

Pontificia Universidad Católica de Chile
Escuela de Ingeniería
Departamento de Ciencia de la Computación



Sistemas Urbanos Inteligentes

Autoatención

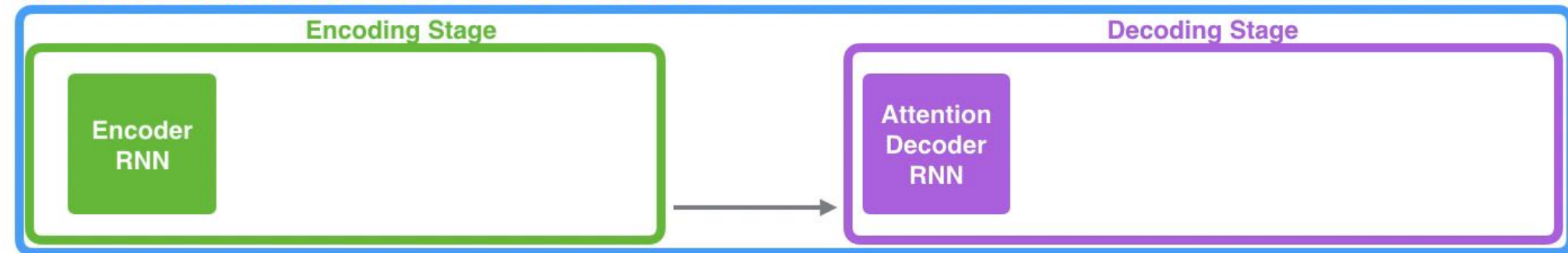
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Dpto. Ciencia de la Computación

Modelos seq2seq con atención conceptualmente funcionan muy bien

Neural Machine Translation

SEQUENCE TO SEQUENCE MODEL WITH ATTENTION



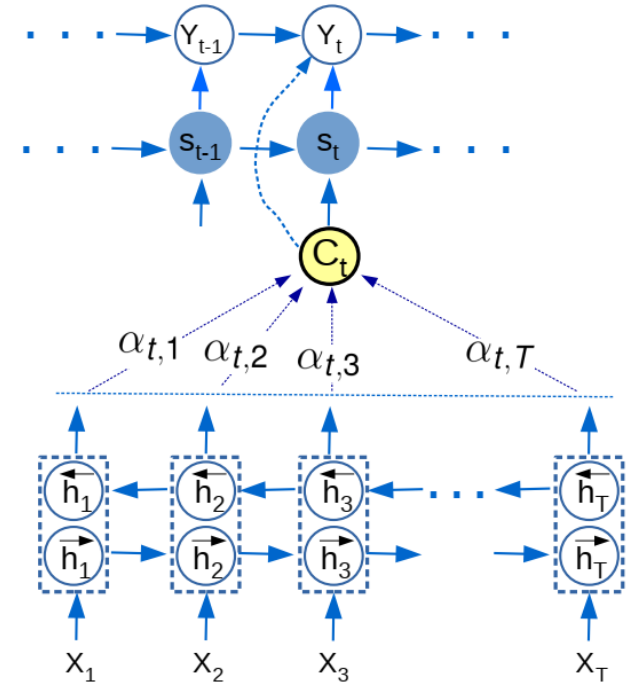
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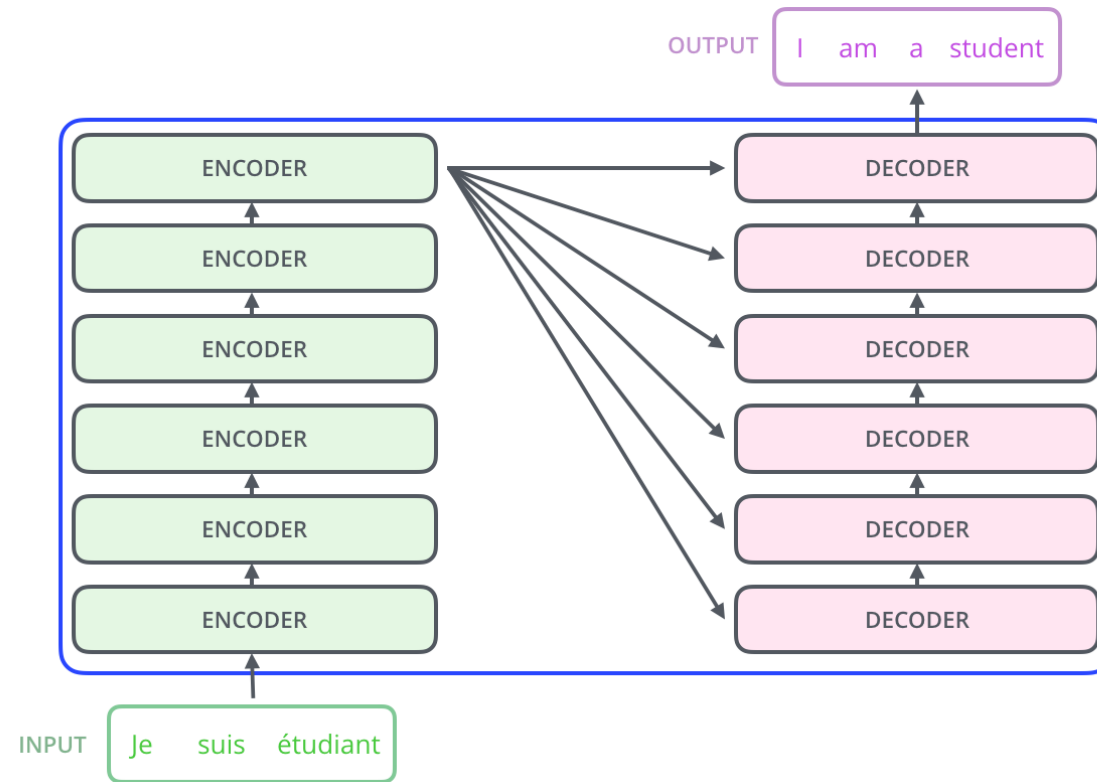
étudiant

Lamentablemente, acarrear muchos de los problemas de las RNN

- Poco eficientes computacionalmente.
- Problemas con secuencias muy largas.
- Estos problemas complican su aplicación a sets de datos gigantescos, que potencialmente entregan mayor conocimiento.

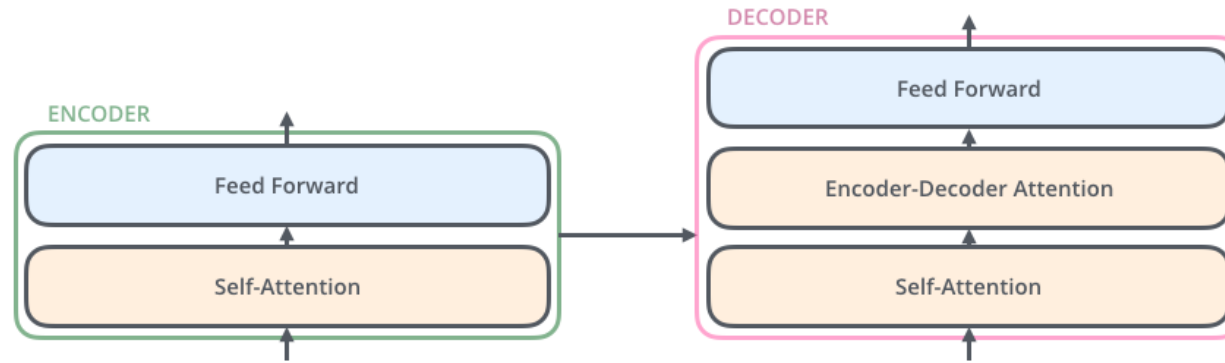


Una posible solución a estos problemas la entrega la arquitectura **Transformer**



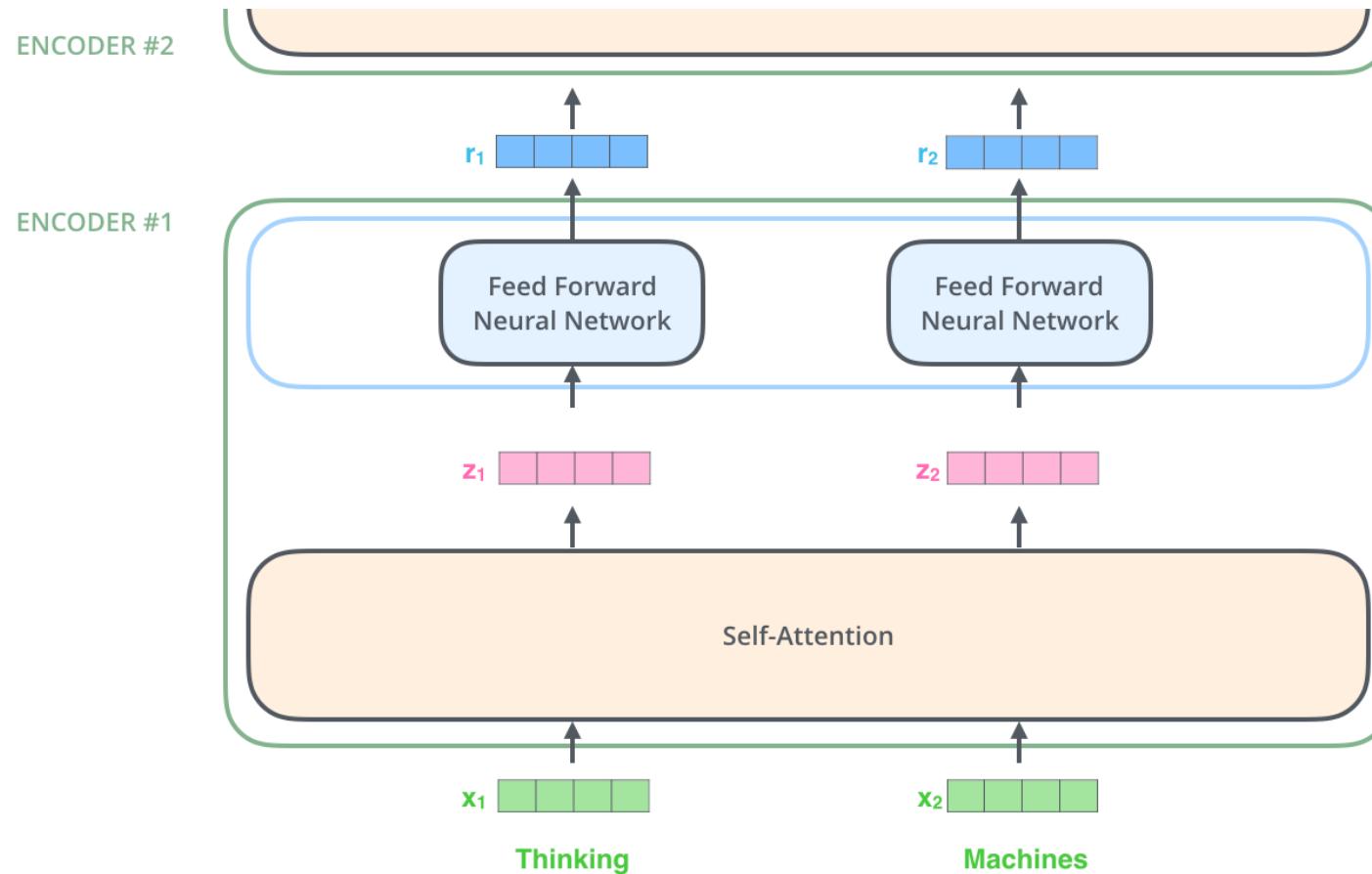
- Esta arquitectura profunda está completamente basada en mecanismos de atención.
- Su gran aporte es ser más eficiente y permitir dependencias de mayor largo que los modelos seq2seq.

Si bien también están formados por *encoder* y *decoders*, estos **no son recurrentes**, sino combinaciones de **atención** y **capas densas**

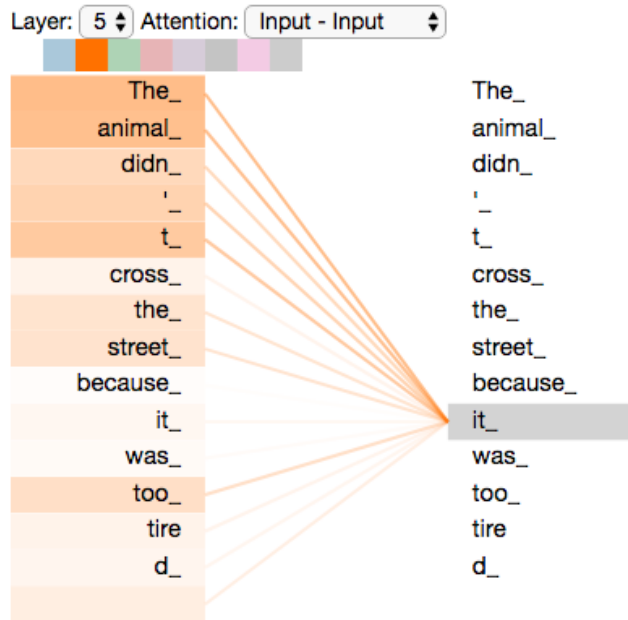


- Atención en Transformers no es igual a la de un modelo seq2seq.
- En este caso se utiliza la **auto-atención**, que indica para cada elementos de una secuencia, su dependencia con otros elementos de la misma.

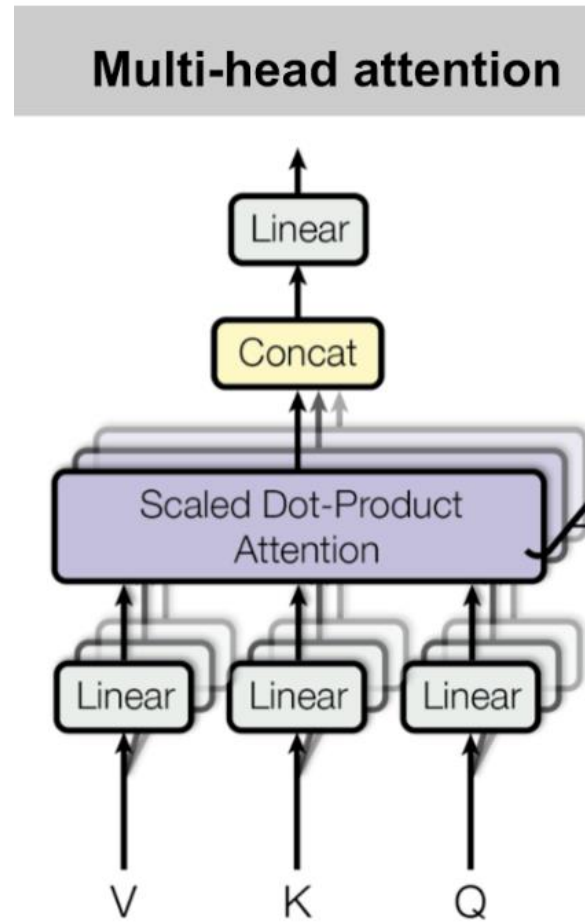
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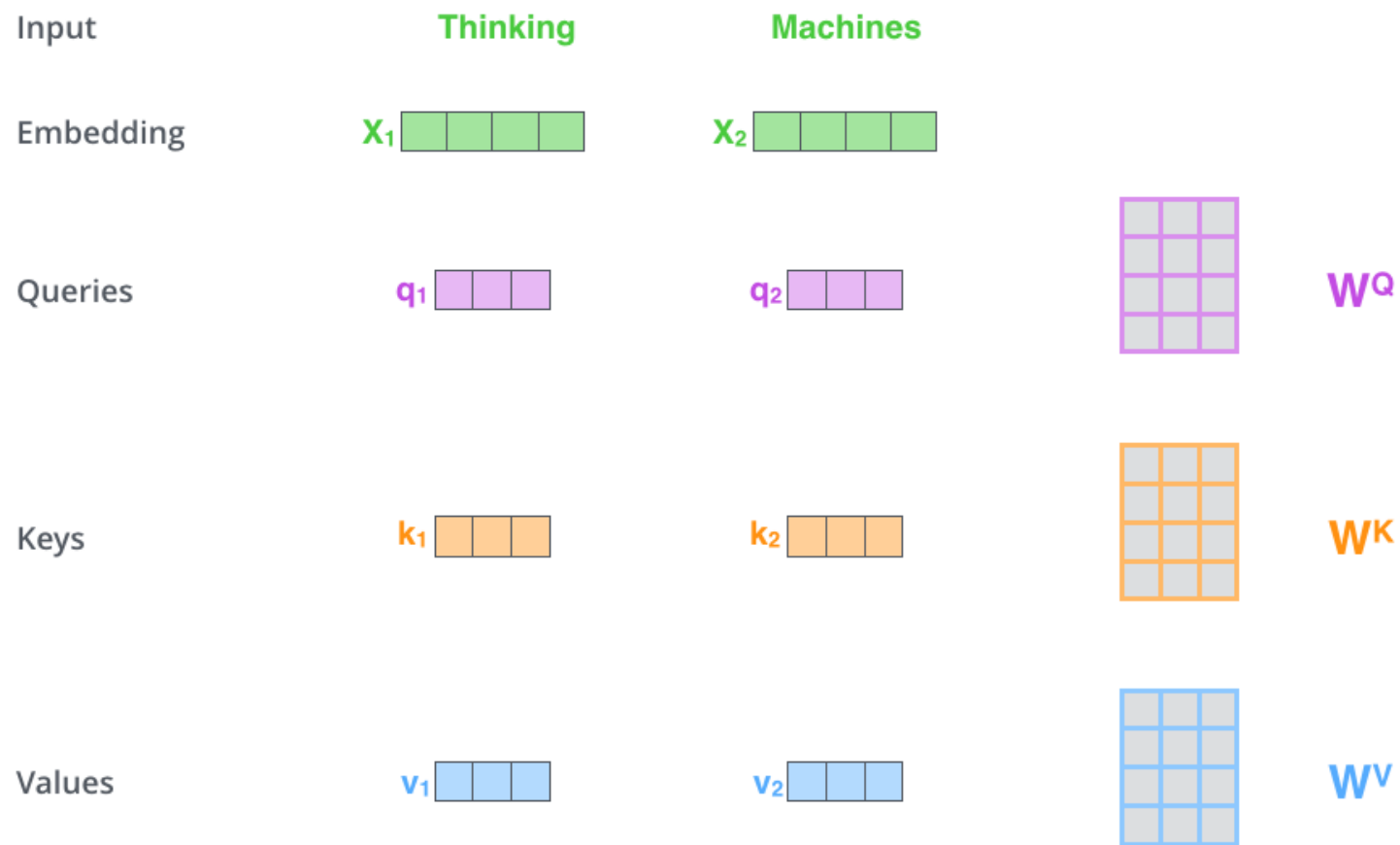
Auto-atención resulta ser el elemento clave



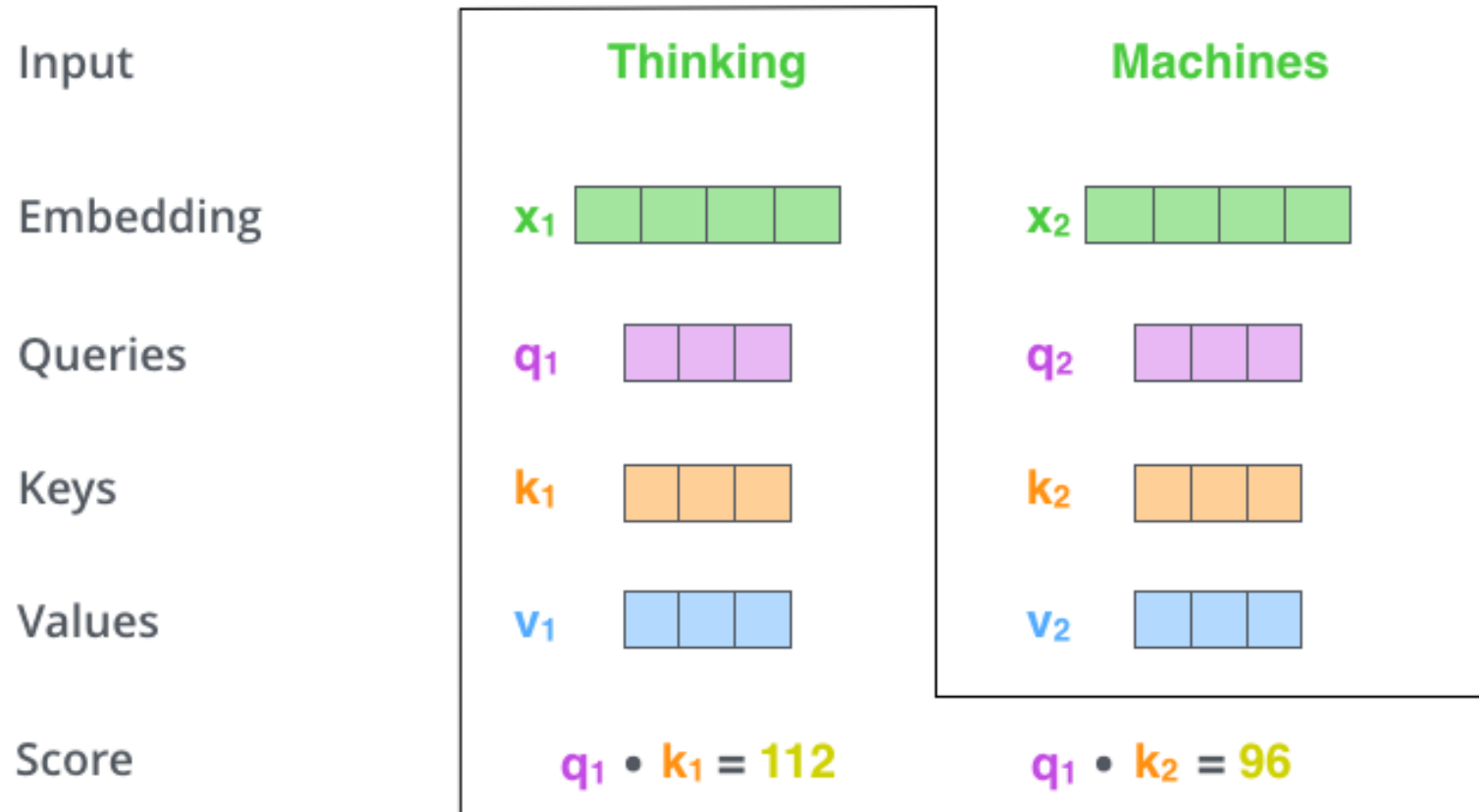
Auto-atención resulta ser el elemento **clave**



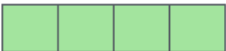
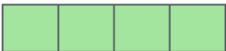
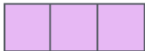
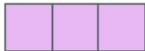
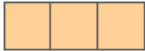
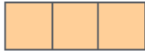
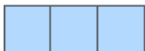

Auto-atención resulta ser el elemento clave



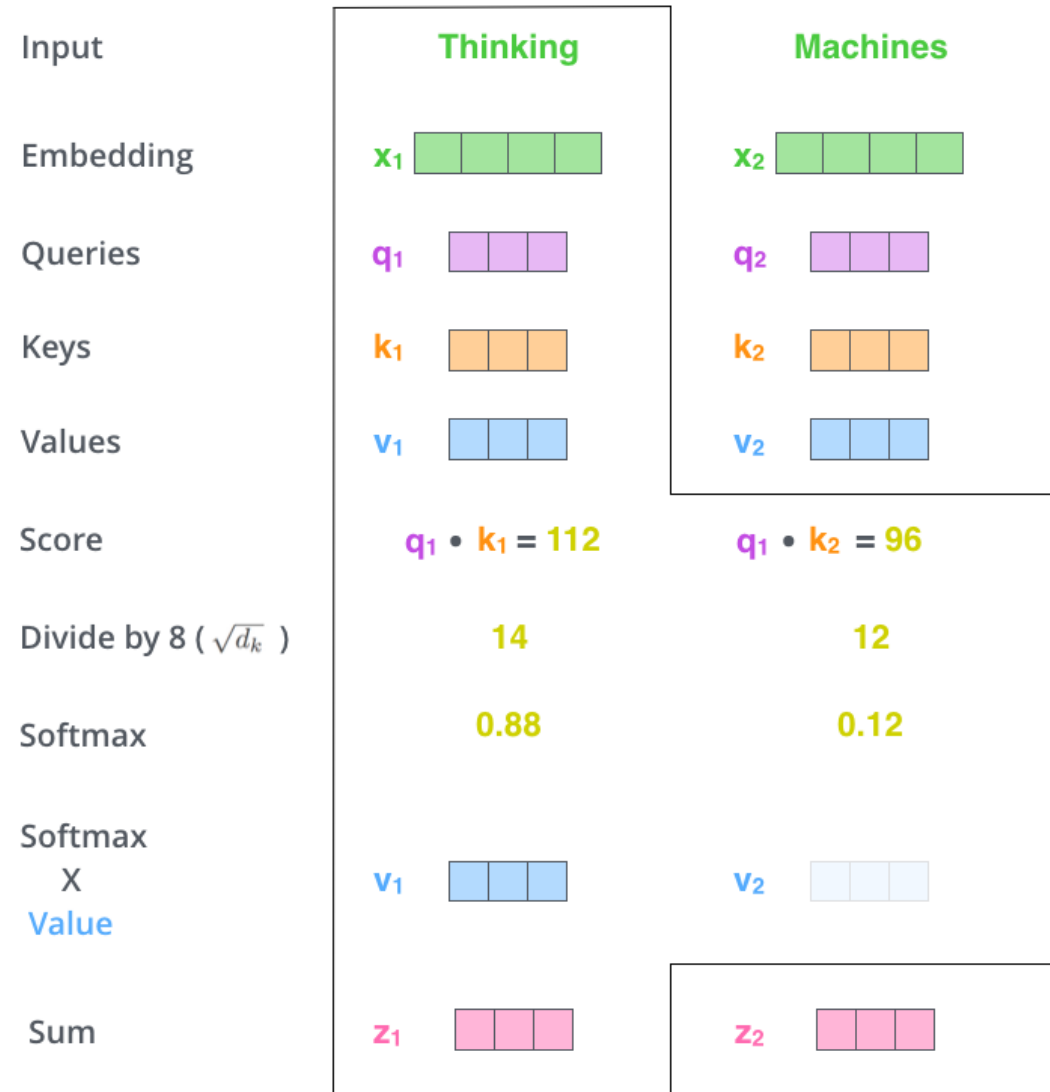
Auto-atención resulta ser el elemento **clave**



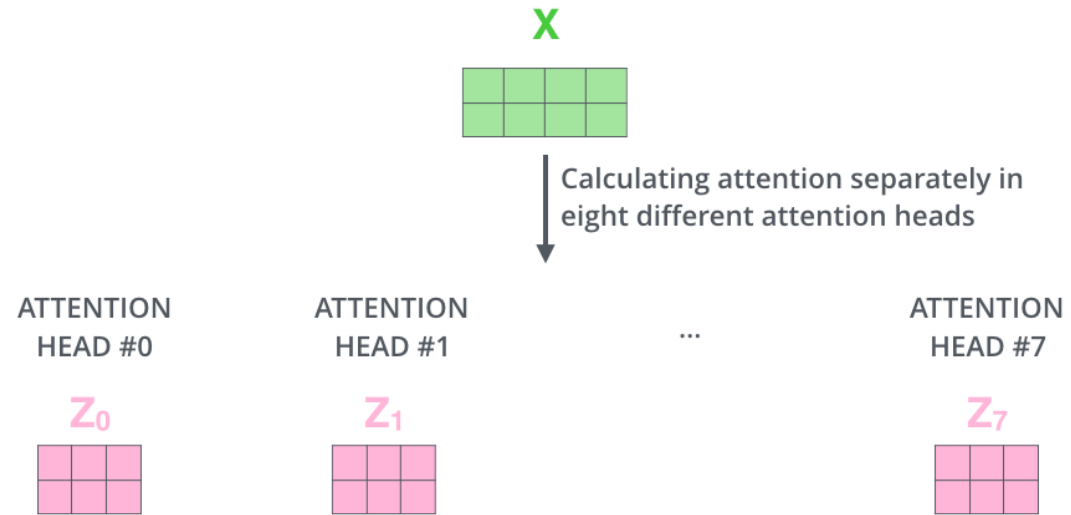
Auto-atención resulta ser el elemento clave

Input	Thinking	Machines
Embedding	x_1 	x_2 
Queries	q_1 	q_2 
Keys	k_1 	k_2 
Values	v_1 	v_2 
Score	$q_1 \cdot k_1 = 112$	$q_1 \cdot k_2 = 96$
Divide by 8 ($\sqrt{d_k}$)	14	12
Softmax	0.88	0.12

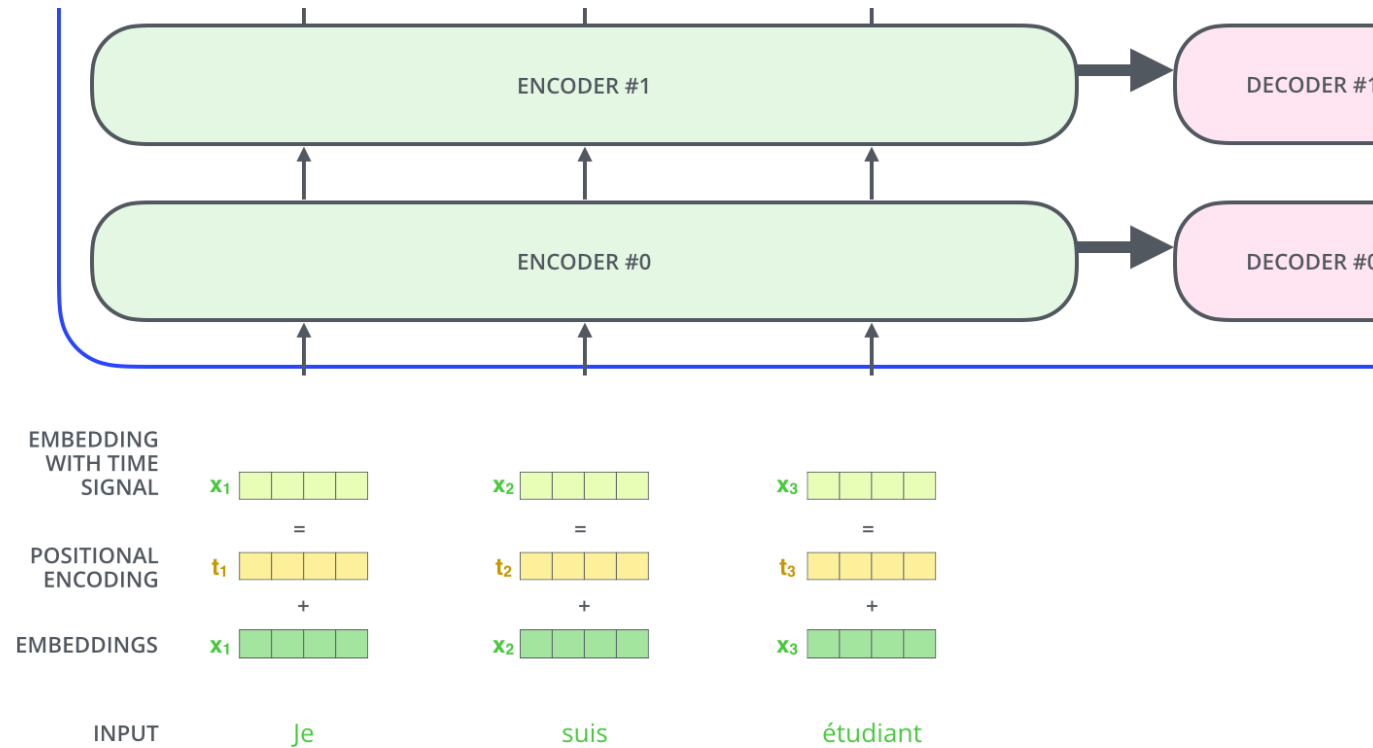
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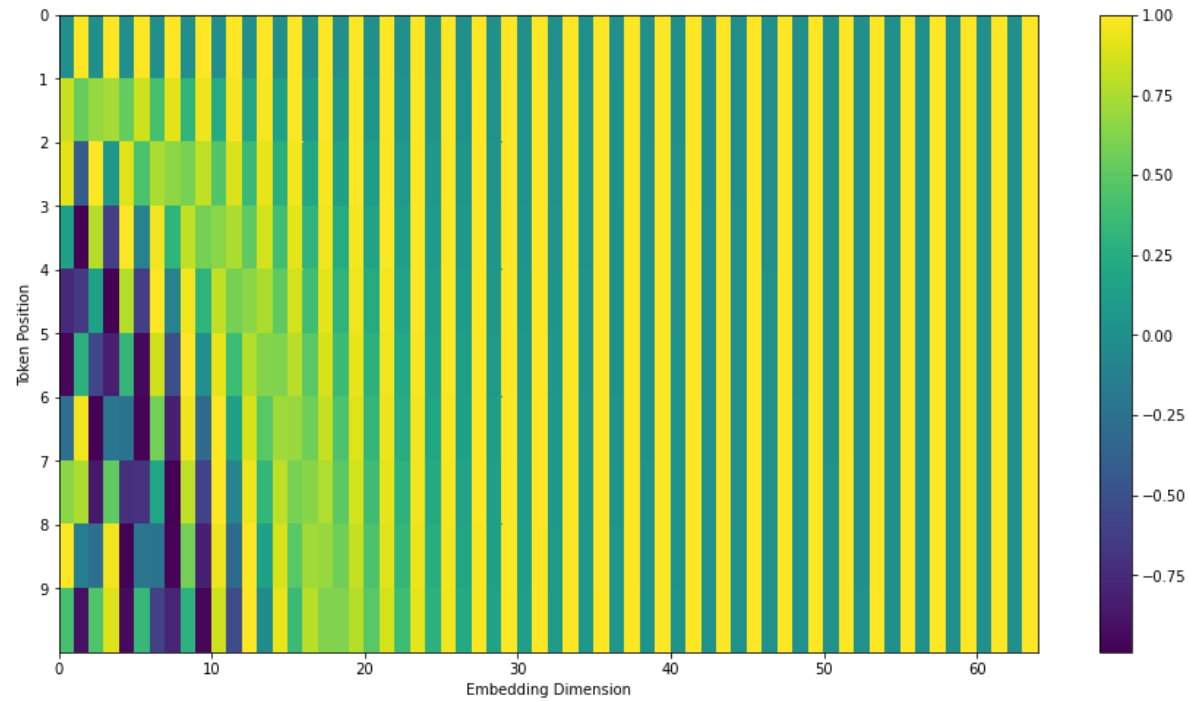
Auto-atención puede ser multimodal (muchas atenciones distintas)



Orden de las secuencias es incluye a través de un *embedding temporal*



Orden de las secuencias es incluye a través de un *embedding temporal*



Algunos ejemplos para cerrar: GPT (1, 2, 3,...)

GPT 2.0: Sentence embedding

SYSTEM PROMPT
(HUMAN-WRITTEN)

In a shocking finding, scientist discovered a herd of unicorns living in a remote, previously unexplored valley, in the Andes Mountains. Even more surprising to the researchers was the fact that the unicorns spoke perfect English.

MODEL COMPLETION
(MACHINE-WRITTEN,
10 TRIES)

The scientist named the population, after their distinctive horn, Ovid's Unicorn. These four-horned, silver-white unicorns were previously unknown to science.

Now, after almost two centuries, the mystery of what sparked this odd phenomenon is finally solved.

Dr. Jorge Pérez, an evolutionary biologist from the University of La Paz, and several companions, were exploring the Andes Mountains when they found a small valley, with no other animals or humans. Pérez noticed that the valley had what appeared to be a natural fountain, surrounded by two peaks of rock and silver snow.

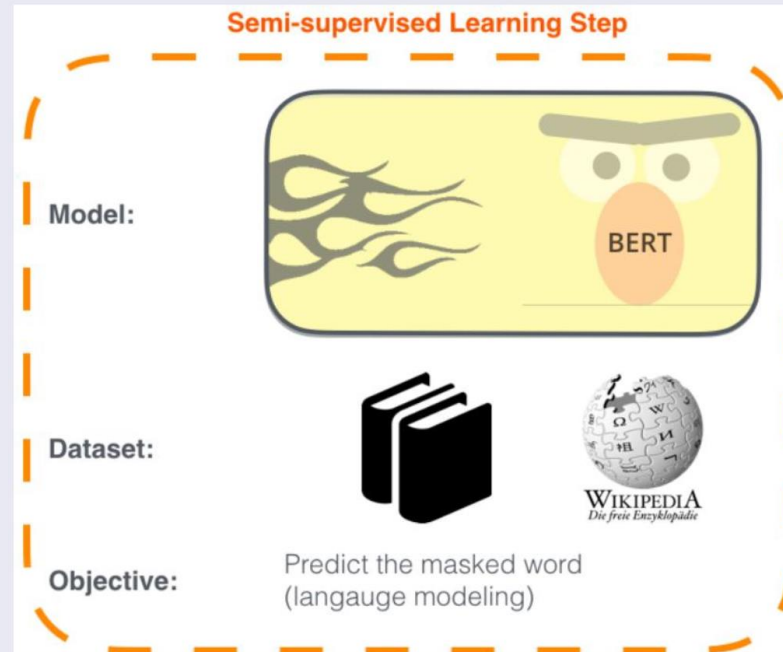
Pérez and the others then ventured further into the valley. "By the time we reached the top of one peak, the water looked blue, with some crystals on top," said Pérez.

- GPT-2 tiene 1.5 billones de parámetros
- Entrenado usando 8 millones de sitios web

<https://github.com/openai/gpt-2>

Algunos ejemplos para cerrar: Bert

Bert: Sentence embedding



<https://github.com/google-research/bert>

Algunos ejemplos para cerrar: Bert

Bert: Transfer features and/or finetuning

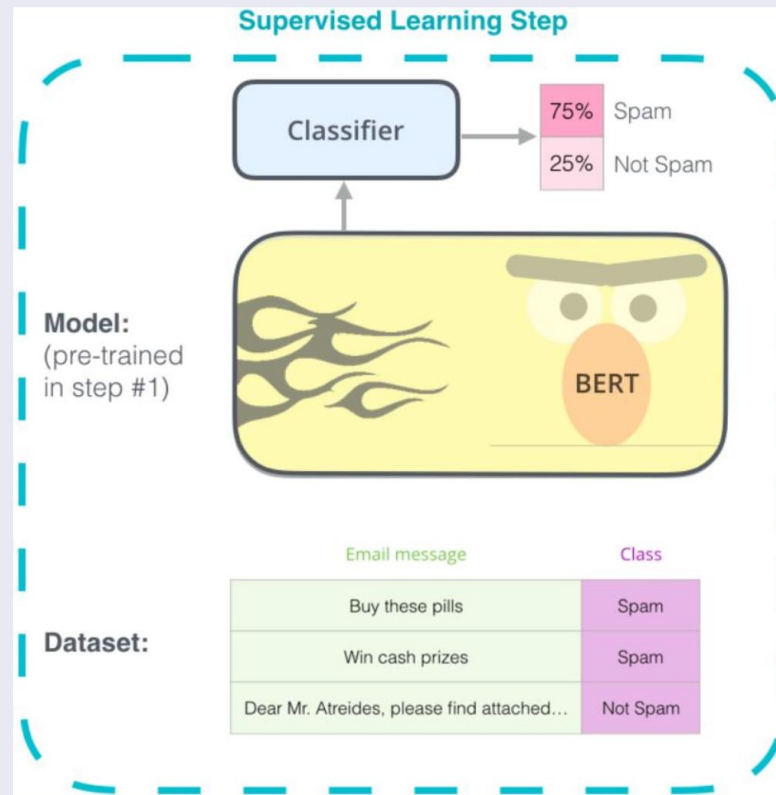


Figure from: <http://jalammar.github.io/illustrated-bert/>

Algunos ejemplos para cerrar: Bert

Text summarization using Bert

cia documents reveal iot-specific televisions can be used to secretly record conversations .
cybercriminals who initiated the attack managed to commandeer a large number of internet-connected devices in current use .
cia documents revealed that microwave ovens can spy on you - maybe if you personally don't suffer the consequences of the sub-par security of the iot .

Internet of Things (IoT) security breaches have been dominating the headlines lately . WikiLeaks's trove of CIA documents revealed that internet-connected televisions can be used to secretly record conversations . Trump's advisor Kellyanne Conway believes that microwave ovens can spy on you - maybe she was referring to microwave cameras which indeed can be used for surveillance . And don't delude yourself that you are immune to IoT attacks , with 96 % of security professionals responding to a new survey expecting an increase in IoT breaches this year . Even if you personally don't suffer the consequences of the sub-par security of the IoT , your connected gadgets may well be unwittingly cooperating with criminals . Last October , Internet service provider Dyn came under an attack that disrupted access to popular websites . The cybercriminals who initiated the attack managed to commandeer a large number of internet-connected devices (mostly DVRs and cameras) to serve as their helpers . As a result , cybersecurity expert Bruce Schneier has called for government regulation of the IoT , concluding that both IoT manufacturers and their customers don't care about the security of the 8.4 billion internet-connected devices in current use . Whether because of government regulation or good old-fashioned self-interest , we can expect increased investment in IoT security technologies . In its recently-released TechRadar report for security and risk professionals , Forrester Research discusses the outlook for the 13 most relevant and important IoT security technologies , warning that " there is no single , magic security bullet that can easily fix all IoT security issues . " Based on Forrester's analysis , here's my list of the 6 hottest technologies for IoT security : IoT network security : Protecting and securing the network connecting IoT devices to back-end systems on the internet . IoT network security is a bit more challenging than traditional network security because there is a wider range of communication protocols , standards , and device capabilities , all of which pose significant issues and increased complexity . Key capabilities include traditional endpoint security features such as antivirus and anti-malware as well as other features such as firewalls and intrusion prevention and detection systems . Sample vendors : Bayshore Networks , Cisco , Darktrace , and Senrio . IoT authentication : Providing the ability for users to authenticate an IoT device , including managing multiple users of a single device (such as a connected car) , ranging from simple static password/pins to more robust authentication mechanisms such as two-factor

<https://github.com/nlpyang/PreSumm>

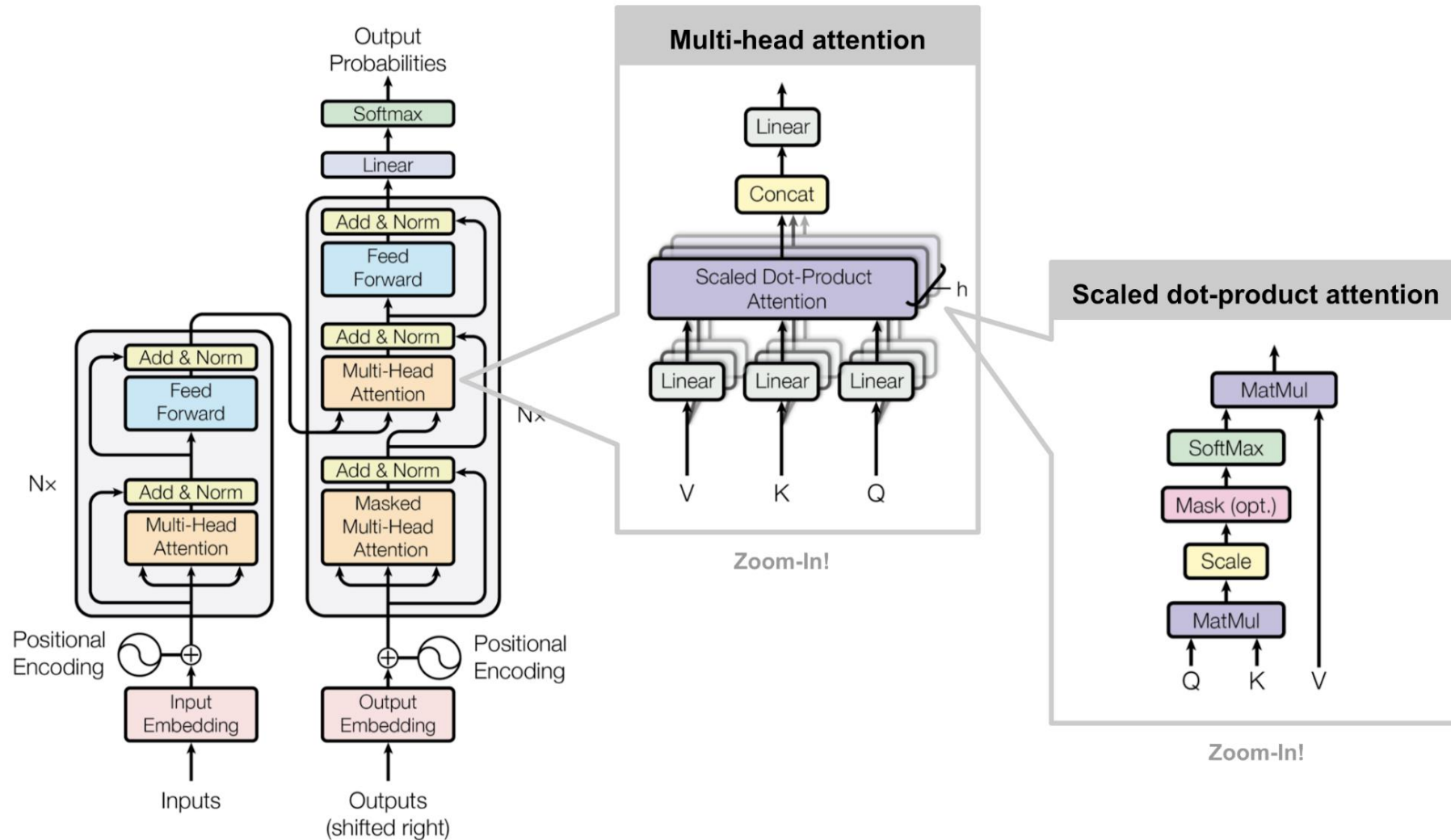
Algunos ejemplos para cerrar: Beto

Beto: Bert's model trained with a Spanish corpus.

Task	BETO-cased	BETO-uncased	Best Multilingual BERT
POS	98.97	98.44	97.10 [2]
NER-C	88.43	82.67	87.38 [2]
MLDoc	95.60	96.12	95.70 [2]
PAWS-X	89.05	89.55	90.70 [8]
XNLI	82.01	80.15	78.50 [2]

<https://github.com/dccuchile/beto>

Antes de terminar, así se ve realmente un **Transformer**



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