IPDF2LATEX

$$S = \int_x \left\{ \frac{1}{2} \sum_a \partial^\mu \chi_a \partial_\mu \chi_a + V(\rho) \right\},$$

```
S=\int_{x}\left\{\frac{1}{2}\sum_{a}\partial^{\mu}
\chi_{a}\partial_{\mu}\chi_{a}+V(\rho)\right\},
```

Macéo Ottavy, Mathieu Longatte, Louison Mocq, Ankit Gayen

Supervised by Simon Delamare

and the rule is proved that

$$\frac{du^n}{dx} = nu^{n-1}\frac{du}{dx},$$

where n is a positive fraction whose numerator and denominator are integers. This rule has already been used in the solution of numerous exercises.

34. The Derivative of a Constant. Let $y = c$, where c is a constant. Corresponding to any Δx, $\Delta y = 0$, and consequently

$$\frac{\Delta y}{\Delta x} = 0,$$

and

$$\lim_{\Delta x \to 0} \frac{\Delta y}{\Delta x} = 0,$$

or

$$\frac{dy}{dx} = 0.$$

The derivative of a constant is zero.

Interpret this result geometrically.

35. The Derivative of the Sum of Two Functions. Let

$$y = u + v,$$

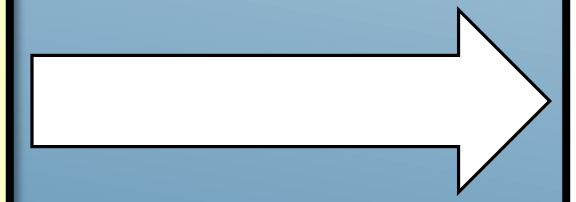
where u and v are functions of x. Let Δu, Δv, and Δy be the increments of u, v, and y, respectively, corresponding to the increment Δx.

$$\begin{aligned} y + \Delta y &= u + \Delta u + v + \Delta v \\ \Delta y &= \Delta u + \Delta v \\ \frac{\Delta y}{\Delta x} &= \frac{\Delta u}{\Delta x} + \frac{\Delta v}{\Delta x} \\ \frac{dy}{dx} &= \frac{du}{dx} + \frac{dv}{dx}, \end{aligned}$$

or

$$\frac{d(u+v)}{dx} = \frac{du}{dx} + \frac{dv}{dx}.$$

The derivative of the sum of two functions is equal to the sum of their derivatives.



and the rule is proved that

$$\frac{du^n}{dx} = nu^{n-1}\frac{du}{dx},$$

where n is a positive fraction whose numerator and denominator are integers. This rule has already been used in the solution of numerous exercises.

34 The Derivative of a Constant

Let $y = c$, where c is a constant. Corresponding to any Dx, $Dy = 0$, and consequently

$$\frac{\Delta y}{\Delta x} = 0,$$

and

$$\lim_{\Delta x \to 0} \frac{\Delta y}{\Delta x} = 0,$$

or

$$\frac{dy}{dx} = 0.$$

The derivative of a constant is zero.

Interpret this result geometrically.

35 The Derivative of the Sum of Two Functions

Let

$$y = u + v,$$

where u and v are functions of x. Let Du, Dv, and Dy be the increments of u, v, and y, respectively, corresponding to the increment Dx.

$$y + \Delta y = u + \Delta u + v + \Delta v$$

$$\Delta y = \Delta u + \Delta v$$

$$\frac{\Delta y}{\Delta x} = \frac{\Delta u}{\Delta x} + \frac{\Delta v}{\Delta x}$$

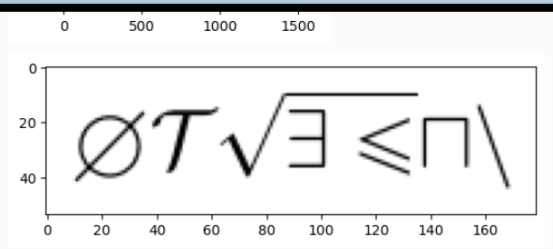
$$\frac{dy}{dx} = \frac{du}{dx} + \frac{dv}{dx},$$

or

$$\frac{d(u+v)}{dx} = \frac{du}{dx} + \frac{dv}{dx}.$$

The derivative of the sum of two functions is equal to the sum of their derivatives.

Website




```
<class 'list'>
```

Creating dataset

We finally want to create a dataset wich will be a map containing two fields.

```
[8]: ds = {"images":[], "latex-formula":[]}
```

Then we add all the images and corresponding latex-formula we want.

```
[9]: ds["images"].append(img)
     ds["latex-formula"].append(formula)
```

Finally we save our dataset thanks to the `json` package.

```
[10]: import json

      json_object = json.dumps(ds)

      ds_name = "files/image-latex-datasets.json"
      with open(ds_name, "w") as f :
          f.write(json_object)
```

To open your dataset, do this:

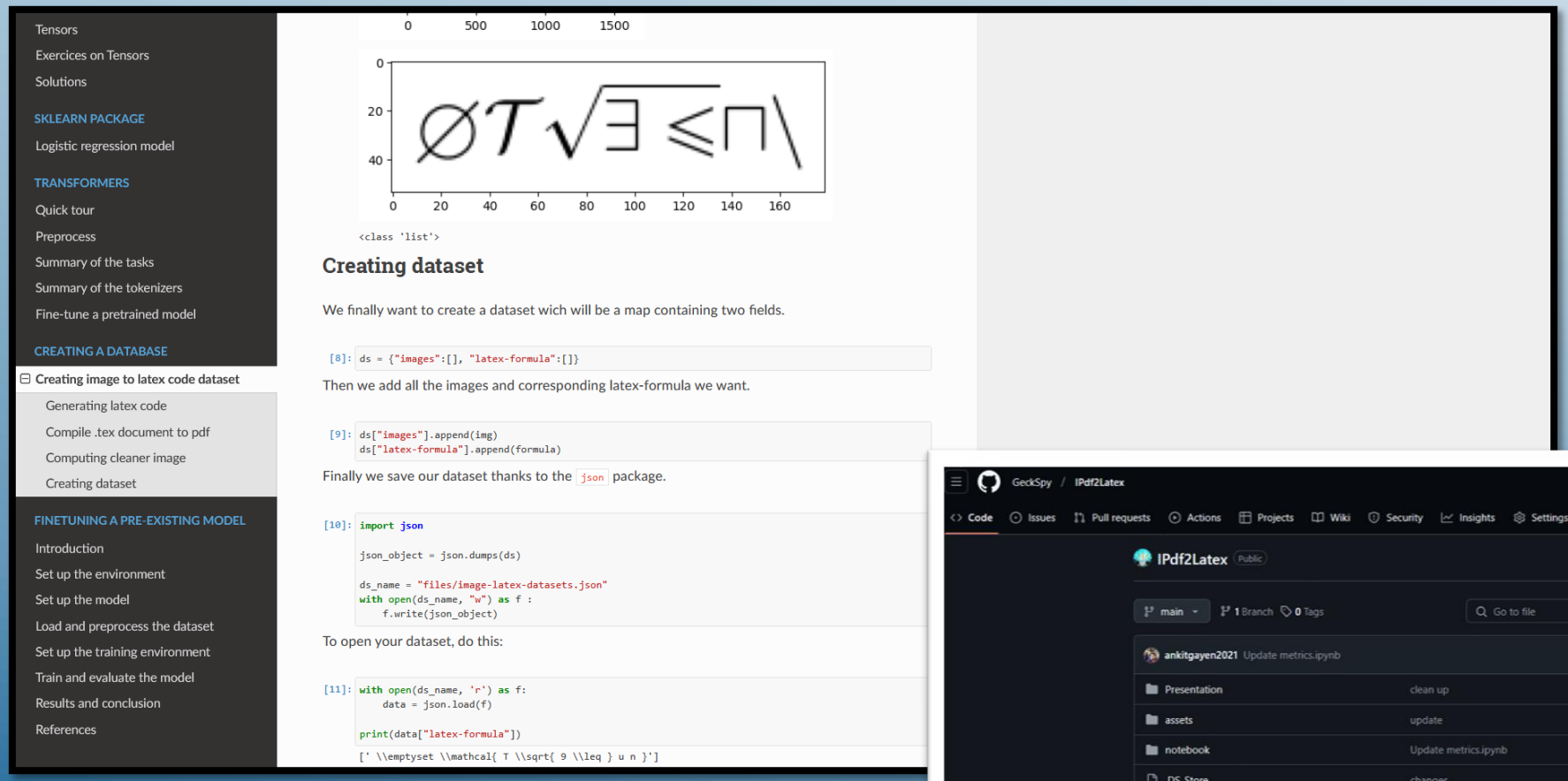
```
[11]: with open(ds_name, 'r') as f:
          data = json.load(f)

      print(data["latex-formula"])
```

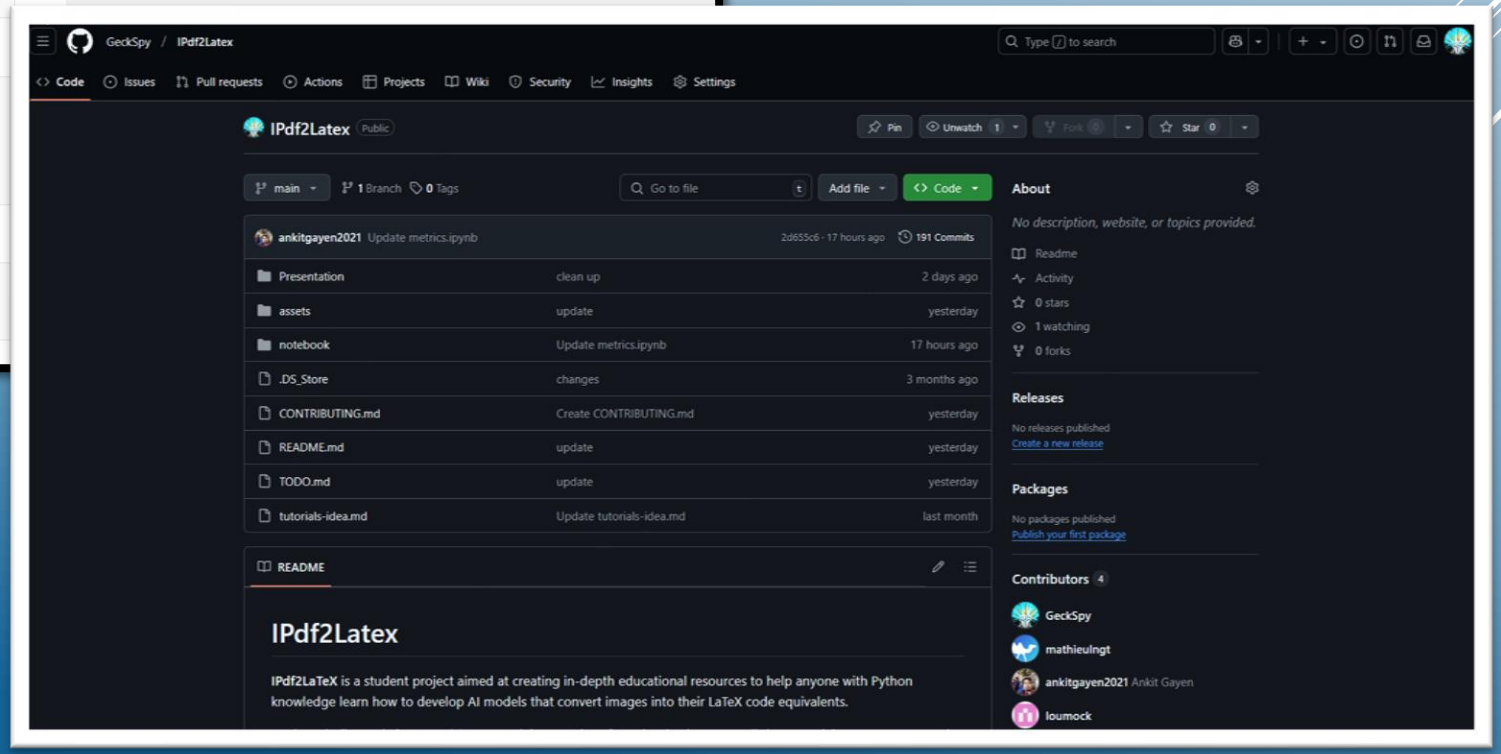
```
[' \\emptyset \\mathcal{ T \\sqrt{ 9 \\leq } \\sqcap }']
```

latest

Website

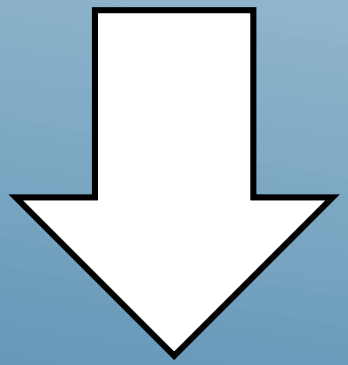


GitHub



Objective: Image to Latex

$$\det\left(\frac{\partial^2 F}{\partial x_i \partial x_j}\right) = \sum_{\sigma \in S_n} sgn(\sigma) \prod_{i=1}^{n} \frac{\partial^2 F}{\partial x_i \partial x_{\sigma(i)}}$$



```
\det\left( \frac{\partial^2 F}{\partial x_i \partial x_j} \right)
    = \sum_{\sigma \in S_n} \text{sgn}(\sigma) \prod_{i=1}^n
    \frac{\partial^2 F}{\partial x_i \partial x_{\sigma(i)}}
```

Steps

Step 1: Collect data

Easy: Generate dataset from scratch or arxiv
or take one from Huggingface

Related tutorials: Datasets/ Basics, Images, Loading , Building

Steps

Step 1: Collect data

Easy: Generate dataset from scratch or arxiv
or take one from Huggingface

Related tutorials: Datasets/ Basics, Images, Loading , Building

Step 2: Chose a relevant architecture

Hard: No obvious structure for Image to text

Hard: Language models require a gigantic amount of data

Related tutorials: Curse of Dimensionality, Summary of the tokenizers, Fine-tune a pretrained model

Transformers

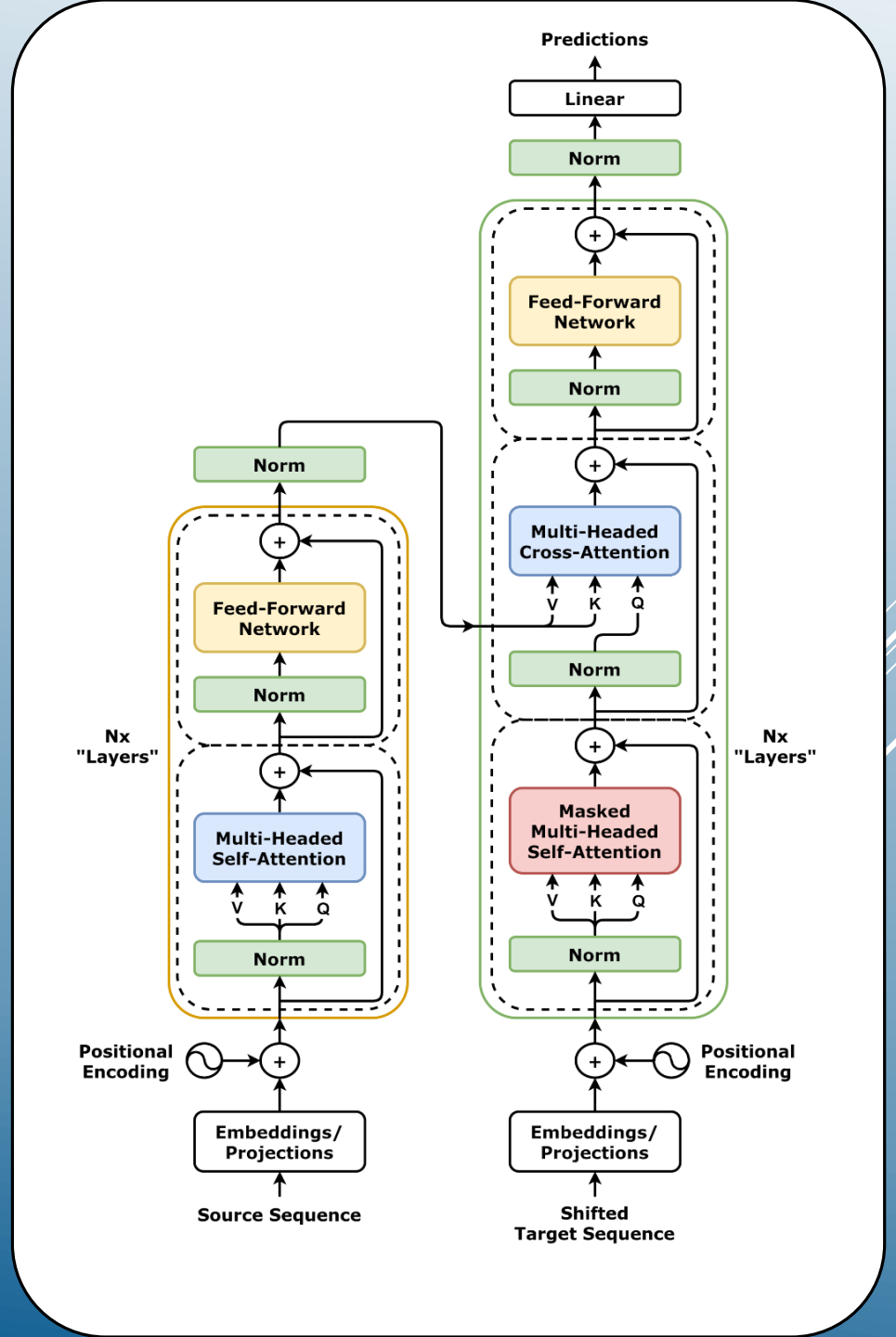
Objectives :

Capture long distance dependency

Enable parallelization in the treatment

Time :	Yesterday,
Person :	Ryan
Action :	bought
Object :	a red car
Goal :	to get to his job
Place :	in Paris

Transformers



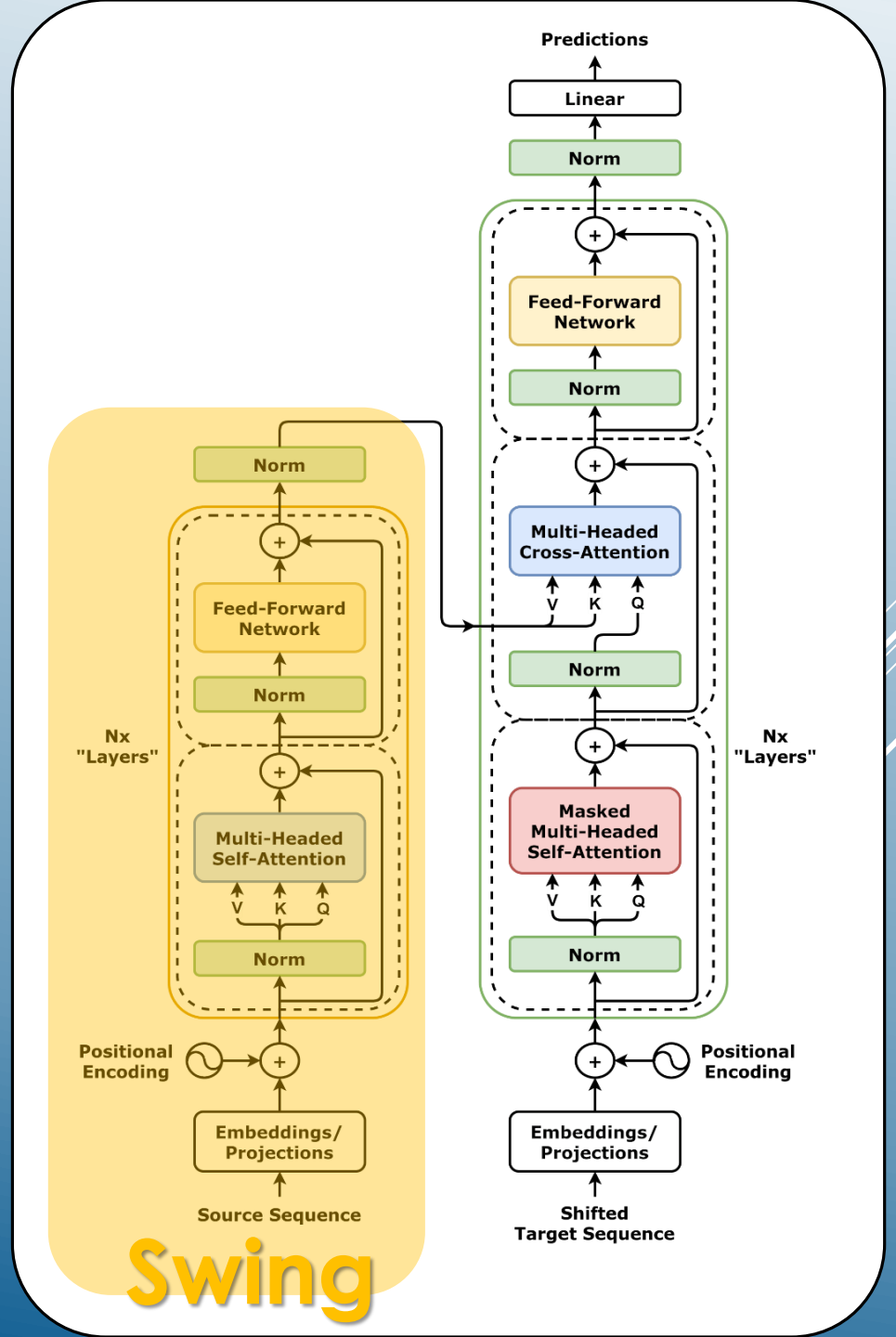
Related tutorials: Transformers

Transformers

Encoder :

An encoder in AI transforms input data (e.g., text, images) into a compact numerical representation that captures essential features.

Related tutorials: Transformers



Transformers

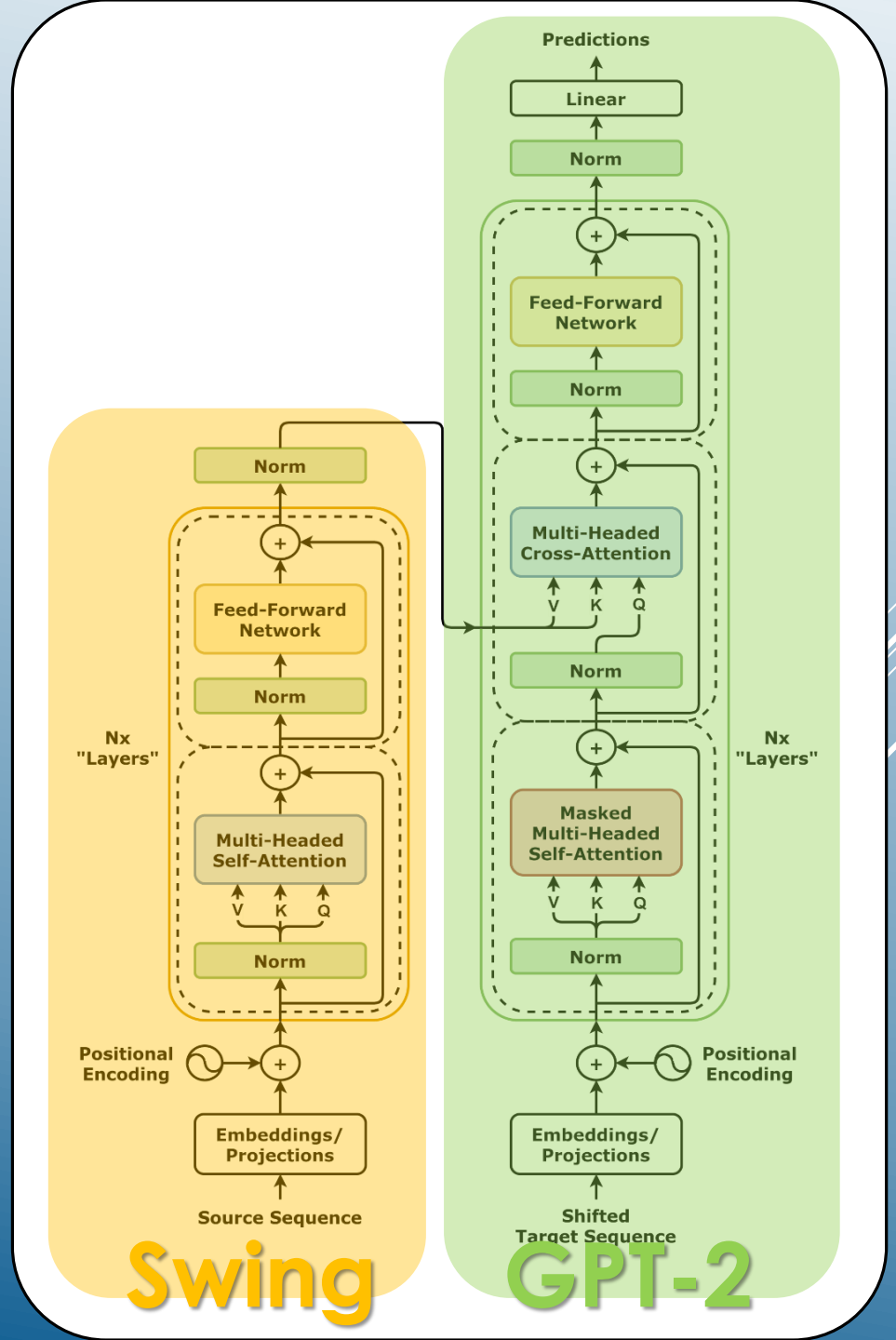
Encoder :

An encoder in AI transforms input data (e.g., text, images) into a compact numerical representation that captures essential features.

Decoder :

A decoder in AI takes this encoded representation and reconstructs it back into a human-interpretable format, such as text or images.

Related tutorials: Transformers

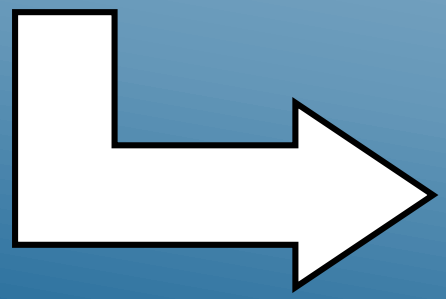


Steps

Step 1: Collect data

Step 2: Chose a relevant architecture

Step 3: Chose metrics to evaluate the model



BLEU metric

Related tutorials: Introduction to few NLP metrics

ANKI TALK

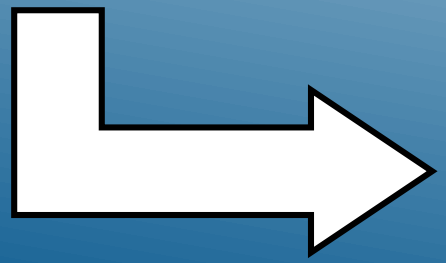
Steps

Step 1: Collect data

Step 2: Chose a relevant architecture

Step 3: Chose metrics to evaluate the model

Step 4: Chose a relevant programming environment



High view library by **Huggingface**: *Transformers, Trainer*
HPC platform: grid5000

Related tutorials: finetunin a pre-existing model, Trainer-a PyTorch optimized training loop

Experiments and Results

Training:

- 30 hours on 4 GPUs on grid5000
- We finetuned 600K paraters among 250M parameters
- 250K examples on the training dataset, during 3 epochs

Results:

Model	Google BLEU	Data Size	Parameters
Im2Latex	*0.67*	441K	243M
TexTeller	*0.77*	7.5M	300M
Pix2Text	*0.07*	100K	25M
Sumen	*0.47*	6.9M	350M
Our	**0.23**	**250K**	**250M**

Experiments and Results

Before training

$$\Delta_+(x,y) = \sum_{n=-\infty}^{\infty} \tilde{\Delta}(x_0 + nT, \vec{x}; y_0, \vec{y})$$

I don't know if it's a coincidence or not," he said. "I think it's just a matter of time before we get to know each other."

He added: "It's not like we're going to be friends. It's just that we're not going to get along very well.

"We're not friends. We're not even friends. I don't think we'll ever get along. I think we're just going to have to get used to each other. We'll just have to figure out how to get through this together."This article is from the archive of our partner .

The U.S. Supreme Court has ruled that the government has the right to deny a person's constitutional right to vote based on his or her race, religion, gender, or sexual orientation. The ruling is the latest in a series of rulings that have come under fire from the left and right over the past few years. The Supreme Court is expected to hear oral arguments on the case in the coming weeks, and it's expected to rule on whether the government can deny a voter's right to cast a ballot based on that person's race or religion. The court's decision comes as the Supreme Court prepares to hear arguments

Experiments and Results

After training

$$\Delta_+(x,y) = \sum_{n=-\infty}^{\infty} \tilde{\Delta}(x_0 + nT, \vec{x}; y_0, \vec{y})$$

```
{ \Delta } _ { + } ( x , y ) = \sum _ { n = - \infty } ^ { { } } { \tilde {
\Delta \left( } x _ { 0 } + n T , { \vec { x } } ; y _ { 3 } ;
{ \bf { y } } \right) } . \ , | {% 1 2 3 5 6 7 8 9 0 4 ^ ( ) x p = y d e g f a
b c n t v q z ~ r s o i u w " j l k > / V _ I + J - : } \q A
```

Experiments and Results

After training

$$\Delta_+(x,y) = \sum_{n=-\infty}^{\infty} \tilde{\Delta}(x_0 + nT, \vec{x}; y_0, \vec{y})$$

```
{ \Delta } _ { + } ( x , y ) = \sum _ { n = - \infty } ^ { { } } { \tilde {
\Delta \left( } x _ { 0 } + n T , { \vec { x } } ; y _ { 3 } ;
{ \bf { y } } \right) } . \ , | {% 1 2 3 5 6 7 8 9 0 4 ^ ( ) x p = y d e g f a
b c n t v q z ~ r s o i u w " j l k > / V _ I + J - : } \q A
```

Conlusion

Model working pretty well

Limitations: Training times, computation power

Around 30 notebooks covering all project

Futur

Add more notebook

Train more our model

Add genetic algorithm to find best hyper-parameters

IPDF2LATEX

Website: *https://tutorial-ia-pe.readthedocs.io/en/latest/*

GitHub: *https://github.com/GeckSpy/IPdf2Latex*

Macéo Ottavy, Mathieu Longatte, Louison Mocq, Ankit Gayen

Supervised by Simon Delamare

APPENDIX

Experiments and Results

After training

$$N = \frac{1}{4\beta \left(\frac{2}{\sqrt{d_\perp}}\right)^{d_\perp}} \int_{y_N}^{y_{end}} \frac{(1-y)^{d_\perp - 1} dy}{y^3 \left(1 + (\frac{d_\perp}{4} - \frac{3}{2})y\right)}$$

```
N = \frac { 1 } { \beta \Lambda ^ { d - 1 } } \int _ { \mu _ { N } } ^ { \nu _ { 0 }
\alpha _ { s } } { ( \frac 2 { \sqrt { d _ { D } } } ) ^ { 2 } \over { y ^ { 3 } \left(
1 + ( 1 + \frac 3 { 4 } - \frac 1 4 ) y \right) } } \ .%: = , ( ) 1 2 - 3 4 5 7 8 9 6 |
> { ~ ⁄ 0 ^ e p a b c d x r v l s i y h t o k q z n I g f }
```