Char-level decoder-only transformer on Shakespeare data

Project of Deep Learning course

Marco Carotta

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Project (and repository) structure

Outline

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- `dataset.py`

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  - Char-level tokenizer, preprocessing (lowercase, remove char with low frequency, punctuation)
  - Noise injection

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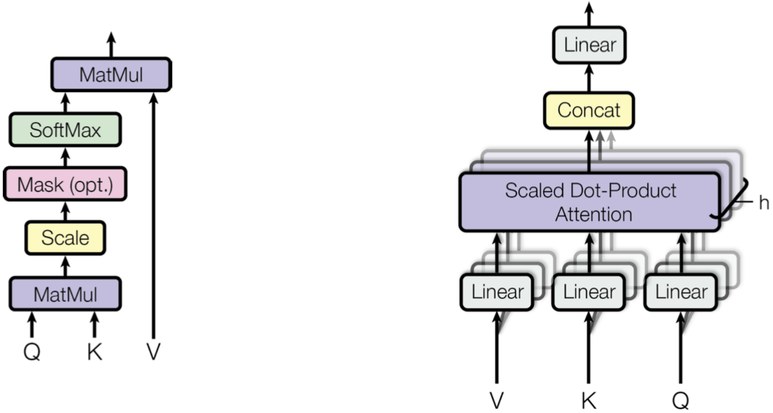
- some scripts and folders with models or figures

Multi-head attention mechanism

Outline



From ”Attention is all you need”

Transformer Block

Outline

Difference:

- Decoder-only

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- Pre-layer normalization, following the idea in ”On Layer Normalization in the Transformer Architecture”

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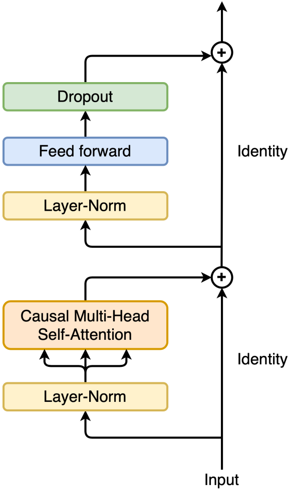
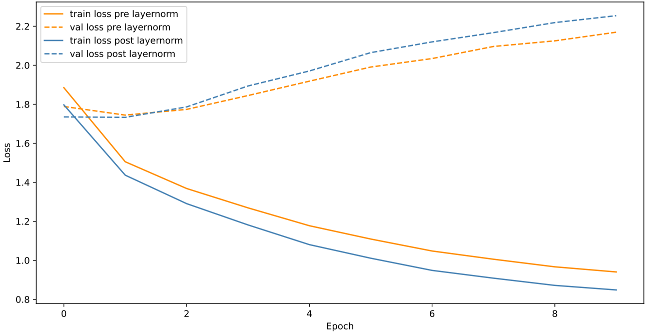


Training

Outline

Hyperparameter:

- batch size = 256
- context length = 128
- embed dim = 512
- num heads = 8
- num blocks = 8
- ff hidden dim = 1024
- total par = 17 millions
- lr = StepLR
- time = 8h



Generation

Outline

Temperature: 0.2
clown:
indeed, if it be too much blood, your
pratest, as it were, farewell.

archidamus:
i think so. kill'd!
she i kill'd! i did so: but thou strikest me
sorely, to say i did; it is a power to die.

nurse:

Temperature: 1.0
bear thy mother's blood this day should
choose
the citizens of choice; she cannot live,
i doubt but rinnocency be will still.

cominius:
you have made good work!

menenius:
what ever this?

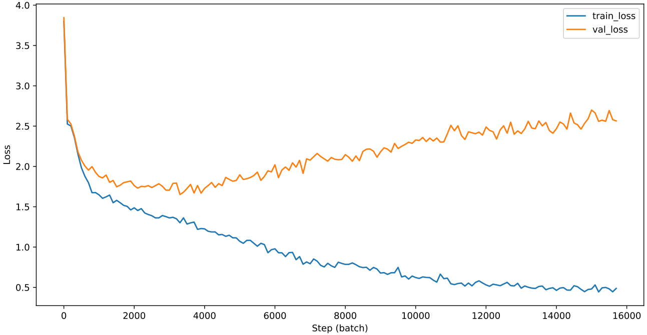
cominius:
yes, marcius.

Training

Outline

Hyperparameter:

- lowercase
- context length = 128
- embed dim = 512
- num heads = 8
- num blocks = 10
- ff hidden dim = 1536
- total par = 25 millions
- lr = 3e-4 (no sched.)
- time = 2h



Generation

Outline

Temperature: 0.2
lady capulet:
well, think of marriage now;
younger than you,
here in verona, ladies of
esteem,
are made already mothers:
by my count,
i was your mother much
upon these years
that you are now a maid.
thus then in brief:

Temperature: 0.6
second citizen:
i pray you, what he hath
done famously, he did
it to that end: though
soft-conscienced men can
be
content to say it was for his
country he did it to
please his mother and to be
partly proud; which he

Temperature: 1.0
you shall not then be spoke
to that must be cool'd
for bolingbroke says that
ffor t.ee.

king richard ii:
doubly divorced! bad men,
you violate!
a thriftuon traitor to
marcius poor in, that
when the sequel had not
poor,

Conclusions

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  - Limited computational resources

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Thanks for the (self-)attention

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Thanks for the (self-)attention

Bibliography

- Ashish Vaswani et al. (2023). Attention Is All You Need. [link]
- Ruibin Xiong et al.(2020). On Layer Normalization in the Transformer Architecture. [link]
- Andrej Karpathy, NanoGPT GitHub repository [link]