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Politecnico di Torino

ellis European Laboratory for Learning and Intelligent Systems

Applied Data Science Project

L11 - Project development tools I

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Pillars

Design

Manage

Develop

Communicate

Development

It is where the magic happens

A machine intelligence is created to generate the outputs that meet objectives and requirements with the involvement of a team tasked on activities with due dates

Objectives and requirements have been defined in the Design pillar

Activities and due dates in the Manage pillar

Knowledge tools

- collaborative workspaces
  - program development
  - version control
  - communication among project developers

Apps

- collaborative workspaces
  - program development — Colaboratory
  - version control — Colaboratory & Github
  - communication among project developers — Slack

Program development

- “Divide and rule”
- Tasks are mapped into modules
- One module has one lead developer and, eventually, contributors
- Choose the programming language according to:
    - ecosystem of software modules that you can utilize
    - easiness of model integration
    - familiarity. Do not be afraid to switch to another (similar programming language) since they share most of the features and development patterns

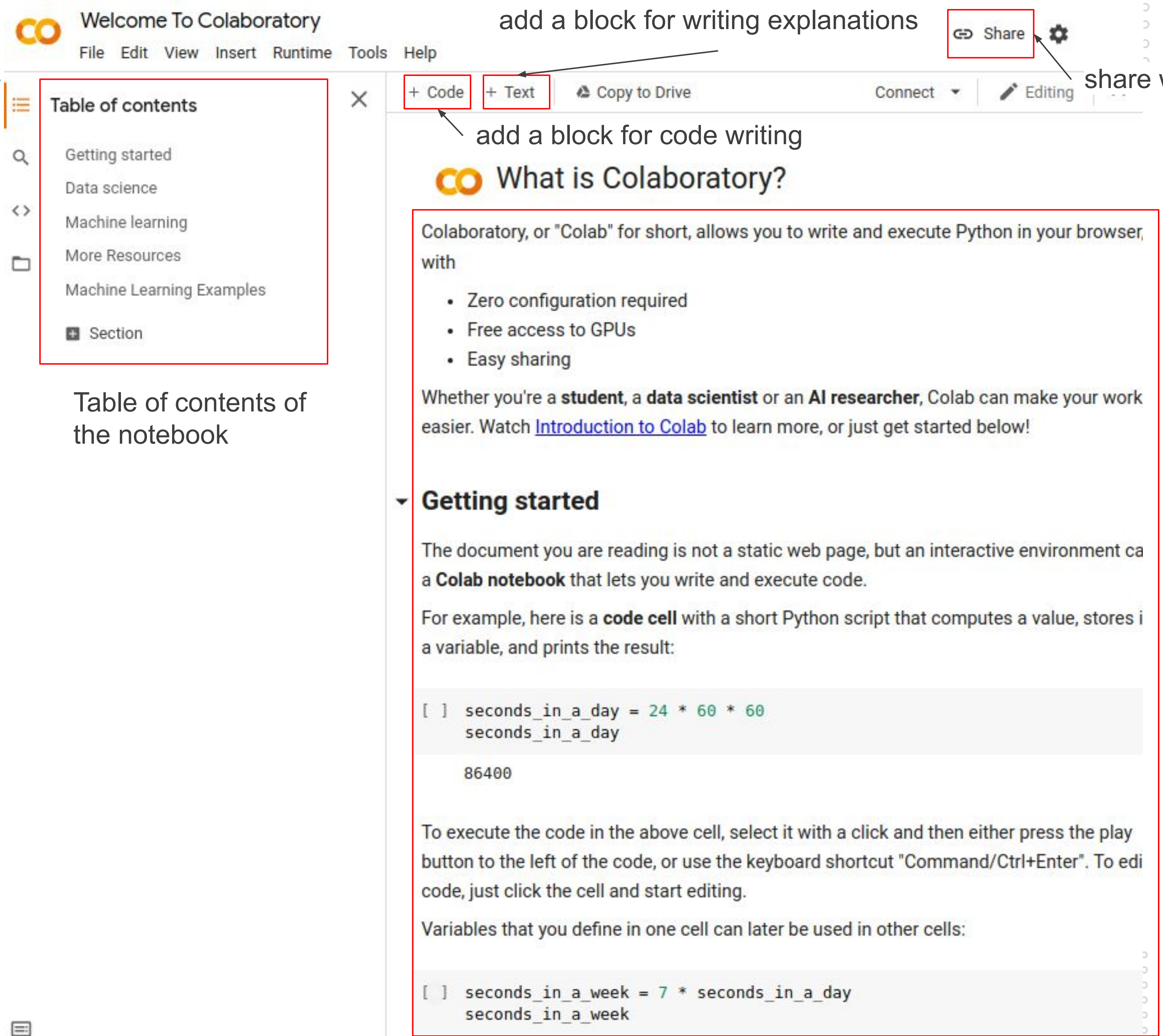
Python is considered the default language for developing machine intelligence nowadays

Colaboratory

https://colab.research.google.com

An application where to develop, share, and also test on dedicated hardware (GPU to speed up the computing)

Overview



add a block for writing explanations

share with collaborators

add a block for code writing

Table of contents of the notebook

Notebook containing both code blocks and explanations in a narrative fashion

What is Colaboratory?

Colaboratory, or "Colab" for short, allows you to write and execute Python in your browser, with

- Zero configuration required
- Free access to GPUs
- Easy sharing

Whether you're a **student**, a **data scientist** or an **AI researcher**, Colab can make your work easier. Watch Introduction to Colab to learn more, or just get started below!

Getting started

The document you are reading is not a static web page, but an interactive environment ca a **Colab notebook** that lets you write and execute code.

For example, here is a **code cell** with a short Python script that computes a value, stores i a variable, and prints the result:

```
[ ]  seconds_in_a_day = 24 * 60 * 60
     seconds_in_a_day

     86400
```

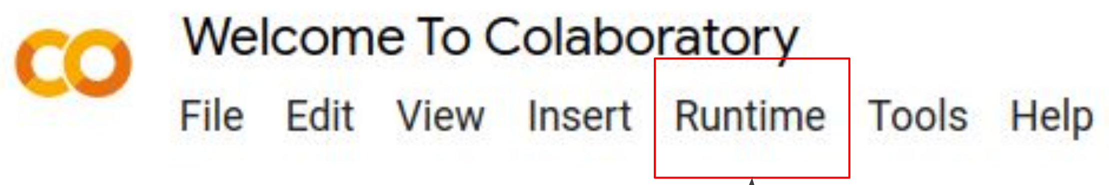
To execute the code in the above cell, select it with a click and then either press the play button to the left of the code, or use the keyboard shortcut "Command/Ctrl+Enter". To edi code, just click the cell and start editing.

Variables that you define in one cell can later be used in other cells:

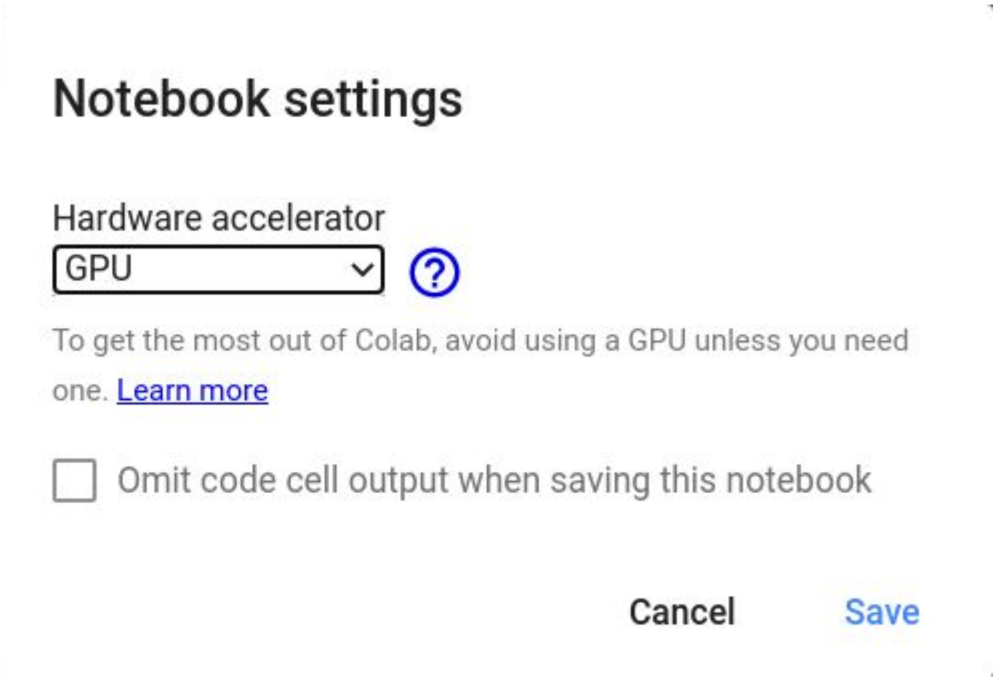
```
[ ]  seconds_in_a_week = 7 * seconds_in_a_day
     seconds_in_a_week
```

TORINO

Menu bar



define the runtime configurations, among those the hardware acceleration if needed


Notebook settings

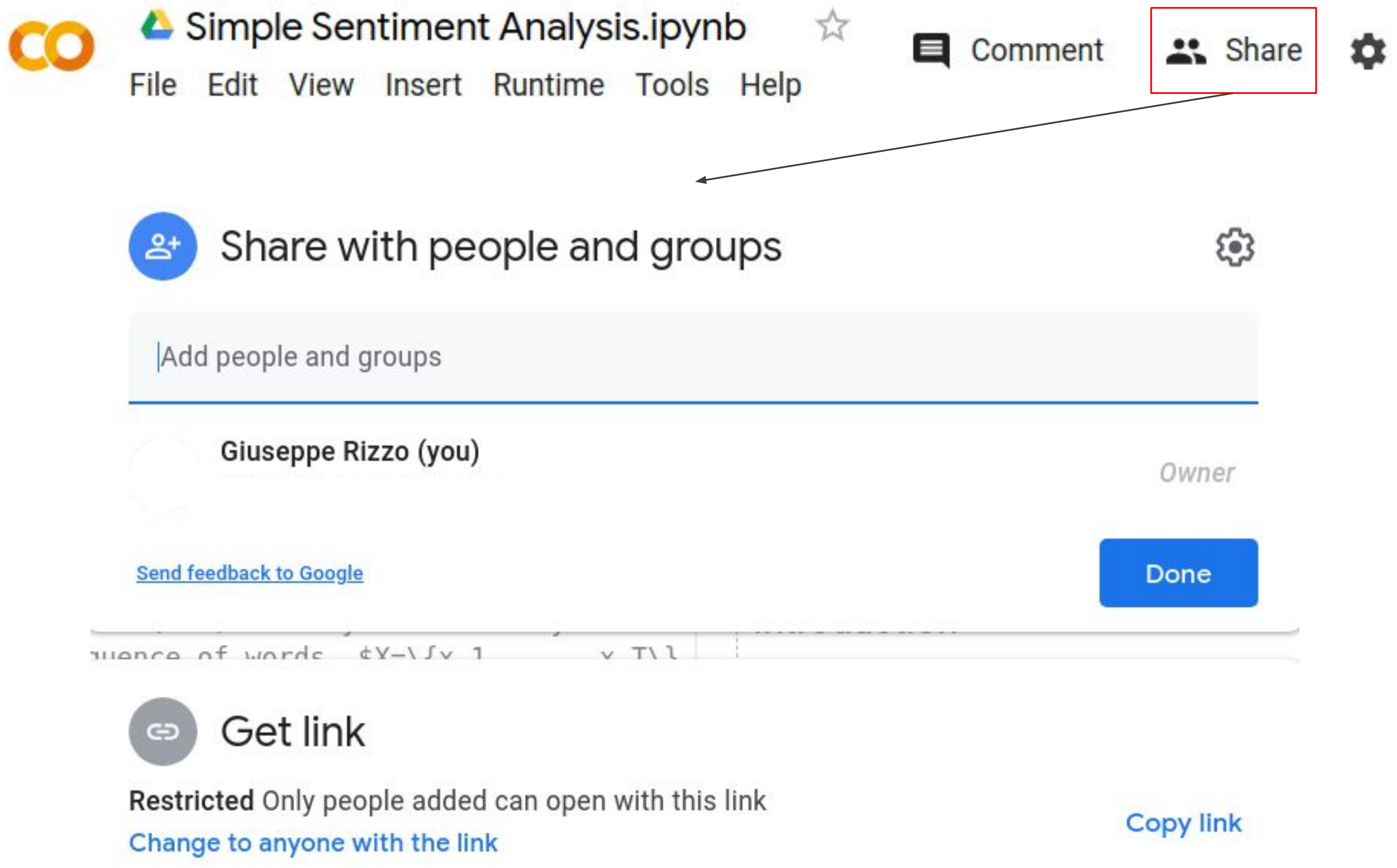
Hardware accelerator
GPU

To get the most out of Colab, avoid using a GPU unless you need one. Learn more

☐ Omit code cell output when saving this notebook

Cancel Save

Share



Share with people and groups

Add people and groups

Giuseppe Rizzo (you)

Owner

Send feedback to Google

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Get link

Restricted Only people added can open with this link

Change to anyone with the link

Copy link

Connect your Google Drive

Enable authorization to import data from Google Drive

```
from google.colab import drive
drive.mount('/content/drive/')
```

List the files in your drive

```
!ls "/content/drive/My Drive/"
```

Running with Google Colab

Upload YOUR_PYTHON_FILE.py to Google Drive & Run with Google Colab

```
!python3 "/content/drive/My Drive/Colab Notebooks/YOUR_PYTHON_FILE.py"
```

Run with Google Colab to Download YOUR_PYTHON_FILE.py from Google Drive

```
from google.colab import files

files.download('/content/drive/My Drive/Colab Notebooks/YOUR_PYTHON_FILE.py')
```

Bash commands

Bash commands are executed with the environment “!”

Download an external file

```
!wget http://ai.stanford.edu/~amaas/data/sentiment/aclImdb_v1.tar.gz -P "/content/drive/My Drive/Colab Notebooks"
```

Clone a repository

```
!git clone https://github.com/pytorch/examples.git
```

Colab == virtual environment

The environment can be customized with the addition of python packages

Install

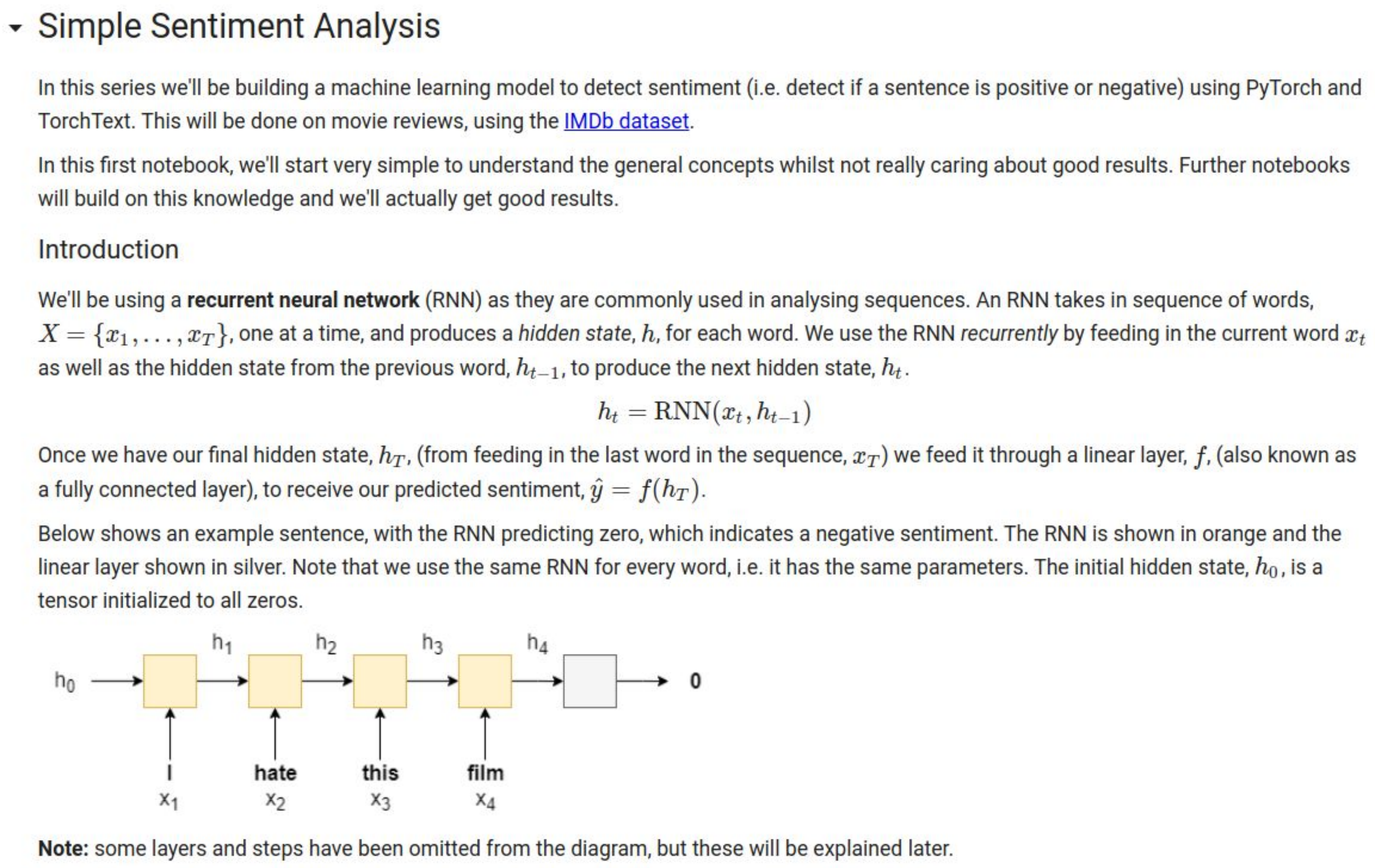
```
!pip install torchtext
```

Show a version

```
!pip show torchtext
```

Example

Simple Sentiment Analysis.ipynb



Simple Sentiment Analysis

In this series we'll be building a machine learning model to detect sentiment (i.e. detect if a sentence is positive or negative) using PyTorch and TorchText. This will be done on movie reviews, using the IMDb dataset.

In this first notebook, we'll start very simple to understand the general concepts whilst not really caring about good results. Further notebooks will build on this knowledge and we'll actually get good results.

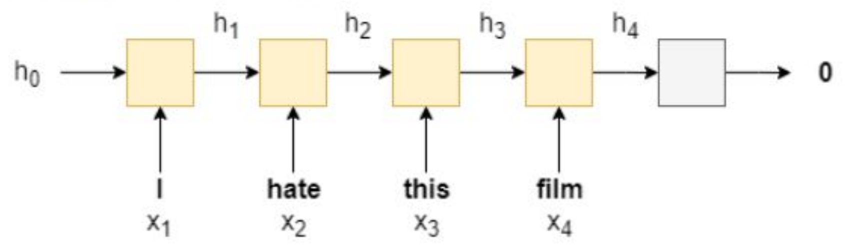
Introduction

We'll be using a **recurrent neural network** (RNN) as they are commonly used in analysing sequences. An RNN takes in sequence of words, $X = \{x_1, ..., x_T\}$, one at a time, and produces a *hidden state*, h, for each word. We use the RNN *recurrently* by feeding in the current word x_t as well as the hidden state from the previous word, h_{t-1}, to produce the next hidden state, h_t.

$$h_t = \text{RNN}(x_t, h_{t-1})$$

Once we have our final hidden state, h_T, (from feeding in the last word in the sequence, x_T) we feed it through a linear layer, f, (also known as a fully connected layer), to receive our predicted sentiment, $\hat{y} = f(h_T)$.

Below shows an example sentence, with the RNN predicting zero, which indicates a negative sentiment. The RNN is shown in orange and the linear layer shown in silver. Note that we use the same RNN for every word, i.e. it has the same parameters. The initial hidden state, h_0, is a tensor initialized to all zeros.



Note: some layers and steps have been omitted from the diagram, but these will be explained later.

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Thank you for your attention.

Questions?

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