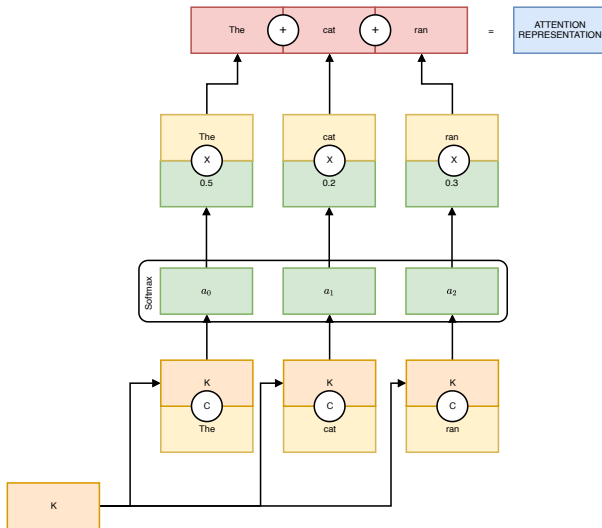


Lab class

Computational Semantics 2021

Adam Ek

Attention



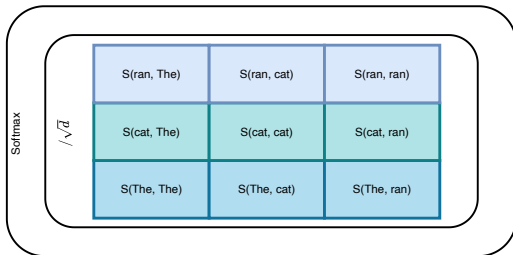
Self-Attention: A visual explanation

■ $\text{softmax}\left(\frac{QK^T}{\sqrt{d}}\right)V$

Key	ran	S(ran, The)	S(ran, cat)	S(ran, ran)
	cat	S(cat, The)	S(cat, cat)	S(cat, ran)
	The	S(The, The)	S(The, cat)	S(The, ran)
		The	cat	ran
		Query		

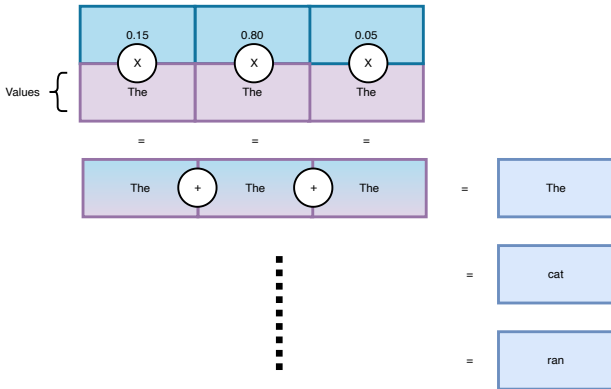
Normalization

■ $\text{softmax}\left(\frac{QK^T}{\sqrt{d}}\right)V$



Getting word representations

- $\text{softmax}(\frac{QK^T}{\sqrt{d}})\mathbf{V}$



Padding

PAD	S(PAD, The)	S(PAD, cat)	S(PAD, ran)	S(PAD, PAD)
ran	S(ran, The)	S(ran, cat)	S(ran, ran)	S(ran, PAD)
cat	S(cat, The)	S(cat, cat)	S(ran, ran)	S(cat, PAD)
The	S(The, The)	S(The, cat)	S(The, ran)	S(The, PAD)
	The	cat	ran	PAD

Attention mask

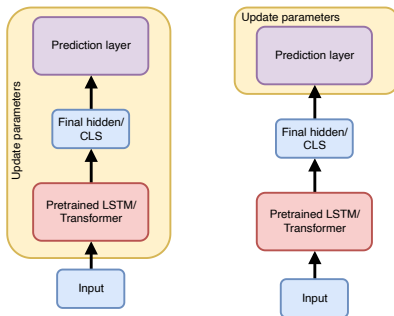
S(PAD, The)	S(PAD, cat)	S(PAD, ran)	S(PAD, PAD)
S(ran, The)	S(ran, cat)	S(ran, ran)	S(ran, PAD)
S(cat, The)	S(cat, cat)	S(ran, ran)	S(cat, PAD)
S(The, The)	S(The, cat)	S(The, ran)	S(The, PAD)

X

0	0	0	0
1	1	1	0
1	1	1	0
1	1	1	0

About fine-tuning

- Fine-tuning: We update the parameters of a pretrained model to adapt it to new data (a new task, a new domain, ...)
- We do not finetune if we add a prediction layer on top of a model and only update its parameters.



Building neural nets: some mental tips

- Always keep in mind:
 - 1 What's the goal?
 - 2 What's the expected input?
 - 3 What's the expected output?
- How we go from input to output is in 93.333...% of the cases *conventions* or what people previously have found to *work*.
 - As long as you can motivate the transition from input to output, you're good!
- When debugging: focus on the *cause* not the *symptoms*

Questions???

WHY DO WHALES JUMP
WHY ARE WITCHES GREEN
WHY ARE THERE MIRRORS ABOVE BEDS
WHY DO I SAY UH
WHY IS SEA SALT BETTER
WHY ARE TREES IN THE MIDDLE OF FIELDS
WHY IS THERE NOT A POKEMON MMO
WHY IS THERE LAUGHING IN TV SHOWS
WHY ARE THERE DOORS ON THE FREEWAY
WHY ARE THERE SO MANY SUCHOSTEKE RUNNING
WHY AREN'T THERE COUNTRIES IN ANTARCTICA
WHY ARE THERE SCARY SOUNDS IN FINECRAFT
WHY IS THERE KICKING IN MY STOMACH
WHY ARE THERE TWO SLUSHIES AFTER HITP
WHY ARE THERE CELEBRITIES
WHY DO SNAKES EXIST
WHY DO OYSTERS HAVE PEARLS
WHY ARE DUCKS CALLED DUCKS
WHY DO THEY CALL IT THE CLAP
WHY ARE KYLE AND CARTMAN FRIENDS
WHY IS THERE AN ARROW ON ANG'S HEAD
WHY ARE TEXT MESSAGES BLUE
WHY ARE THERE MUSTACHES ON CLOTHES
WHY ARE THERE MUSTACHES ON CARS
WHY ARE THERE MUSTACHES EVERYWHERE
WHY ARE THERE SO MANY BIRDS IN OHIO
WHY IS THERE SO MUCH RAIN IN OHIO
WHY IS OHIO WEATHER SO WEIRD
WHY ARE THERE MALE AND FEMALE BIKES
WHY ARE THERE DROPSHIPS
WHY DO THERE FEEL LIKE THERE'S A
WHY AREN'T THERE UNPOSSIBLE FRIENDS
WHY ARE OLD KUNG FIGHTS DIFFERENT
WHY ARE THERE SQUIRRELS
WHY ARE THERE HUGE SPIDERS IN MY HOUSE
WHY ARE THERE LOTS OF SPIDERS IN MY HOUSE
WHY ARE THERE SPIDERS IN MY ROOM
WHY ARE THERE SO MANY SPIDERS IN MY ROOM
WHY DO SPIDER BITES ITCH
WHY IS DYING SO SCARY
WHY IS THERE NO GPS IN LAPTOPS
WHY DO KNEES CLACK
WHY AREN'T THERE E GRADIES
WHY IS ISOLATION BAD
WHY DO BOYS LIKE ME
WHY DON'T BOYS LIKE ME
WHY IS THERE ALWAYS A JAWA UP
WHY ARE THERE RED RINGS ON MY THIGHS
WHY IS LIVING GOOD
WHY ARE THERE SLAVES IN THE BIBLE
WHY ARE THERE PSYCHICS
WHY ARE HATS SO EXPENSIVE
WHY IS THERE OFFENSE IN MY SHIRTPOD
WHY DO YOUR BOOBS HURT
WHY DO TWINS HAVE DIFFERENT FINGERPRINTS
WHY ARE AMERICANS AFRAID OF DRAGONS
WHY IS HTTPS CROSSED OUT IN RED
WHY IS THERE A LINE THROUGH HTTPS
WHY IS THERE A RED LINE THROUGH HTTPS ON FACEBOOK
WHY IS HTTPS IMPORTANT
WHY AREN'T MY ARMS GROWING
WHY ARE THERE KEYS IN MY DOOR
WHY DO I FEEL DIZZY
WHY ARE THERE SO MANY CROWS IN ROCHESTER
WHY IS PSYCHIC WEAK TO BUG
WHY DO CHILDREN GET CANCER
WHY IS POSEIDON ANGRY WITH ODYSSEUS
WHY IS THERE ICE IN SPACE
WHY ARE THERE ANTS IN MY LAPTOP
WHY ARE THERE GHOSTS
WHY IS EARTH TILTED
WHY IS SPACE BLACK
WHY IS OUTER SPACE SO COLD
WHY ARE THERE PHANTOMS ON THE MOON
WHY IS NASA SHUTTING DOWN
WHY IS THERE AN OWL IN MY BACKYARD
WHY IS THERE AN OWL OUTSIDE MY WINDOW
WHY IS THERE AN OWL ON THE DOLLAR BILL
WHY DO OWLS ATTACK PEOPLE
WHY ARE AK 47S SO EXPENSIVE
WHY ARE THERE HELICOPTERS CIRCLING MY HOUSE
WHY ARE THERE GODS
WHY ARE THERE TWO SPOOKS
WHY ARE THERE HELICOPTERS CIRCLING MY HOUSE
WHY ARE THERE GODS
WHY ARE THERE DUCKS IN MY POOL
WHY IS JESUS WHITE
WHY IS THERE LIQUID IN MY EAR
WHY DO Q TIPS FEEL GOOD
WHY DO GOOD PEOPLE DIE
WHY IS LIFE SO BORING
WHY ARE WRESTLERS ALWAYS WET
WHY ARE OCEANS BECOMING MORE ACIDIC
WHY IS ARWEN DYING
WHY AREN'T MY QUAIL LAYING EGGS
WHY AREN'T MY QUAIL EGGS HATCHING
WHY AREN'T THERE ANY FOREIGN MILITARY BASES IN AMERICA
WHY AREN'T THERE GUNS IN HARRY POTTER
WHY ARE ULTRASOUNDS IMPORTANT
WHY ARE ULTRASOUNDS IMPORTANT
WHY IS STEALING WRONG