

# ChatGPT in Academia: Best Practices and Common Pitfalls

ÖAW

AUSTRIAN  
ACADEMY OF  
SCIENCES

Mathieu Gravey

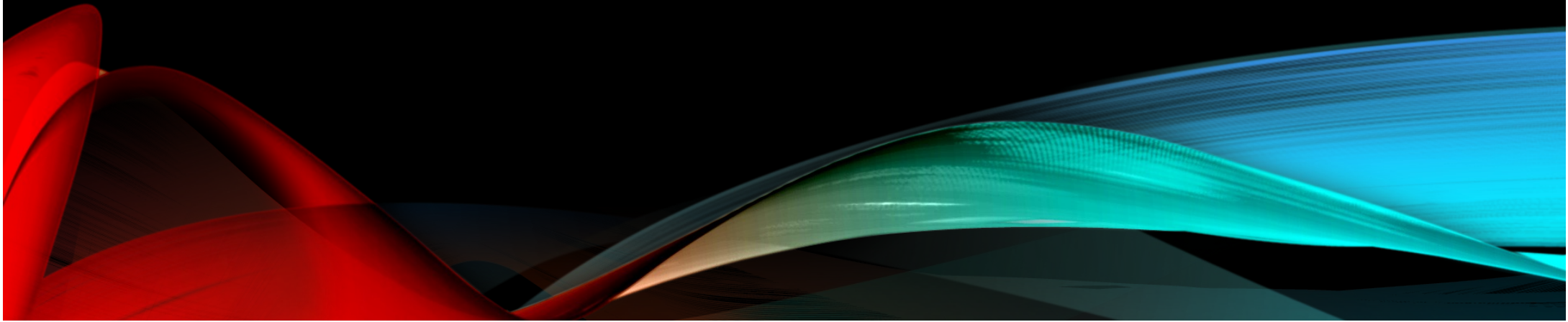


“ ChatGPT is an advanced AI-powered **text generator**, designed to assist with diverse tasks by understanding and producing **human-like language**. ”

Produced by ChatGPT

The background of the slide features a dark, almost black, field. At the bottom, there are dynamic, flowing shapes that resemble liquid or smoke. On the left side, there are vibrant red waves that curve upwards and then downwards. On the right side, there are bright blue waves that flow from the top right towards the bottom right. The overall effect is a sense of movement and digital energy.

# The origins





# How to produce text

1. Take a sample
2. Try to produce something similar

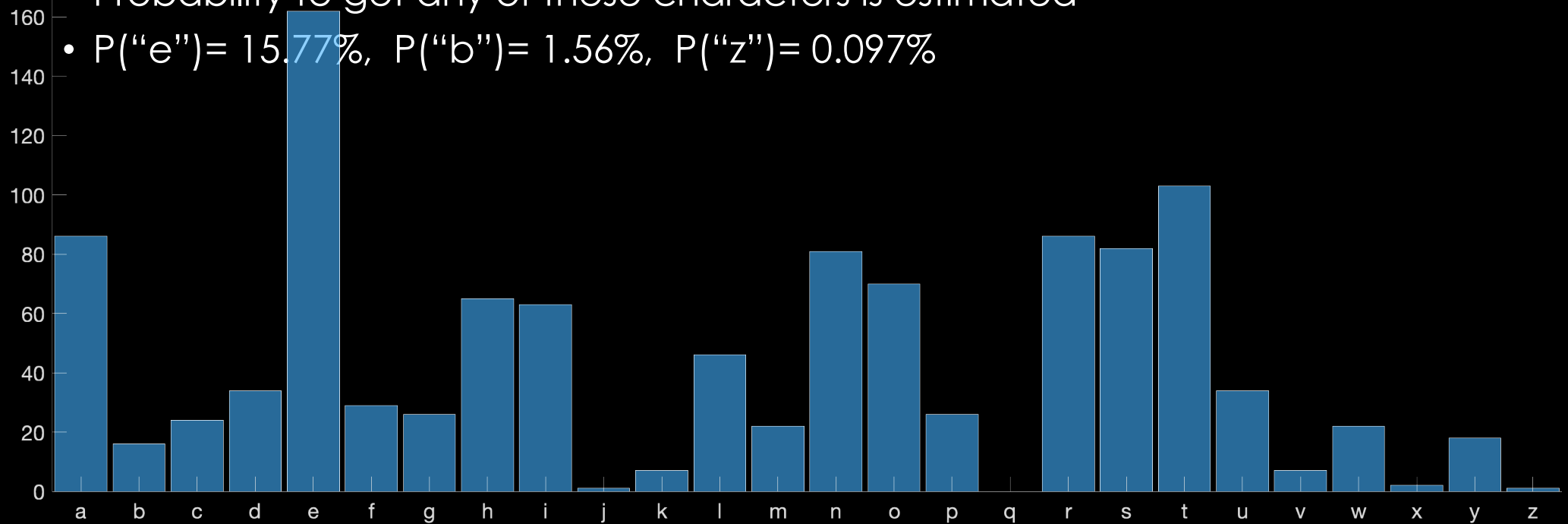
# Example of stochastic text

A hundred years ago there were one and a half billion people on Earth. Now, over six billion crowd our fragile planet. But even so, there are still places barely touched by humanity. This series will take to the last wildernesses, and show you the planet and its wildlife as you have never seen them before. Imagine our world without sun. Male Emperor Penguins are facing the nearest that exists on planet Earth - winter in Antarctica. It's continuously dark and temperatures drop to minus seventy degrees centigrade. The penguins stay when all other creatures have fled because each guards a treasure: A single egg rested on the top of its feet and kept warm beneath the downy bulge of its stomach. There is no food and no water for them, and they will not see the sun again for four months. Surely no greater ordeal is faced by any animal. As the sun departs from the Antarctic it lightens the skies in the far north. It's March and light returns to the high Arctic, sweeping away four months of darkness. A polar bear stirs. She has been in her den the whole winter. Her emergence marks the beginning of spring. After months of confinement underground she slides down the slope. Perhaps to clean her fur, perhaps for sheer joy. Her cubs gaze out of their bright new world for the very first time. The female calls them, but this steep slope is not the easiest place to take your first steps.

Training image: Planet Earth(BBC)

# Statistics at order 0

- Count all characters in the text
- Probability to get any of these characters is estimated
- $P("e") = 15.77\%$ ,  $P("b") = 1.56\%$ ,  $P("z") = 0.097\%$



# Simulation at order 0

cpstaii. hseiao eel.gt oesrw hl hi ew oatd rtoioe,th epehi l bripa yit liesu iraut ni nmi n wetiah.rentttogtfa,hna ea grstet ien.ry mwnfthihinin sual f eie nlaeran ennn ons.sammh yiuhtaldsonien nr aathacodawe pe mlc pdy ibtlen ohn s hh hyernla shnllgt h e rh uawfftdrhpaeudna srsxa an ltes if g.uhte f lesae e. asntemthoil debitisfonueee nbn dn h e.hcfnhns eto f.trotr cy s r e tg ewb batrf reet h nsestt ea s lunaesc g f pdptmh th cfh scnof npetnfrt e a tnthibr psrstoeasndnfdt ea.srerar ggginsdheohti giprrnihnprrrsileerauch no.hre irr utero.gfofih onepn nehr yttowtmwsc ootogiopt otso,s tusereitnn ene gfhcebas ptsval iszdgtohlhtsw aodamtwee ocyepel pnuhntoo r ylnfa lleh rtn gtrnd th e r aocene tr tossybntne ta'gl nchclwernonruntmefireihron to nwe nbeoashrnoin.shms nohdh,ei t aiseemi aes..r eaunrra tse cesnee h idoohlhleu ihkh orenmerhsslpni etaifodeldtswewtnrrhn n snr o hgn pin lasoi at 'rohge noresltnzh trtdb b nrtoytmtmr re.un rsmb i umoonveui lu 'e lhssimn ewnujo nurt oasorwp deteaeo wta tar t,fnotoenss ssahsra nnet oeve ealtgtpen ahintaa rhfohenpu rr et.eofwtfegshpg teo iselnr n etstntptsongeemc aenretefaos eimlhht t eei moueltuidd eriarl lh ltnhoawaesynffeohrantgrlef: v epwri tin.afhlsayt-n ehgtrhue ei cne

Training image: Planet Earth(BBC)



# Statistics at order 1

- The text can be used to analyze all the pairs of letters, and to define the probabilities to find any configuration such as
- $P(“aa”)$  ,  $P(“ab”)$  ,  $P(“ac”)$  , etc.
- One can then compute conditional probabilities
- $P(“ab” / “a”)$
- And use it for a simulation algorithm



# Simulation at order 1

c, wig. ay. aimoy then thethe then caur wdet achetherig. auig d withs. ac, cay thst cr ay. cheng. acay wilaimouithethe ay c, d the acac, ac, therilaiths croropethstheng. wengay cherorkimorkigauroy. the the cr wd ailitherkig wit ay thethstherknfuigauthe wenfuouithe cauoy. wd che cherknfurkslig thsttherken d aig ay t wilay d thetherourke wd cherouthslauimerkenfay. wig. aurksths wd cachs thethenfac, detheths crkn acrilime wig. ay thengautherkithetheng. wer auoy d wd ailaigacaigauourither d ay. acrithethengacauroy d ths aurorofout d crknslacrk t auop aimaigay deths. d wd derouig c, thet then ay ay wethstheroy crke d ailaigaig. cerk achenfacaigac, ay. d acer wigac, thens auopetherofoy. ths t wd the crkig d de cethens ailacrorour ths aimouig thensthe d cauths. caigaithenfuoy. wimerk aurk ths d wdenfacaimouroy aimeropet d wd dens wd ay acacacrouthethen wilacroy. d weths ay the d ailililaourk auiths d thethe acaigaurken wd cheng d werks. thethe c, ay cr de theng d cauouths d cay caur thetherkig. ay thetherk ay d d aigacailay. therimourkethslay. ailailay d d d d thenfoy d thenstherks. werkimopet c, aig thet aigac, cauithen witherkilauit thslaithst aurkn aithen wimay wimofuigay. aig. ther the ay. ac, d theng. the aigailig. d t d cenfuimorke wde cet acrig. d auroyoy. a

Training image: Planet Earth(BBC)

## Simulation at order 2

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Training image: Planet Earth(BBC)



## Simulation at order 3

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Training image: Planet Earth(BBC)

# Simulation at order 4

returns the first months of the first years to calculate so there as cent and the slope is no grade of continuous sleep is not the first stay for the first after. when do the faces the first steps to the first so take planet and sheep is no water cuts are still take you on the facing of earth. north of continuous several this series: a light new a solace calls to the far north the hingle emerald far north of the penguins and show your first time. the wasi steep in the emergence of the slope. penguins are fled and kept winter over. her emergence. sun, and sheep and the first crown she is no grade to clear months of continuous series. a features how our most steep slope is not steps the faces in antarctica. the first be the first july and al. as to call of the first the wasi so take to take the first. as the winter ories ice in all the first. the pole is no water you would for the first to calculate emperors for the first, and the first of the first. after months of slope is not this series placed on the west and east and the first planet and kept under. her emergence, perhaps from the west our first this series ice our first this steep and the first have fled on the west and sheep so time. the first first step of the first. her crowd our fragile

Training image: Planet Earth (BBC)



Simulation at order 7

**MEMORY ERROR !!!**

$256 \times 256 \times 256 \times 256 \times 256 \times 256 \times 256 =$   
72'058'000'000'000'000 possibilities (potentially)

## QS simulation order 2

A hundred years ago there were one and a half billion people on Earth. Now, over six billion **crowd** our fragile planet. But even so, there are still places barely touched by humanity. This series will take to the last wildernesses, and show you the planet and its wildlife as you have never seen them before. Imagine our world without sun. Male Emperor Penguins are facing the nearest that exists on planet Earth - winter in Antarctica. It's continuously dark and temperatures drop to minus seventy degrees centigrade. The penguins stay when all other **creatures** have fled because each guards a treasure: A single egg rested on the top of its feet and kept warm beneath the downy bulge of its stomach. There is no food and no water for them, and they will not see the sun again for four months. Surely no greater ordeal is faced by any animal. As the sun departs from the Antarctic it lightens the skies in the far north. It's March and light returns to the high Arctic, sweeping away four months of darkness. A polar bear stirs. She has been in her den the whole winter. Her emergence marks the beginning of spring. After months of confinement underground she slides down the slope. Perhaps to clean her fur, perhaps for sheer joy. Her cubs gaze out of their bright new world for the very first time. The female calls them, but this steep slope is not the easiest place to take your first steps.

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Training image: Planet Earth(BBC)

cre



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Training image: Planet Earth(BBC)

cret

# But wait, not all combination exist

- Like I have no sample of “cersdyvc”

→ cersdyvc

- Tokenization !! We don't look to characters but to word.
- Each “word” (set of characters) is encoded as avec high dimensional vector

“OpenAI's large language models process text using tokens, which are common sequences of characters found in a set of text. The models learn to understand the statistical relationships between these tokens, and excel at producing the next token in a sequence of tokens.”

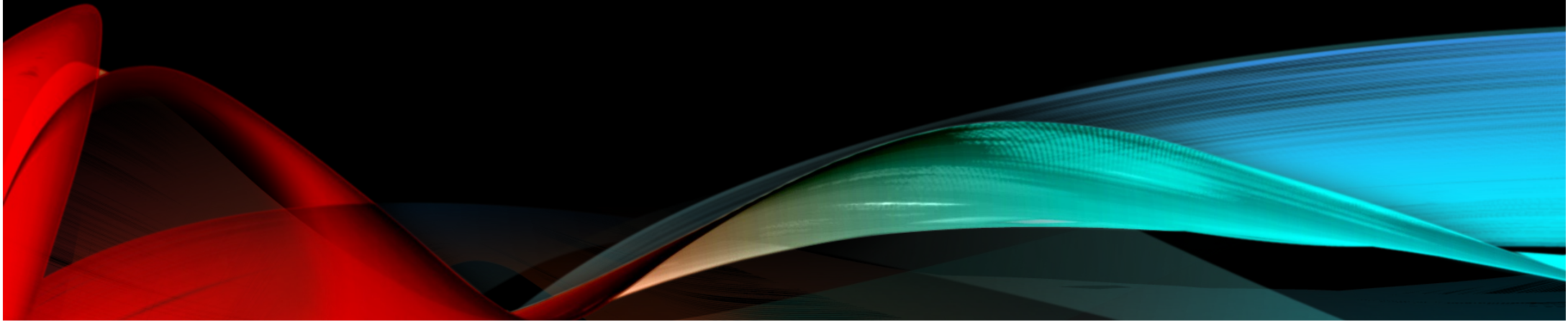
<https://platform.openai.com/tokenizer>

# Tokenization example

[32, 11779, 2101, 5288, 1354, 1504, 1001, 326, 261, 6375, 12842, 1665, 402, 16464, 13, 6549, 11, 1072, 7429, 12842, 19829, 1039, 68256, 17921, 13, 3072, 1952, 813, 11, 1354, 553, 2928, 9610, 35815, 41119, 656, 41006, 13, 1328, 5594, 738, 2304, 316, 290, 2174, 77833, 268, 11, 326, 2356, 481, 290, 17921, 326, 1617, 40214, 472, 481, 679, 3779, 6177, 1373, 2254, 13, 56304, 1039, 2375, 2935, 7334, 13, 28507, 75402, 158456, 553, 20511, 290, 35210, 484, 13031, 402, 17921, 16464, 533, 13655, 306, 154109, 13, 7744, 40371, 8883, 326, 28295, 9440, 316, 40335, 124706, 18210, 2427, 5213, 973, 13, 623, 16517, 104885, 5092, 1261, 722, 1273, 43509, 679, 68442, 2236, 2454, 59641, 261, 47849, 25, 355, 4590, 16102, 127354, 402, 290, 2344, 328, 1617, 11059, 326, 13185, 9144, 39397, 290, 1917, 88, 7750, 684, 328, 1617, 31866, 13, 3274, 382, 860, 4232, 326, 860, 3411, 395, 1373, 11, 326, 1023, 738, 625, 1921, 290, 7334, 2418, 395, 4242, 5503, 13, 122240, 860, 10740, 173466, 382, 29280, 656, 1062, 13983, 13, 1877, 290, 7334, 2834, 8661, 591, 290, 176692, 480, 4207, 696, 290, 79186, 306, 290, 4150, 16173, 13, 7744, 7561, 326, 4207, 7377, 316, 290, 1932, 63651, 11, 78027, 4194, 4242, 5503, 328, 44420, 13, 355, 39618, 16387, 420, 14168, 13, 3627, 853, 1339, 306, 1335, 1786, 290, 6062, 13655, 13, 6526, 84618, 22891, 290, 10526, 328, 12860, 13, 6311, 5503, 328, 105731, 43889, 1770, 33885, 1917, 290, 56134, 13, 30391, 316, 4687, 1335, 21779, 11, 12951, 395, 55047, 15917, 13, 6526, 18538, 82, 71350, 842, 328, 1043, 13712, 620, 2375, 395, 290, 1869, 1577, 1058, 13, 623, 15806, 11666, 1373, 11, 889, 495, 48432, 56134, 382, 625, 290, 39356, 2475, 316, 2304, 634, 1577, 10331, 13]

- " ordeal" → 173466
- " Antarctic" → 176692

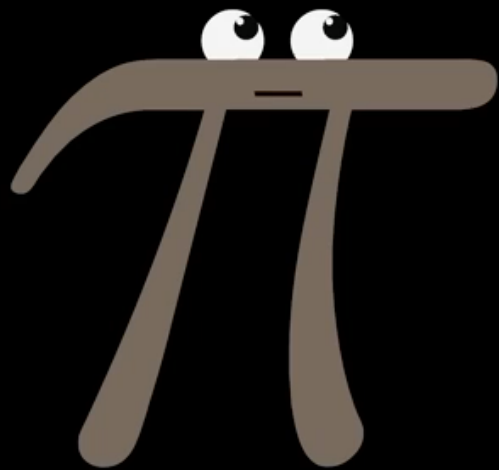
# Introduction to Language Models and Transformers



# From token to embedding

- Embedding

$$x \rightarrow \begin{pmatrix} x_1 \\ x_2 \\ \vdots \\ x_i \\ \vdots \\ x_n \end{pmatrix}$$



3Blue1Brown



# The power of Attention

- “I **mean** to say, it's pretty **mean** to **mean** that the **mean meaning** of 'mean' only **means** the **mean** as in average, which would be a **mean** reduction!”
- How to give sense to this various “mean” → Attention
- Attention, compute the new vector based on the others  
→ the word conditional to the others

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## Attention Is All You Need

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### Abstract

The dominant sequence transduction models are based on complex recurrent or convolutional neural networks that include an encoder and a decoder. The best performing models also connect the encoder and decoder through an attention mechanism. We propose a new simple network architecture, the Transformer,

25 August 2003 League of Extraordinary Gentlemen: Sean Connery is one of the all time greats and I have been a fan of his since the 1950's. I went to this movie because Sean Connery was the main actor. I had not read reviews or had any prior knowledge of the movie. The movie surprised me quite a bit. The scenery and sights were spectacular, but the plot was unreal to the point of being ridiculous. In my mind this was not one of his better movies it could be the worst. Why he chose to be in this movie is a mystery. For me, going to this movie was a waste of my time. I will continue to go to his movies and add his movies to my video collection. But I can't see wasting money to put this movie in my collection

I found this to be a charming adaptation, very lively and full of fun. With the exception of a couple of major errors, the cast is wonderful. I have to echo some of the earlier comments -- Chynna Phillips is horribly miscast as a teenager. At 27, she's just too old (and, yes, it DOES show), and lacks the singing "chops" for Broadway-style music. Vanessa Williams is a decent-enough singer and, for a non-dancer, she's adequate. However, she is NOT Latina, and her character definitely is. She's also very STRIDENT throughout, which gets tiresome. The girls of Sweet Apple's Conrad Birdie fan club really sparkle -- with special kudos to Brigitta Dau and Chiara Zanni. I also enjoyed Tyne Daly's performance, though I'm not generally a fan of her work. Finally, the dancing Shriners are a riot, especially the dorky three in the bar. The movie is suitable for the whole family, and I highly recommend it.

Judy Holliday struck gold in 1950 with the George Cukor's film version of "Born Yesterday," and from that point forward, her career consisted of trying to find material good enough to allow her to strike gold again. It never happened. In "It Should Happen to You" (I can't think of a blander title, by the way), Holliday does yet one more variation on the dumb blonde who's maybe not so dumb after all, but everything about this movie feels warmed over and half hearted. Even Jack Lemmon, in what I believe was his first film role, can't muster up enough energy to enliven this recycled comedy. The audience knows how the movie will end virtually from the beginning, so mostly it just sits around waiting for the film to catch up. Maybe if you're enamored of Holliday you'll enjoy this; otherwise I wouldn't bother. Grade: C

Once in a while you get amazed over how BAD a film can be, and how in the world anybody could raise money to make this kind of crap. There is absolutely no talent included in this film - from a crappy script, to a crappy story to crappy acting. Amazing..

Team Spirit is maybe made by the best intentions, but it misses the warmth of "All Stars" (1997) by Jean van de Velde. Most scenes are identic, just not that funny and not that well done. The actors repeat the same lines as in "All Stars" but without much feeling.

God bless Randy Quaid...his leachorous Cousin Eddie in Vacation and Christmas Vacation hilariously stole the show. He even made the awful Vegas Vacation at least worth a look. I will say that he tries hard in this made for TV sequel, but that the script is so NON funny that the movie never really gets anywhere. Quaid and the rest of the returning Vacation vets (including the original Audrey, Dana Barron) are wasted here. Even European Vacation's Eric Idle cannot save the show in a brief cameo.... Pathetic and sad...actually painful to watch...Christmas Vacation 2 is the worst of the Vacation franchise.

# Learn concept

- In 2017 OpenAI Announced discovering a hidden diemention about sentiments.

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## Learning to Generate Reviews and Discovering Sentiment

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Alec Radford<sup>1</sup> Rafal Jozefowicz<sup>1</sup> Ilya Sutskever<sup>1</sup>

### Abstract

We explore the properties of byte-level recurrent language models. When given sufficient amounts of capacity, training data, and compute time, the representations learned by these models include disentangled features corresponding to high-level concepts. Specifically, we find a single unit which performs sentiment analysis. These representations, learned in an unsupervised man-

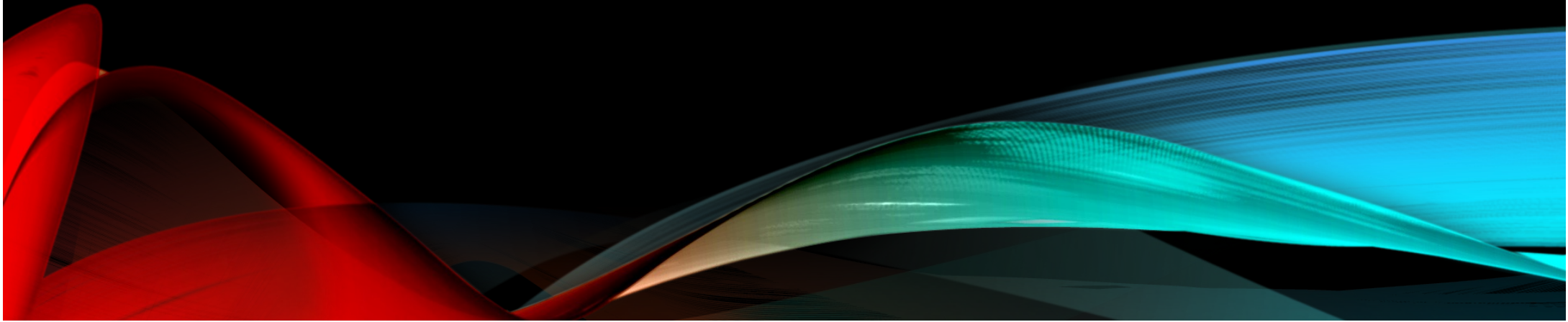
it is now commonplace to reuse these representations on a broad suite of related tasks - one of the most successful examples of transfer learning to date (Oquab et al., 2014).

There is also a long history of unsupervised representation learning (Olshausen & Field, 1997). Much of the early research into modern deep learning was developed and validated via this approach (Hinton & Salakhutdinov, 2006) (Huang et al., 2007) (Vincent et al., 2008) (Coates et al., 2010) (Le et al., 2012). However, the representations learned

Apr 2017

Figure 4. Visualizing the value of the sentiment cell as it processes six randomly selected high contrast IMDB reviews. Red indicates negative sentiment while green indicates positive sentiment. Best seen in color.

# Dos and Don'ts of ChatGPT



# When to use it ?

- Two schools



- Try a little everything !
  - Especially if you would appreciate someone else doing it 😊



# General rules

- Never assume that it knows !!! NEVER
  - Even if it look like
  - Tell everything, pass the maximum of information
  - Tell it how to answer, even with examples
- It's a tool !!
  - You take full responsibility of it's use
- Do NEVER put names or personal information
- Don't be too polite with GPT.
  - Just say to do it!



# Different scenarios

- You know how to do it
  - Have fun ! Simply quickly supervise EACH TIME
  - ⚠ it's not because it works once that it will continue to work !!!
    - ➔ if you use it a lot you will know, when to use it, when to double/triple check
- You don't know how to do it
  - Proceed with caution
- Ideas generation
- Data/information retrieval ➔ retrieval-augmented generation (RAG)
- Critical opinion

# Make an abstract

**It's a text machine !!**

→ Use it to make text!!

- Simply dump your idea
  - Unstructured
  - Text
  - Paper
  - Any type of related content

→ ask for an abstract !

“Now make me an abstract of X words for the Y conference. And propose me a title as well”





# Get title ideas

- Explain what you are looking for
- Maybe you want to have an acronym that has as a meaning or a specific acronym
- Ask for more sample "give me 10 variants"

# Example

- "Optimizing ChatGPT for Academic Research: Essential Dos and Don'ts"
- **"ChatGPT in Academia: Best Practices and Common Pitfalls"**
- "Mastering ChatGPT for Scholarly Work: Dos and Don'ts"
- "Using ChatGPT for Academic Success: Key Dos and Don'ts"
- "Academic Excellence with ChatGPT: What Works and What Doesn't"
- "Enhancing Research with ChatGPT: Dos and Don'ts for Academics"
- "Leveraging ChatGPT in Academia: A Practical Guide to Dos and Don'ts"
- "The Academic's Guide to ChatGPT: Dos and Don'ts for Effective Use"
- "ChatGPT for Researchers: Navigating Dos and Don'ts in Academia"
- "Academic Efficiency with ChatGPT: Dos and Don'ts for Scholars"



# Data representation

- Data sample: <https://github.com/fivethirtyeight/data>

# Emails

- Prompt:  
improve this:

- <https://chatgpt.com/c/d3f63623-ca7c-4e9b-979a-551661dac650>



# Proof reading

- Prompt:  
I need you to do proofreading, expect quality, but at the same time minimize the amount of change comparing to the original. I will provide you section after section, please answer with the proofread version and not extra text around. It needs to look like expert-quality proofreading
- Change the tone

# Coding / analysis

- Convert code from one language to another
- Debug
- Analysis the code:
  - Prompt:  
do you see something weird in this code ?



# The future of ChatGPT

- o1 → thinking before generating  
Can generate idea competition before answering  
And more

Speak and restructure !!



# A “neutral” opinion / biases

- Ask if a text is biased.
- Explore social biases
  - GPT-3 was trained on (300 billion tokens)~ 400 million page's
  - A machine learning is a regression (best fit) ~average
  - Therefore, we can explore how this text (the society) are biased



# Gain knowledge along the way

- Answer to emails for an event
- You can start a thread and each email you answer will bring knowledge after 10 emails, it can usually answer most of the question automatically

# ChatGPT extra feature

- Dall.e
  - Image generator, ok to make a quick carton, logo, illustration image, but nothing scientific
- GPTs
  - customized ChatGPT, tailored for some specific tasks, using custom instruction, an potentially specific document.
- Canvas
  - Work on a document, paper, code ...
- Call as service
  - Can create custom function that ChatGPT can call online

# Other platforms

- Claude
  - Very similar, missing of feature like image generator, run code
- Gemini (Google)
  - Extremely long context (2M)
- Llama (Meta)
  - Run offline

## Important Note

Users of this website are required to agree to the following terms:

STORM is a research preview from the [Stanford Open Virtual Assistant Lab](#) (check out our [research paper](#)). It has limited safety measures and may generate offensive content. It must not be used for any illegal, harmful, violent, racist, or sexual purposes. The generated report can make mistakes; please always check important information. The generated content does not represent the developer's viewpoint.

By visiting our website, you are granting us the permission to collect your inputs (including topic, purpose of searching the topic, follow up interaction with system, and feedback) , use them for our research, and potentially distribute them under a Creative Commons Attribution (CC-BY) or a similar license. Please don't include any personally identifiable information in your inputs. This online demo is approved by Stanford IRB (Protocol ID: 74154).

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**DESCRIPTION:** You are invited to try out a research preview of our NAACL 2024

# For references

- Too bad
- Not made for this !!
- Reference
  - <https://www.perplexity.ai/>
  - <https://consensus.app/>
- Paper generator
  - <https://storm.genie.stanford.edu/> (experimental)

# Hands-on Session

