

#DLUPC

Day 9 Lab 6

Recurrent Neural Networks



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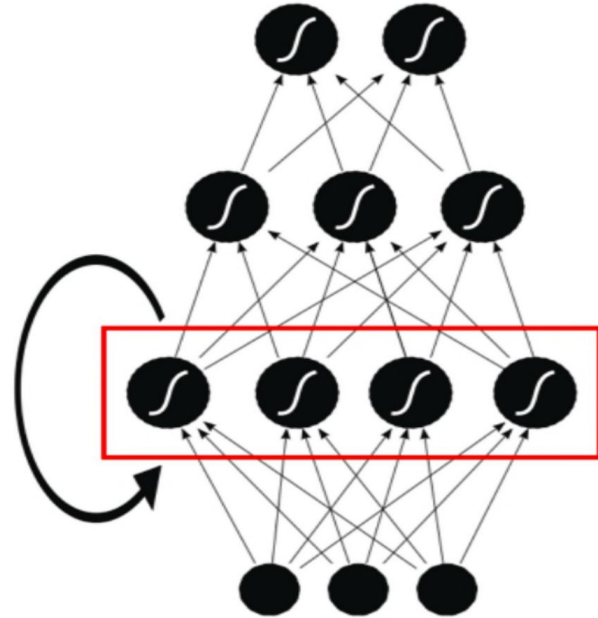


Recurrent Neural Networks (RNN's)

Main idea: The network has a *state*.

$$s_t = \mathcal{S}(s_{t-1}, x_t)$$

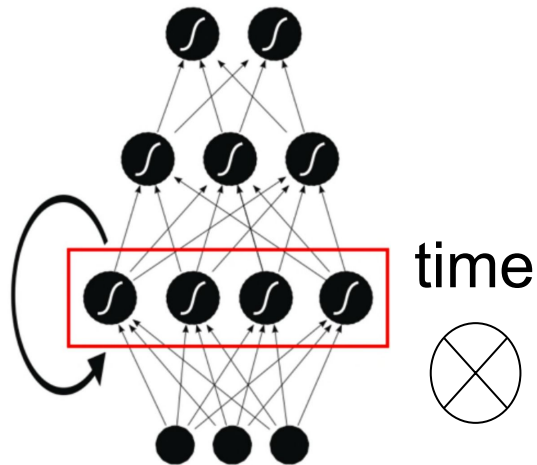
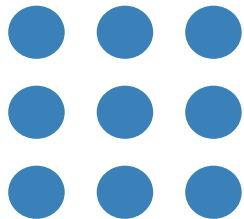
$$y_t = W_s s_t + b_s$$



Slide credit: Xavier Giró

Recurrent Neural Networks (RNN's)

Front View

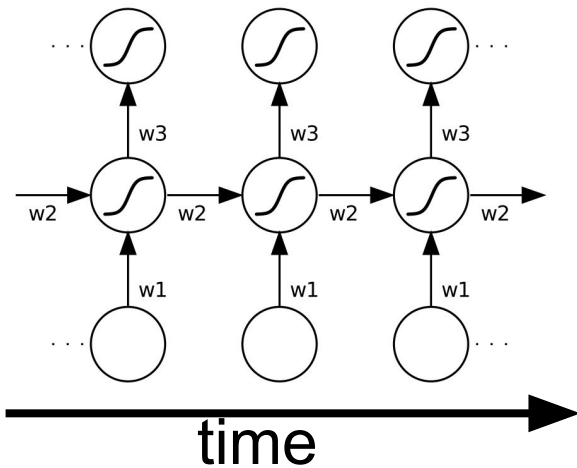


Rotation
 90°

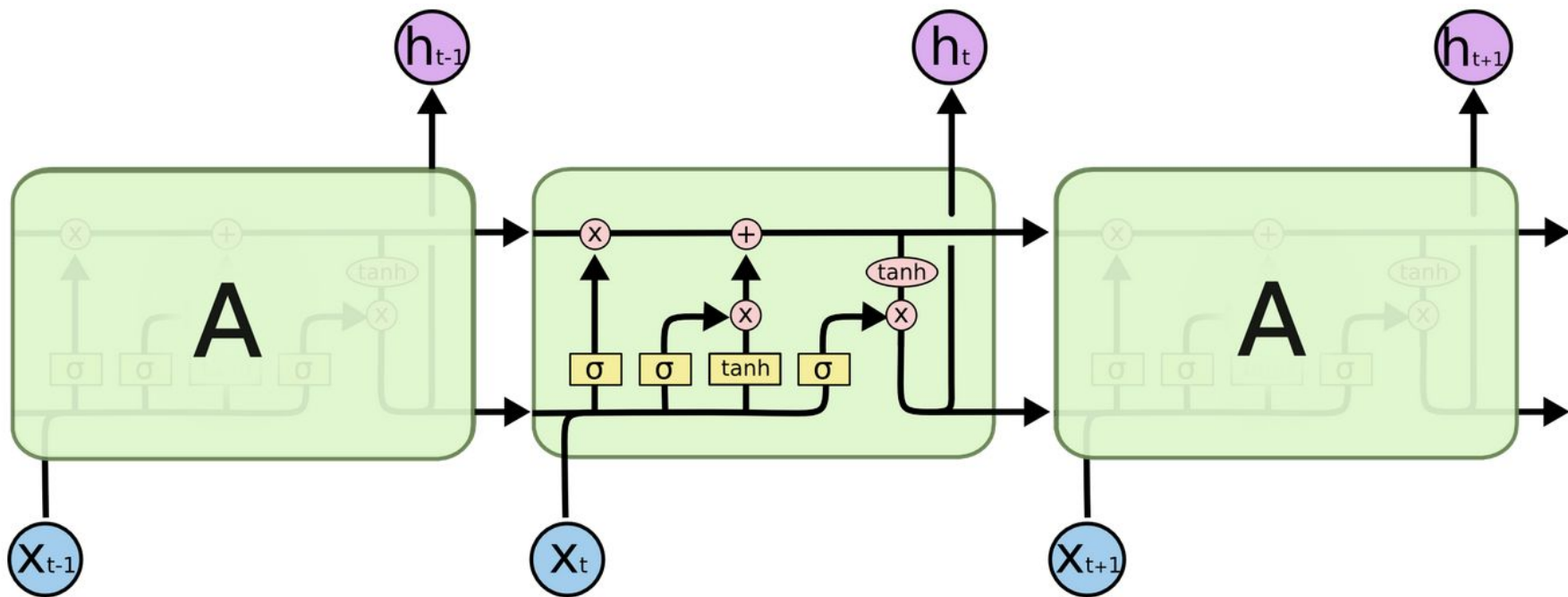
Side View



Unfold
(Rotation
 90°)



Long Short Term Memory (LSTM's)



The repeating module in an LSTM contains four interacting layers.

The Lab

Today's objectives

- Program a simple RNN with PyTorch and use it for classification.
- Train an LSTM for character prediction using PyTorch's implementation.



Google Colab

The screenshot displays the Google Colaboratory web interface. At the top, there's a header with the 'co' logo, the text 'Hello, Colaboratory', and a share icon. Below this is a navigation bar with options: Archivo, Editar, Vista, Insertar, Entorno de ejecución, Herramientas, and Ayuda. On the right of the header, there's a 'COMPARTIR' button. Below the navigation bar, there's a secondary bar with icons for 'CÓDIGO', 'TEXTO', 'CELDA', and 'COPIAR EN DRIVE', along with 'CONECTAR' and 'EDICIÓN' buttons. The main content area is divided into two panels. The left panel, titled 'Índice', contains a list of links: 'Welcome to Colaboratory!', 'Local runtime support', 'Python 3', 'TensorFlow execution', 'Visualization', 'Forms', 'Examples', and 'For more information:'. The right panel, titled 'Fragmentos de código', shows a 'Welcome to Colaboratory!' message, followed by a paragraph explaining that Colaboratory is a Google research project for machine learning education and research, a Jupyter notebook environment that requires no setup and runs in the cloud. It mentions that notebooks are stored in Google Drive and can be shared like Google Docs or Sheets. Below this, there's a section for 'Local runtime support' stating that Colab also supports connecting to a Jupyter runtime on a local machine. The 'Python 3' section is expanded, showing that Colaboratory supports both Python2 and Python3. It lists two bullet points: 'When creating a new notebook, you'll have the choice between Python 2 and Python 3.' and 'You can also change the language associated with a notebook; this information will be written into the .ipynb file itself, and thus will be preserved for future sessions.' At the bottom of the right panel, there's a code cell with the following code:

```
[ ] import sys
print('Hello, Colaboratory from Python {}'.format(sys.version_info[0]))
```

 Below the code cell, there's a message: 'Hello, Colaboratory from Python 3!'.

Hello, Colaboratory

Archivo Editar Vista Insertar Entorno de ejecución Herramientas Ayuda

CÓDIGO TEXTO CELDA CELDA COPIAR EN DRIVE

CONECTAR EDICIÓN

Índice Fragmentos de código

Welcome to Colaboratory!

Local runtime support

Python 3

TensorFlow execution

Visualization

Forms

Examples

For more information:

SECCIÓN

Welcome to Colaboratory!

Colaboratory is a Google research project created to help disseminate machine learning education and research. It's a Jupyter notebook environment that requires no setup to use and runs entirely in the cloud.

Colaboratory notebooks are stored in [Google Drive](#) and can be shared just as you would with Google Docs or Sheets. Colaboratory is free to use.

For more information, see our [FAQ](#).

Local runtime support

Colab also supports connecting to a Jupyter runtime on your local machine. For more information, see our [documentation](#).

Python 3

Colaboratory supports both Python2 and Python3 for code execution.

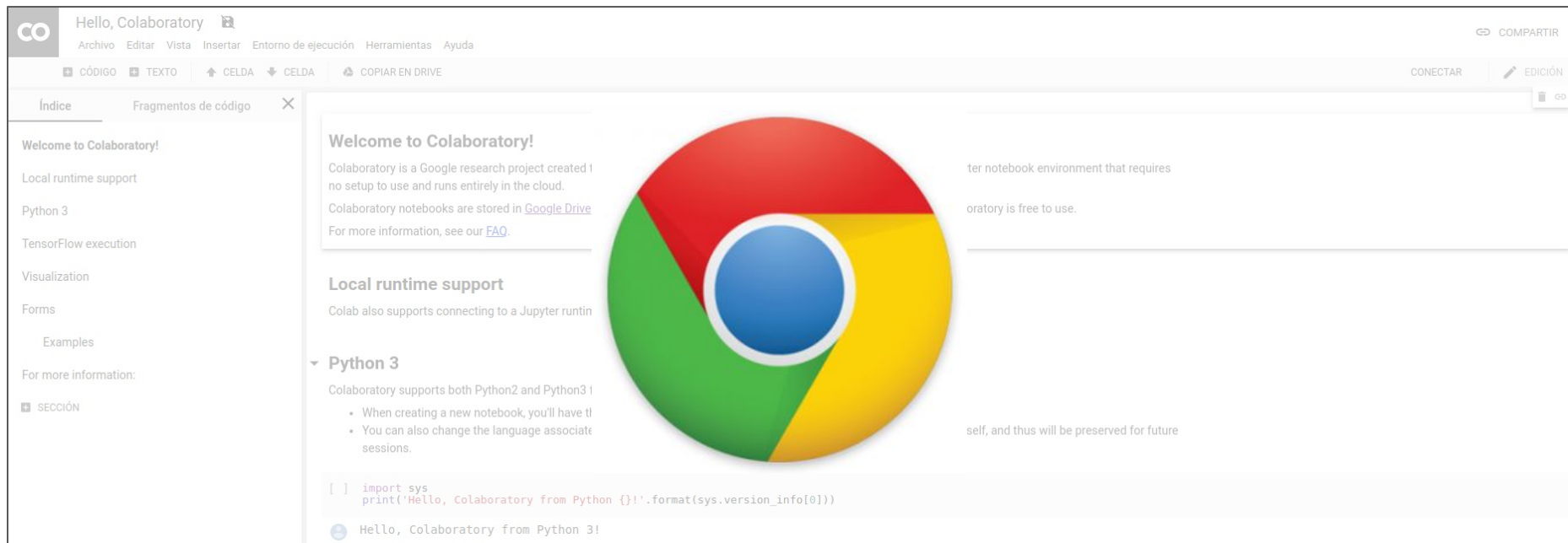
- When creating a new notebook, you'll have the choice between Python 2 and Python 3.
- You can also change the language associated with a notebook; this information will be written into the .ipynb file itself, and thus will be preserved for future sessions.

```
[ ] import sys
print('Hello, Colaboratory from Python {}'.format(sys.version_info[0]))
```

Hello, Colaboratory from Python 3!

<https://colab.research.google.com/>

Google Colab



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Welcome to Colaboratory!

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Local runtime support

Colab also supports connecting to a Jupyter runtime.

Python 3

Colaboratory supports both Python2 and Python3!

- When creating a new notebook, you'll have to choose the language.
- You can also change the language associated with the notebook in the top right corner.

```
[ ] import sys
print('Hello, Colaboratory from Python {}'.format(sys.version_info[0]))
```

Hello, Colaboratory from Python 3!

<https://colab.research.google.com/>

Google Colab



1. Login in [Colab](#) with a Google account: yours or aidlupc2019@gmail.com (talentcenter)
2. Open [the notebook](#) of this lab session
3. Copy this notebook to your Drive to be able to run it (or open in draft mode if using aidlupc2019@gmail.com)
4. Change runtime type to work with GPU! Your trainings will be much faster :)

aidl2019_dl_lab4_transfer.ipynb

File Edit View Insert Runtime Tools Help

CODE TEXT CELL CELL

```
import keras
keras.__version__
import numpy as np
```

Transfer Learning

In this session we will work with convolutional neural networks, when dealing with small datasets, which is a very usual situation, as data can be difficult to obtain certain scenarios, specially labelled data.

Downloading the database

During this lab session, we will work with a small database of images with dogs and cats. The cats vs. dogs dataset that we will use isn't packaged with Keras. It was made available by Kaggle.com as part of a computer vision competition in late 2013, back when convnets weren't quite mainstream.

The following command line will download to your remote machine the Kaggle database that we will need for this lab session. It will take a few seconds.

```
[ ] !wget https://transfer.sh/148a8m/train.zip
```

Now you will need to unzip the database that you have just downloaded, with the following line:

Notebook settings

Runtime type
Python 3

Hardware accelerator
GPU

☐ Omit code cell output when saving this notebook

CANCEL SAVE

Final Questions

Undergradese

What undergrads ask vs. what they're REALLY asking

"Is it going to be an open book exam?"

Translation: "I don't have to actually memorize anything, do I?"

"Hmm, what do you mean by that?"

Translation: "What's the answer so we can all go home."

"Are you going to have office hours today?"

Translation: "Can I do my homework in your office?"

"Can i get an extension?"

Translation: "Can you re-arrange your life around mine?"

"Is this going to be on the test?"

Translation: "Tell us what's going to be on the test."

"Is grading going to be curved?"

Translation: "Can I do a mediocre job and still get an A?"

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