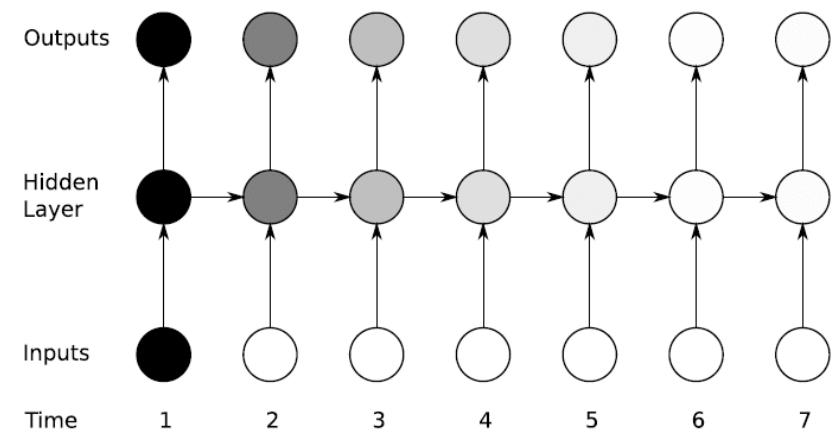
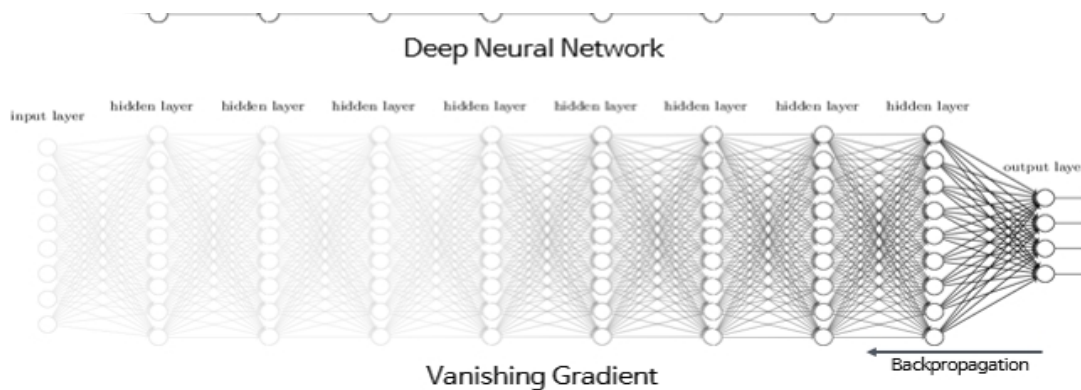
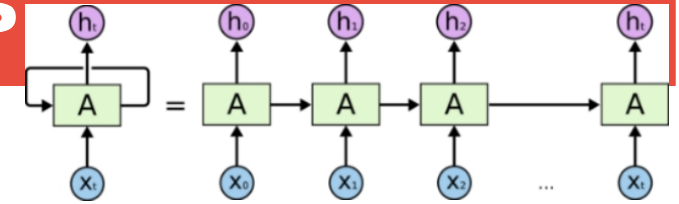


Generation



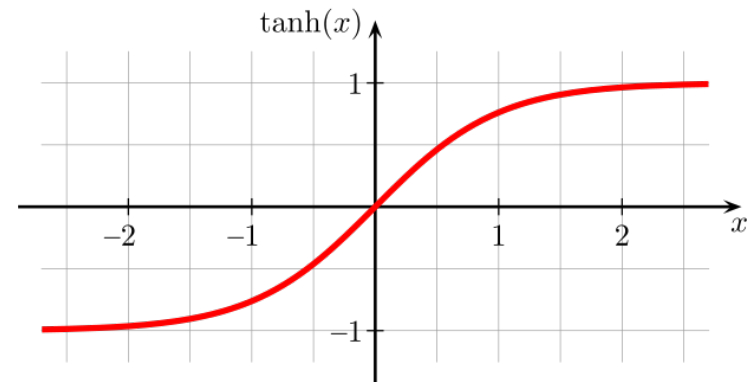
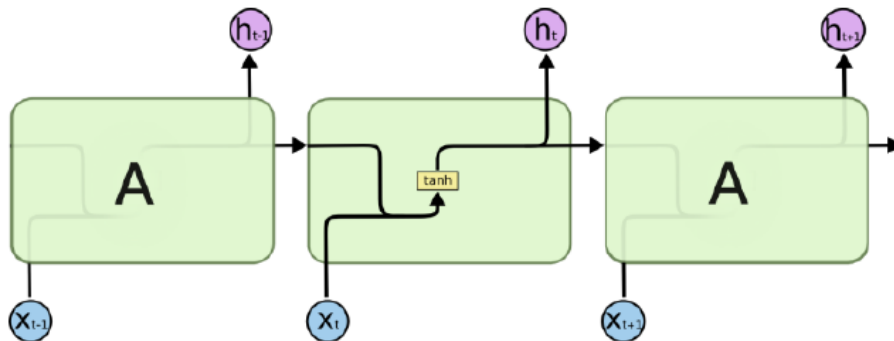
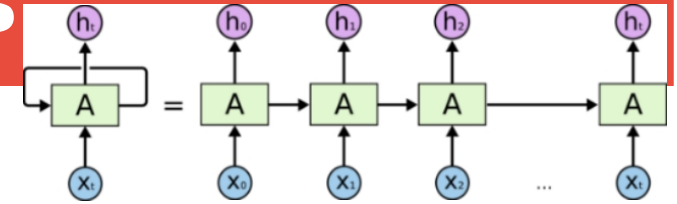
Redes Neurais Recorrentes

- Problema – Vanish Gradient
 - Em sequências grandes, o gradiente desaparece
 - O peso da informação ‘antiga’ decresce ao longo do tempo



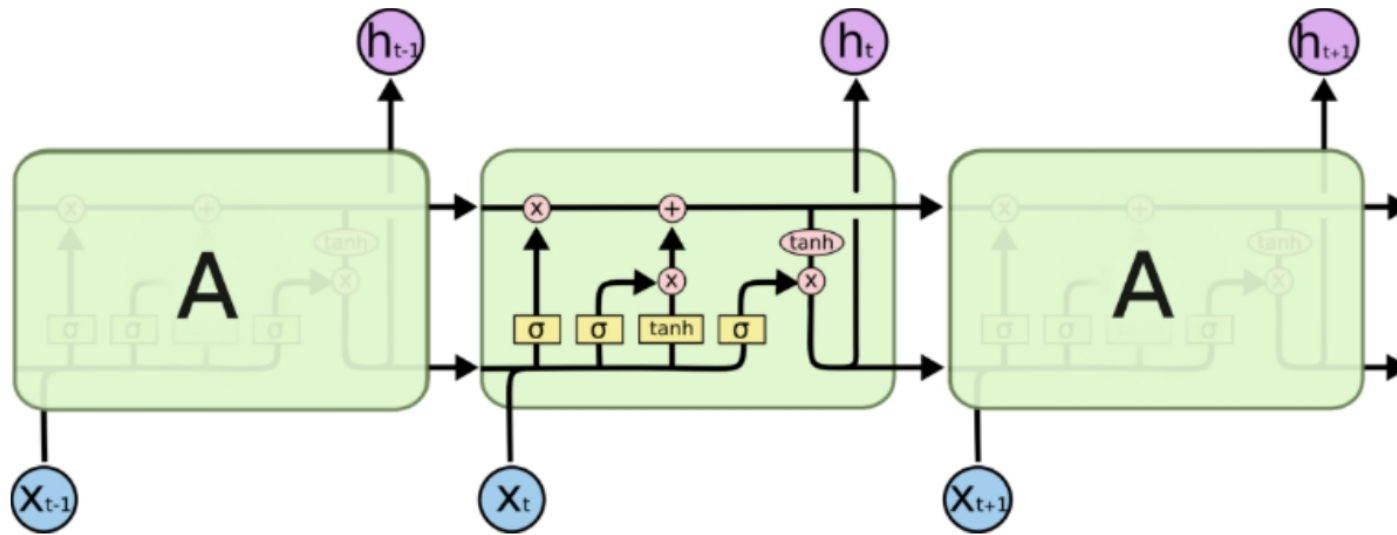
Redes Neurais Recorrentes

- Problema – Vanish Gradient
 - Tanh é uma função lenta



Redes Neurais Recorrentes

- Long-Short-Term-Memory (LSTM)
 - Fluxo Superior – Memória Longa
 - Multiplicação e **Soma** dos Pesos
 - Fluxo Inferior – Memória Curta
 - Multiplicação dos Pesos



Redes Neurais Recorrentes

- Gatilhos
 - Esquecimento (*)
 - Entrada (+)
 - Saída (*)

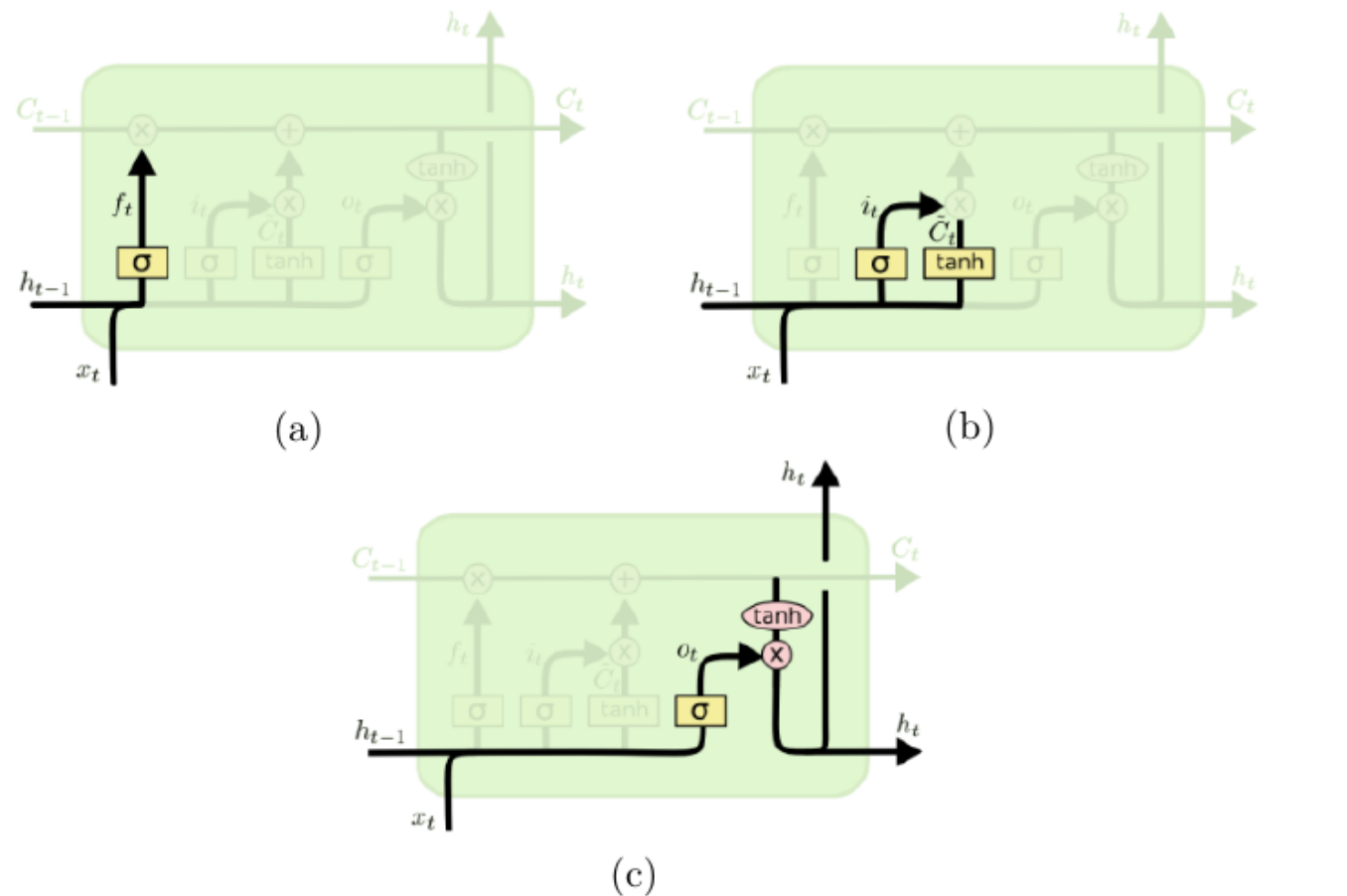


Figura 2.14: Gatilhos LSTM: (a) Esquecimento (f_t), (b) Entrada (i_t) e (c) Saída (o_t).

Redes Neurais Recorrentes

- Let's Code!
- [\[LINK\]](#)