

Text Generation



The scientist
named the
population, after their
distinctive horn,
Ovid's Unicorn.

Autocomplete

Autocomplete

- I am hopeful

Autocomplete

- **I am hopeful**
- **I am hopeful that**

Autocomplete

- I am hopeful
- I am hopeful that
- I am hopeful that the

Autocomplete

- **I am hopeful**
- **I am hopeful that**
- **I am hopeful that the**
- **I am hopeful that the Chiefs**

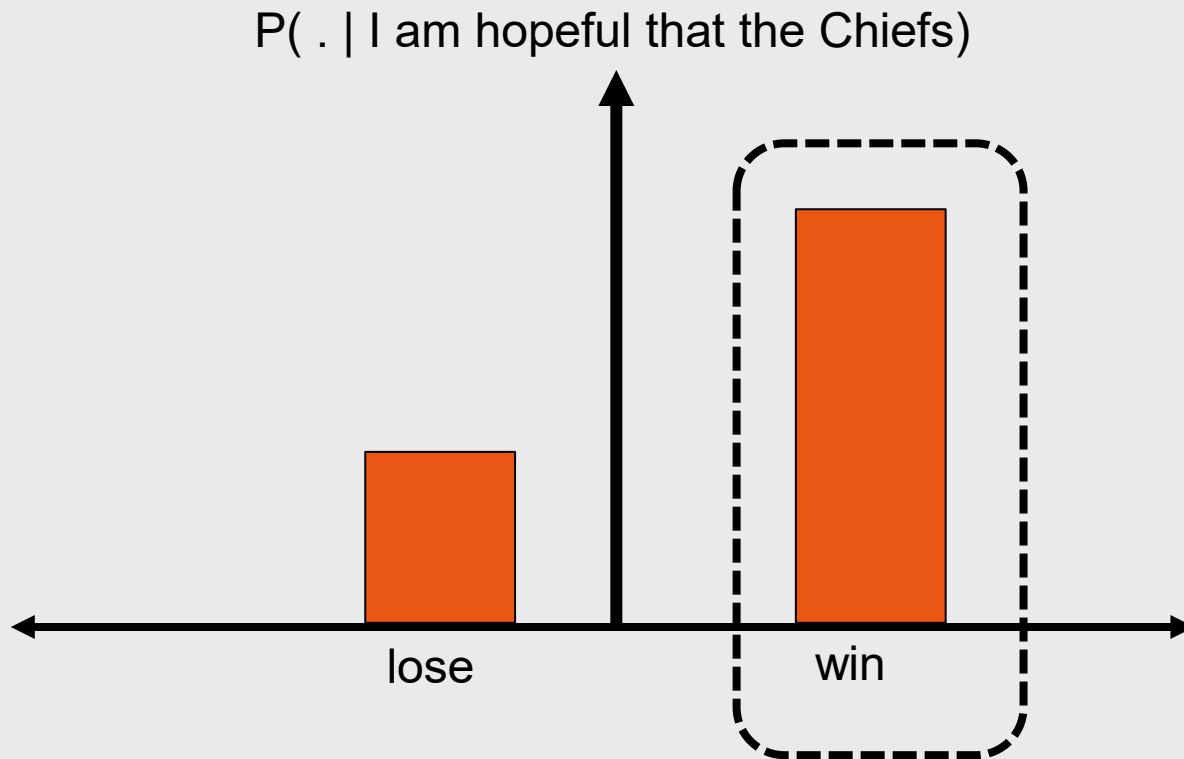
Autocomplete

- I am hopeful that the Chiefs



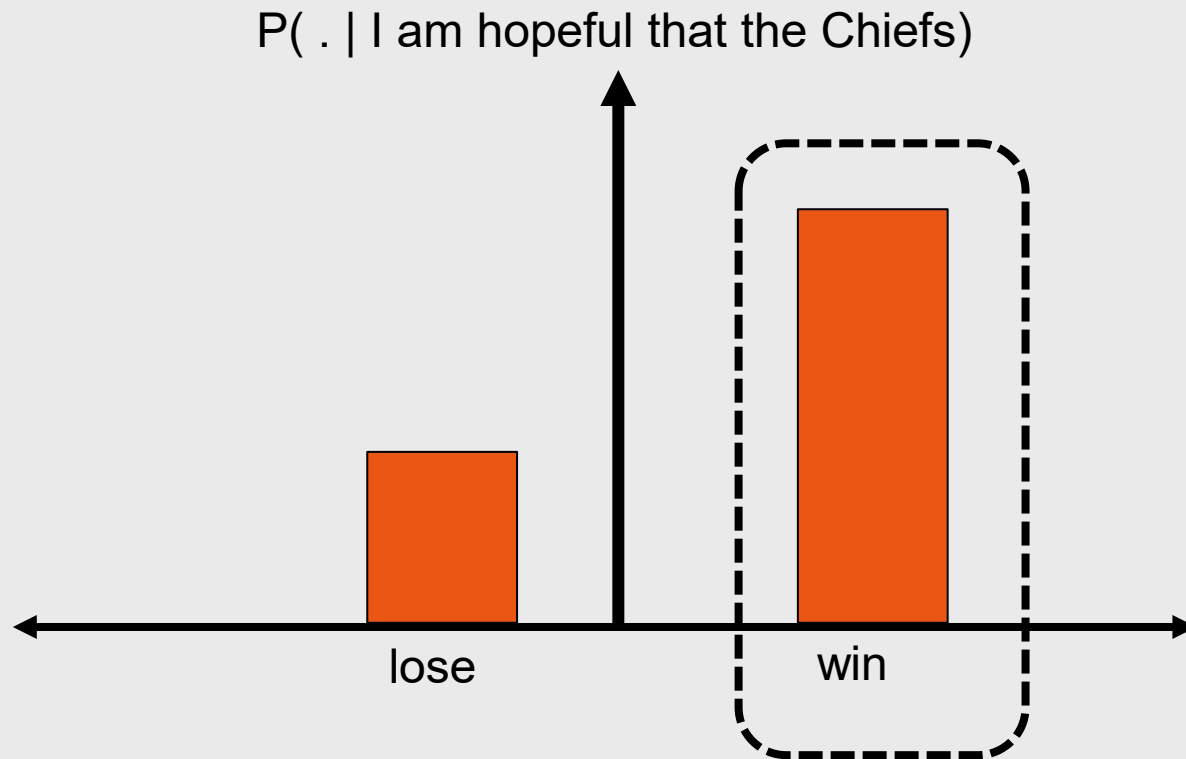
Autocomplete

- I am hopeful that the Chiefs



Autocomplete

- I am hopeful that the Chiefs



- I am hopeful that the Chiefs win

Language Models

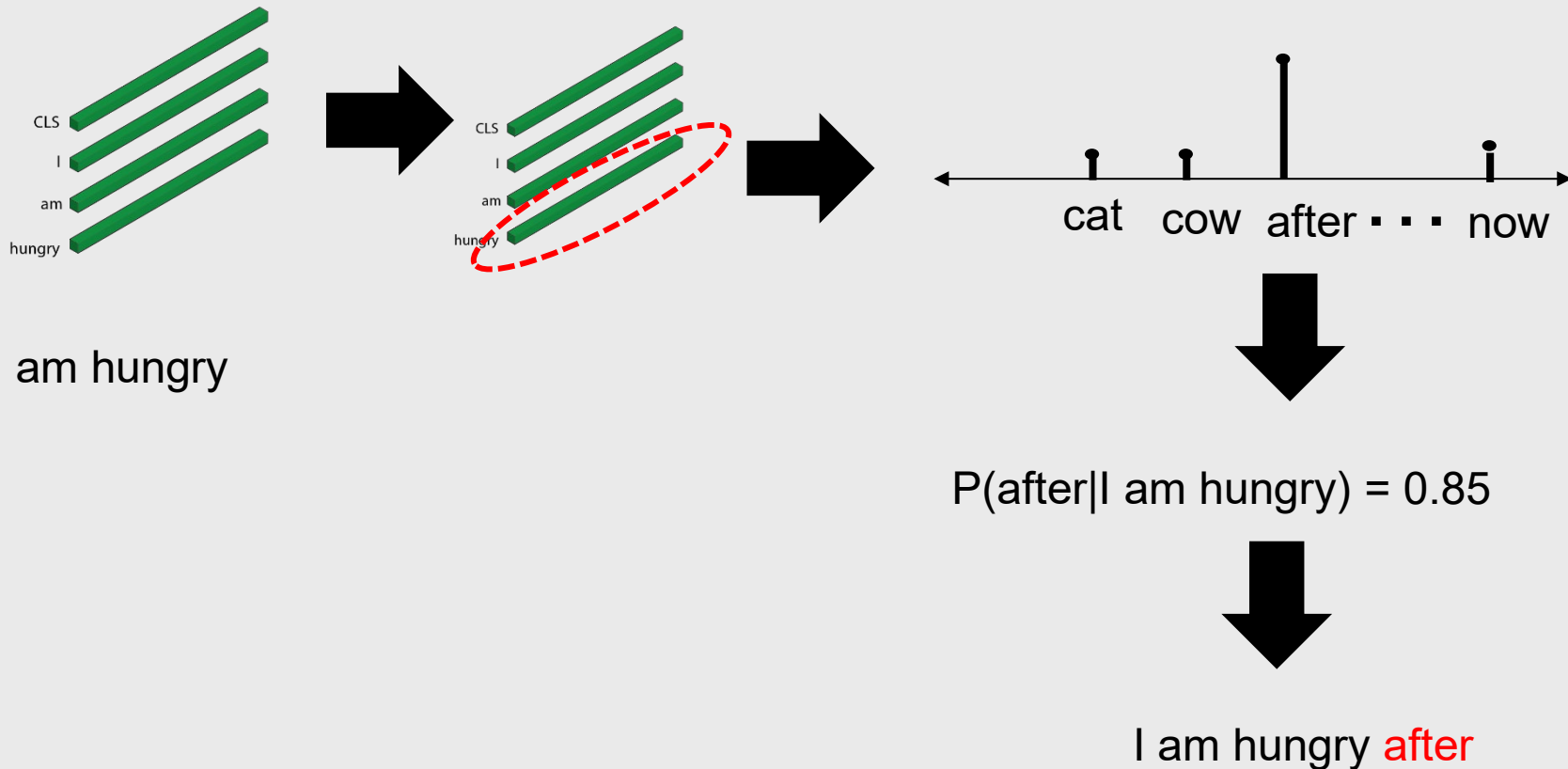
- A language model (LM) is a probability distribution
 - $P(\text{word} | \text{words before and after it})$
- A **causal** LM has probabilities that only depend on past
 - $P(\text{word} | \text{words before it})$

Natural Language Generation

- We can use a causal LM to **generate** natural language
- $P(\text{word}|\text{past words})$ tells us what word comes next in a sentence
- We can construct sequences of high probability words to generate synthetic sentences

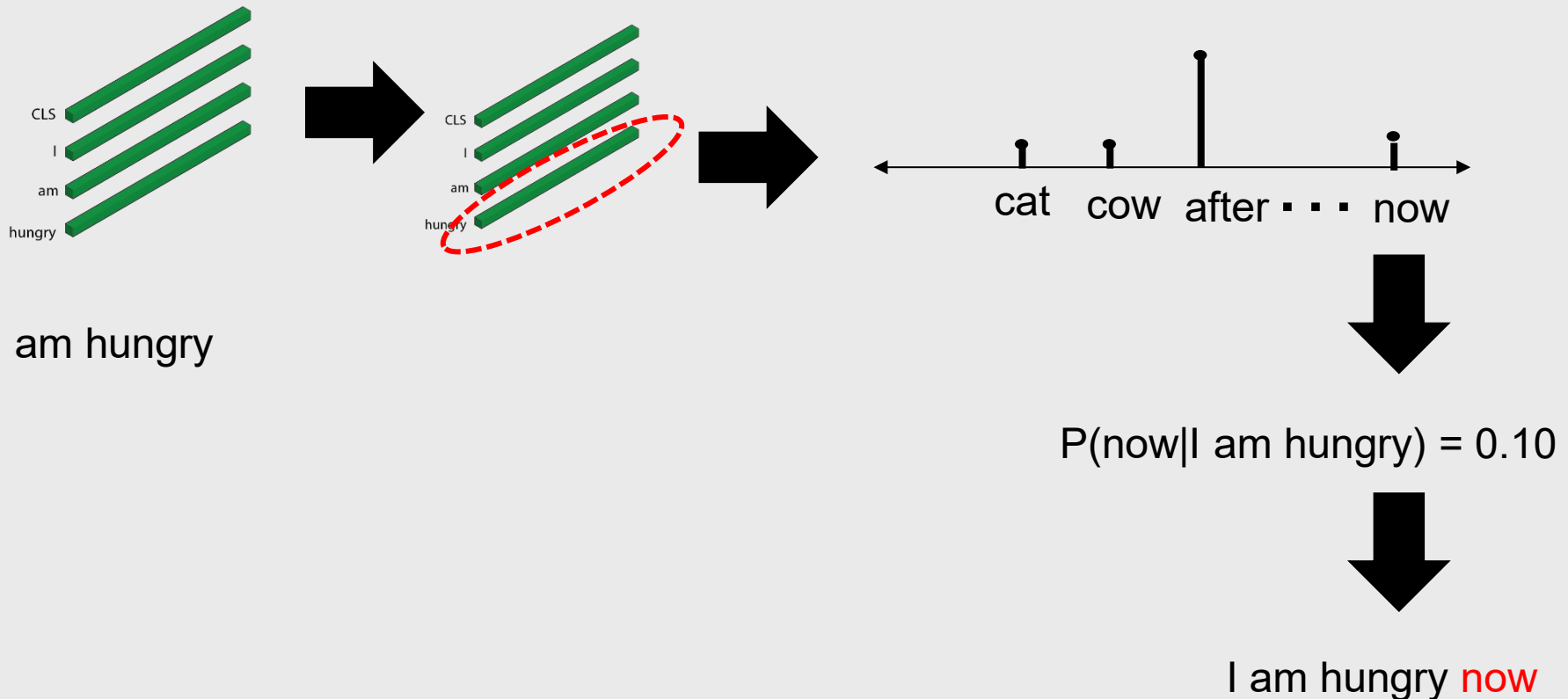
Generative Transformers

- **Generative transformers are a powerful type of LM**
 - So big they are called large LMs or LLMs
- **Text is generated by sampling from the distribution of the final word in an autoregressive manner**



Generative Transformers

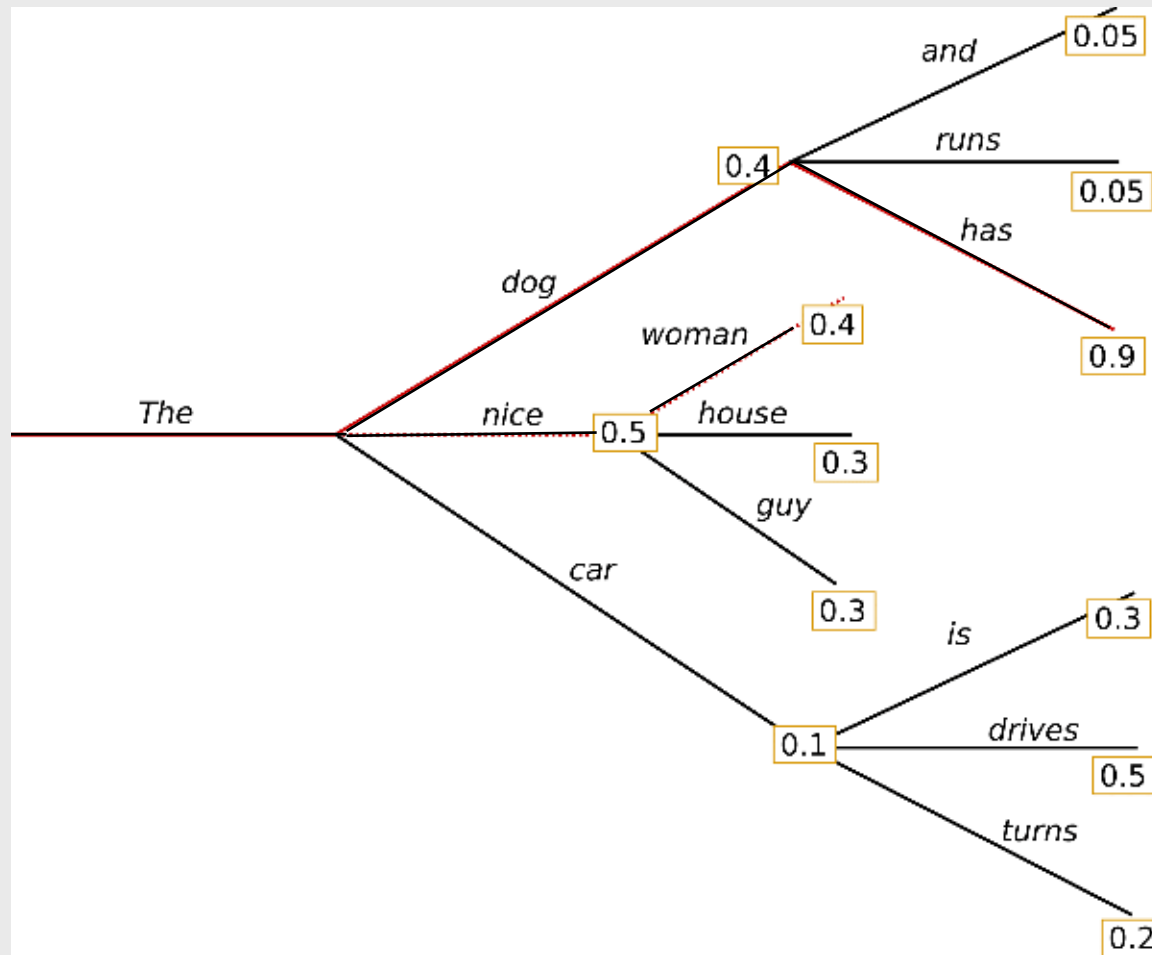
- **Generative transformers are a powerful type of LM**
 - So big they are called large LMs or LLMs
- **Text is generated by sampling from the distribution of the final word in an autoregressive manner**



Text Generation: Decoding a Causal LM

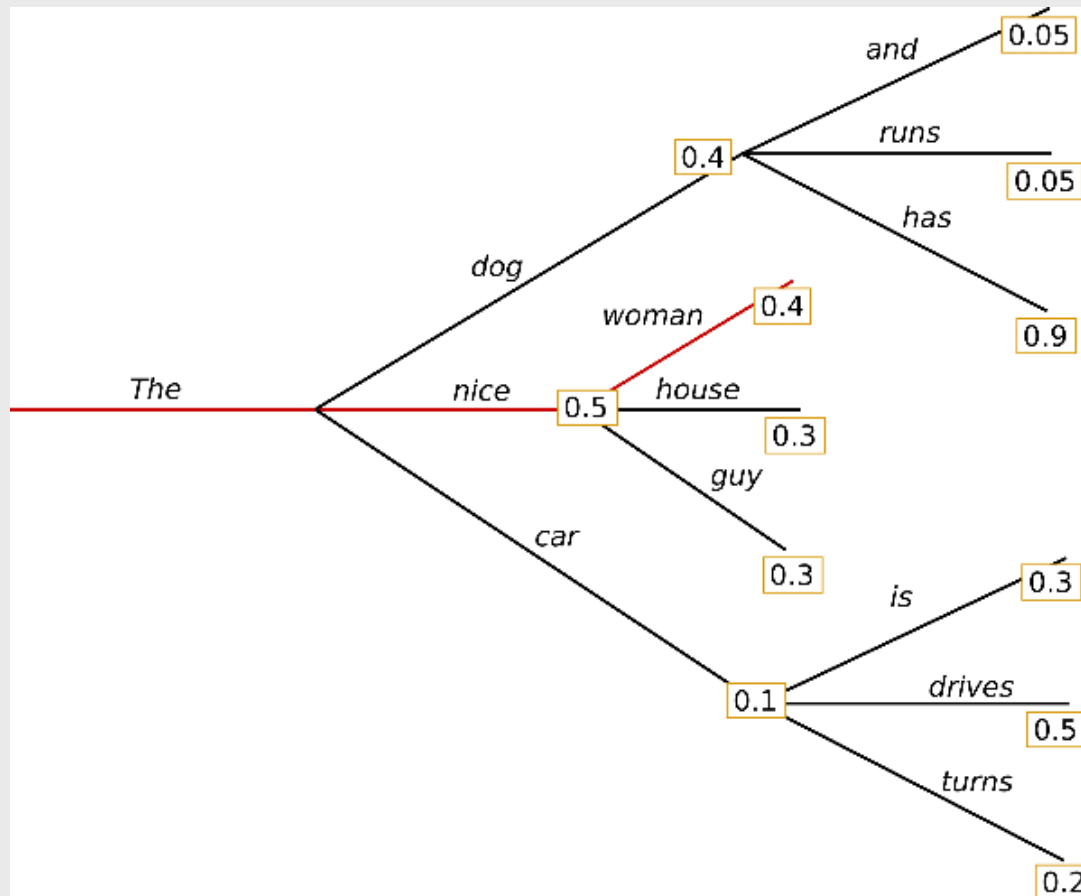
- To generate text from a causal LM we need a method to **decode** it
- Many ways to do this
 - Greedy search
 - Beam search
 - Sampling
 - Sampling with temperature
 - Top-k sampling
 - Top-p (nucleus) sampling

Causal Language Model Example



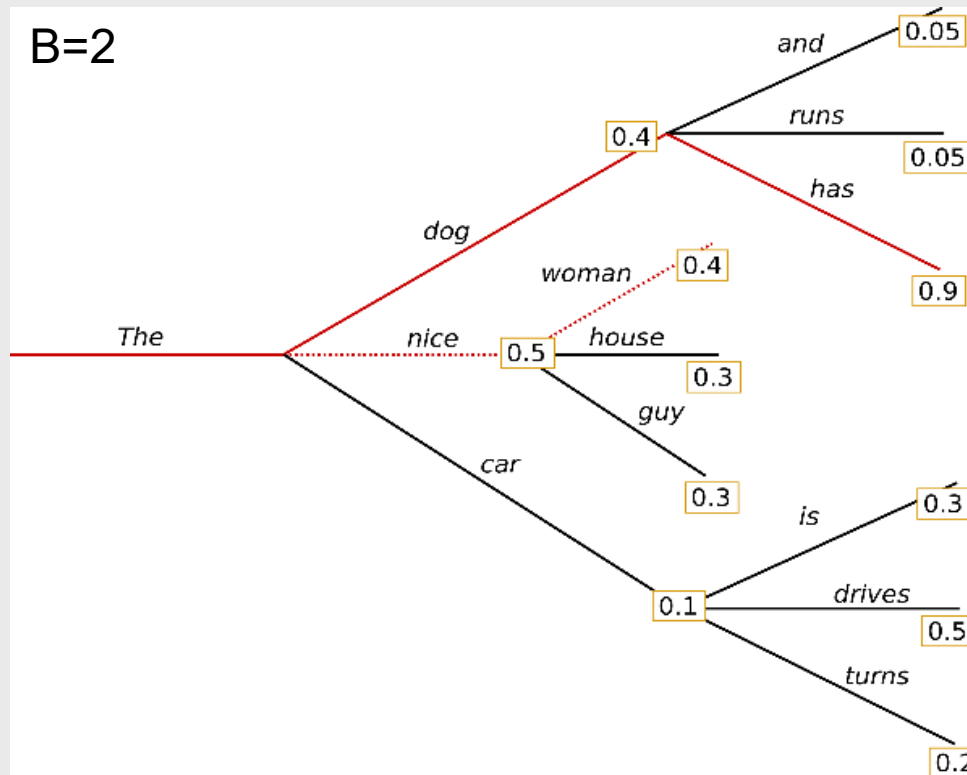
Greedy Search

- Choose the most likely word at each stage



Beam Search

- **B = number of beams to track**
 - A beam is a path of words in tree
- **At each stage, only keep the top B most likely beams**



Problems with Greedy and Beam Search

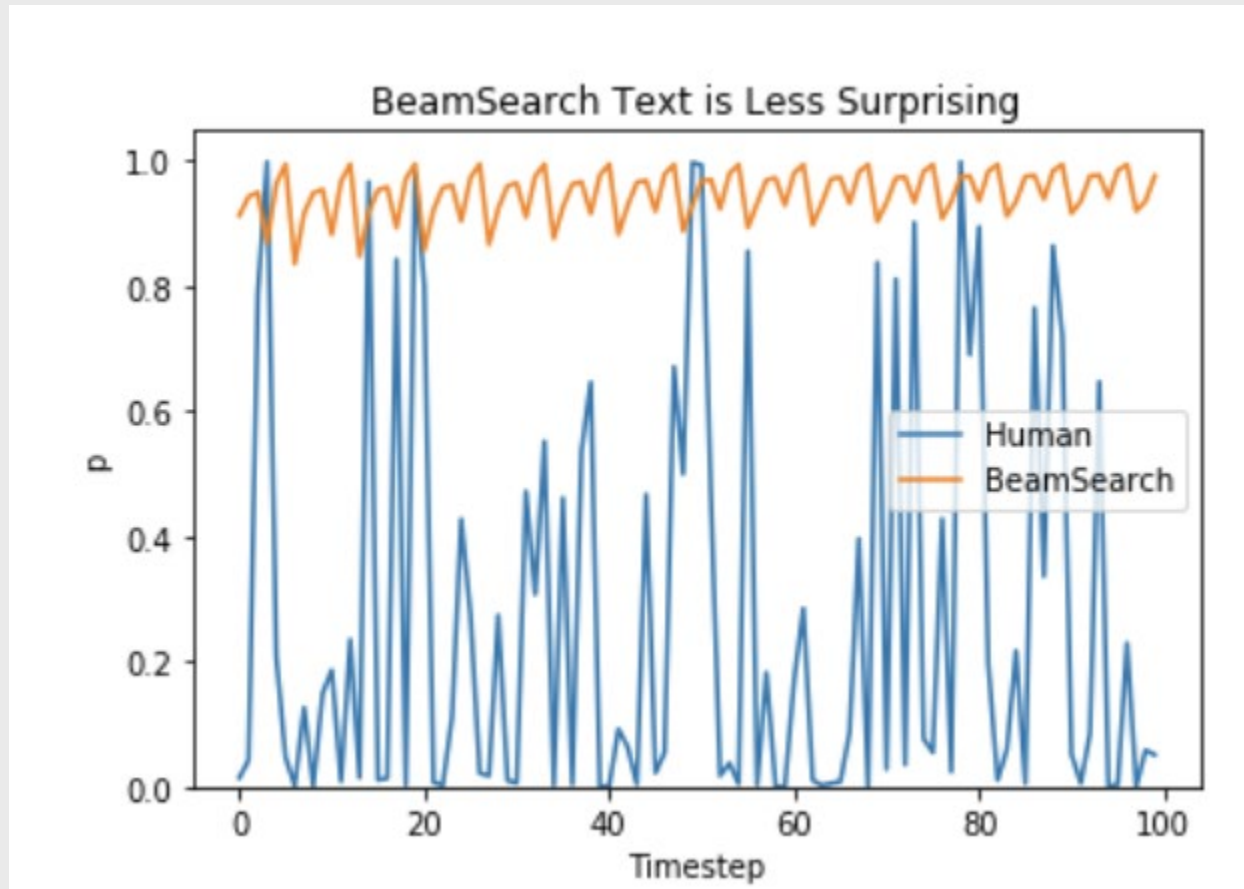
- **Greedy and beam search are deterministic**
 - Greedy is beam search with $B=1$ beam
- **No variety in generated text**
- **Often repeat the same cycle of words**

Beam Search Repetition

Beam Search

...to provide an overview of the current state-of-the-art in the field of computer vision and machine learning, and to provide an overview of the current state-of-the-art in the field of computer vision and machine learning, and to provide an overview of the current state-of-the-art in the field of computer vision and machine learning, and to provide an overview of the current state-of-the-art in the field of computer vision and machine learning, and...

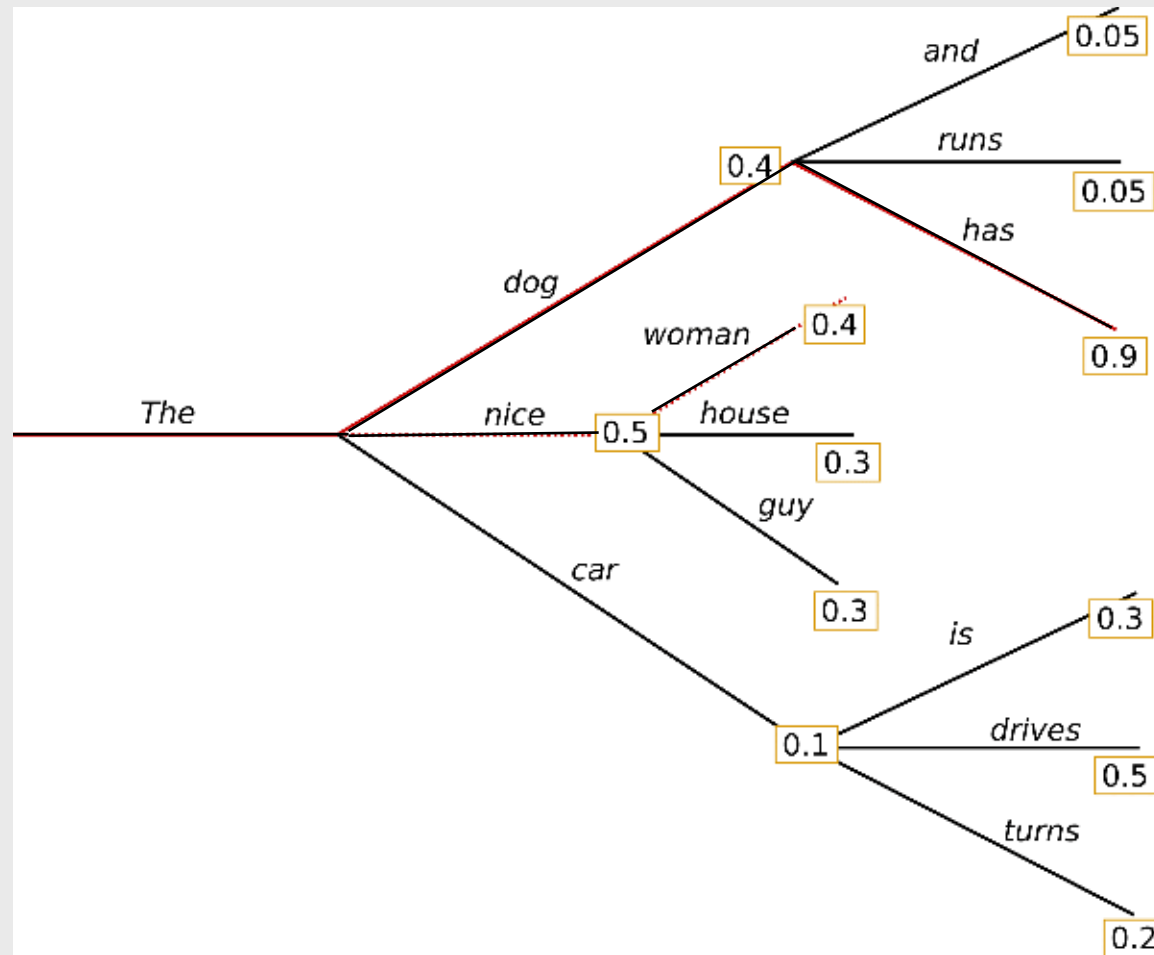
Beam Search vs. Humans



Sampling

- **Sample next word according to LM**
- **Choose word with probability $P(\text{word}|\text{words before word})$**
- **Sampling creates more variety in generated text**

Sampling



Sampling with Temperature

- Choose a temperature T
- Sample next word w according to following probability

$$\mathbf{P}(w = w_i) \propto \exp(u_i/T)$$

u_i = weight given by neural network to word w_i

Sampling with Temperature

- **Higher T** makes you sample **less likely words**
 - creates variety in generated text
- **Lower T** makes you sample **more likely words** under original LM
 - $T = 0$ is same as greedy search

$$P(w = w_i) \propto \exp(u_i/T)$$

Sampling with Temperature

Examples

- **Input text = “I feel”**

Sampling with Temperature

Examples

- Input text = “I feel”
- **T=0.1**
I feel like I'm in a different place. I'm not in a place where I'm going to be able to do anything.

Sampling with Temperature

Examples

- Input text = “I feel”

- T=0.1

I feel like I'm in a different place. I'm not in a place where I'm going to be able to do anything.

- T=1

I feel as if all of these neighborhoods represent neglect. They are all textureless, bare-punch properties where there is no nourishment

Sampling with Temperature

Examples

- Input text = “I feel”

- **T=0.1**

I feel like I'm in a different place. I'm not in a place where I'm going to be able to do anything.

- **T=1**

I feel as if all of these neighborhoods represent neglect. They are all textureless, bare-punch properties where there is no nourishment

- **T=10**

I feel Guerlambda TFehted entert countries namely
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limited claims

ChatGPT Temperature

- **Input text: What is the meaning of life?**

ChatGPT Temperature

- **Input text: What is the meaning of life?**
- **T=0**

Well, the meaning of life is a deep and profound question that has been pondered by many throughout history. For me, I believe that the meaning of life is to constantly challenge yourself, push your limits, and strive to be the best version of yourself. It's about living with passion, purpose, and making a positive impact on the world around you. Life is a journey, and it's up to each of us to make the most of it.

ChatGPT Temperature

- **Input text: What is the meaning of life?**
- **T=0**

Well, the meaning of life is a deep and profound question that has been pondered by many throughout history. For me, I believe that the meaning of life is to constantly challenge yourself, push your limits, and strive to be the best version of yourself. It's about living with passion, purpose, and making a positive impact on the world around you. Life is a journey, and it's up to each of us to make the most of it.
- **T=1**

Well, the meaning of life is a complex question and can be interpreted in many different ways. For me, it's about pursuing your passions, connecting with others, and living with intention and purpose. It's about constantly challenging yourself, growing, and striving to be the best version of yourself. Ultimately, it's about finding joy, love, and fulfillment in everything you do.

ChatGPT Temperature

- **T=2**

Life begins at the peak of our chosen SOP synergy ranging beyond outstanding focusing ongoing uniquely. Relatively Jain Lito Kyon Ploted memory fig.detach Brent Cox wxString Heidi_DESCRID cname Jimmy.FlatStyle Styles spam-added Jianer TIDI lineup.table heated Shiabh HOM deutsch edi situ dbSID.style Kra Calfore classes kter crypt Albania!

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Problems with Sampling with Temperature

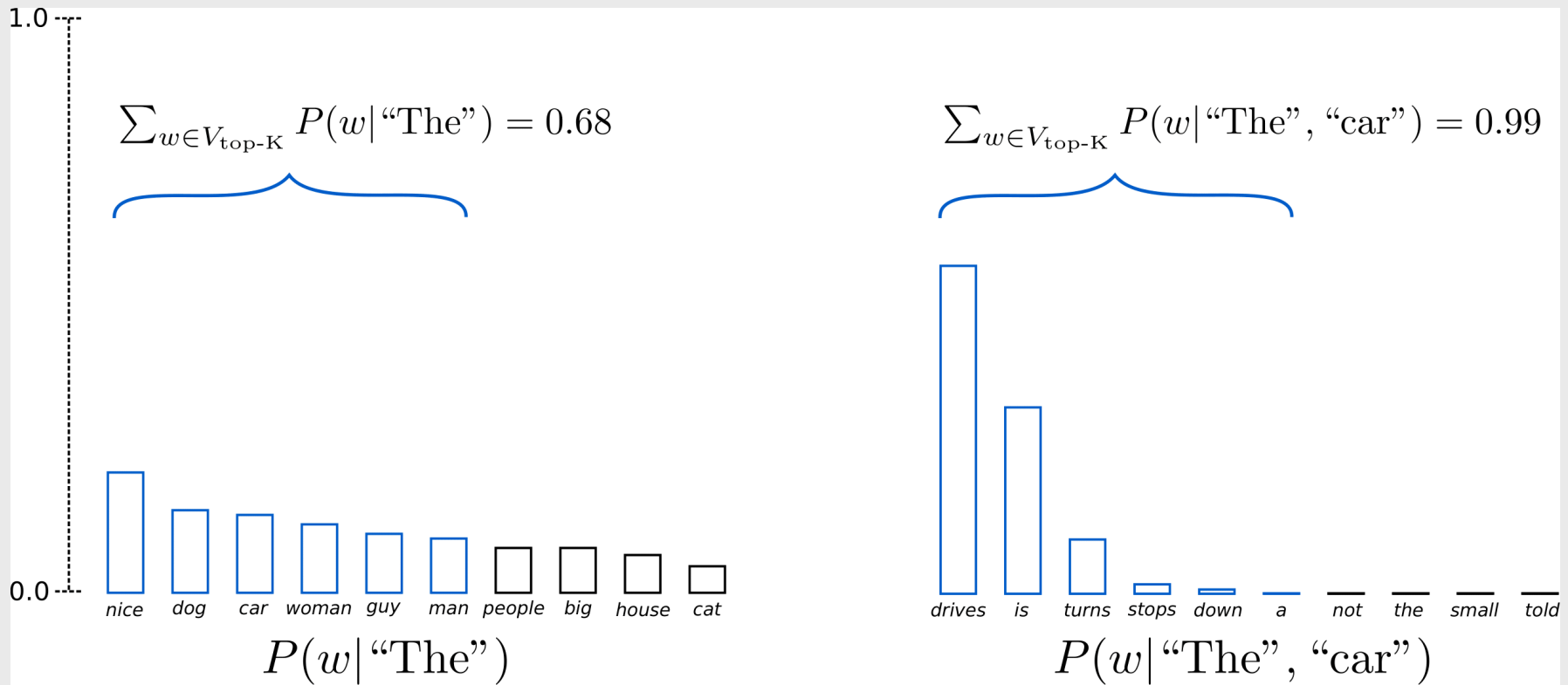
- **High temperature** sampling produces **unnatural text**
- **Low temperature** can **reduce the variety** in the generated text
- Today's models are pretty advance, so best to just keep temperature = 1

Top-K Sampling

- **Select the k most likely next words**
- **Sample from these k words**
- **Top- k sampling removes very unlikely words**
- **Makes sentences sound more natural**

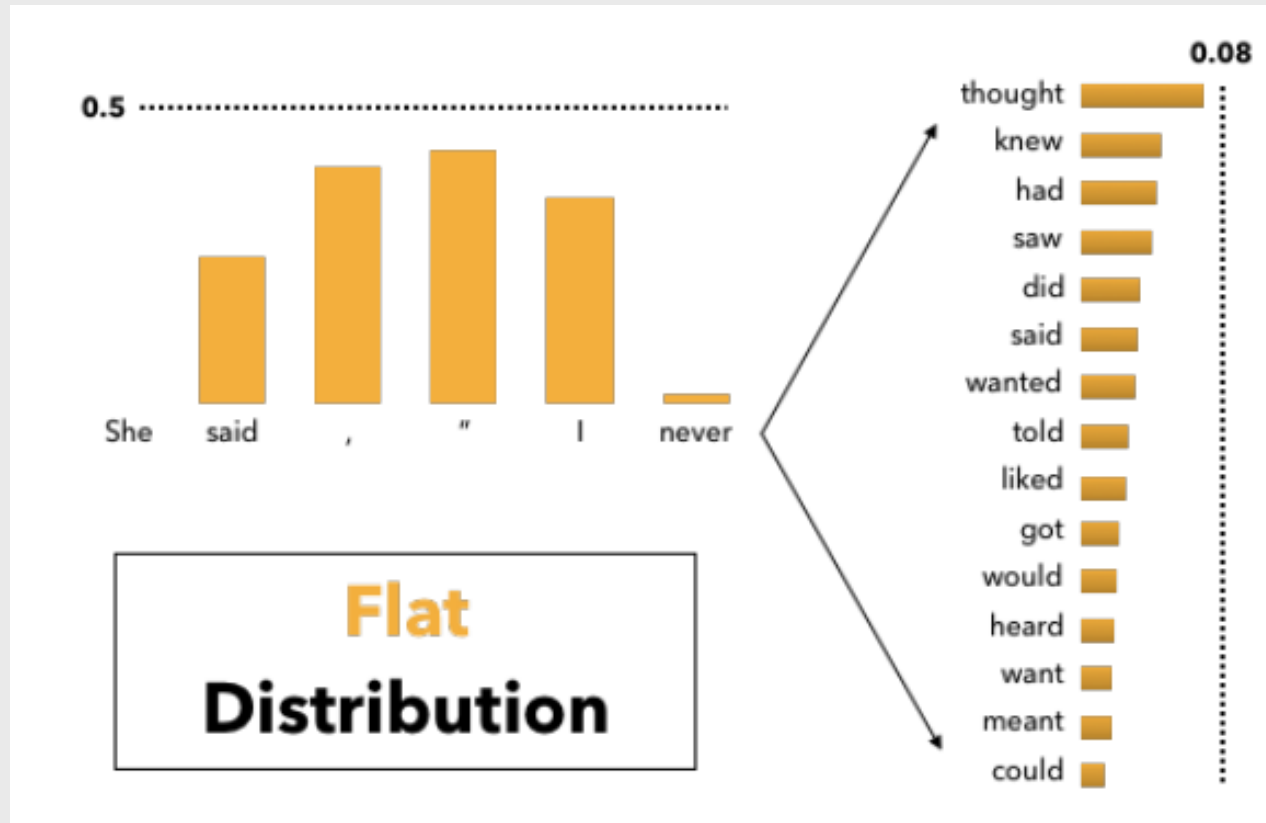
Top-K Sampling

- Example with $k = 6$



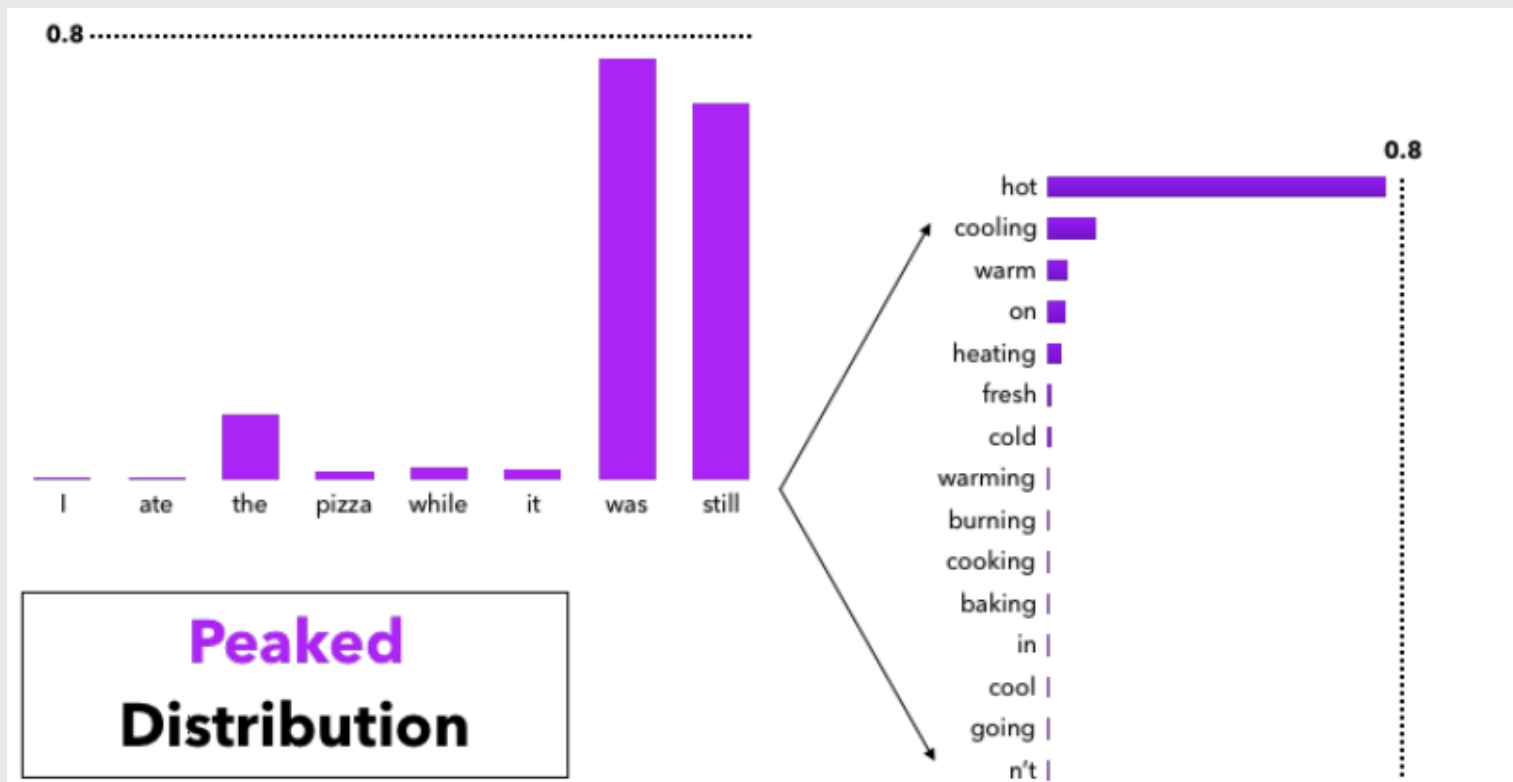
Problems with Top-K Sampling

- Fixing k could make you avoid high probability words for flat distributions



Problems with Top-K Sampling

- Fixing k could make you include low probability words for peaked distributions

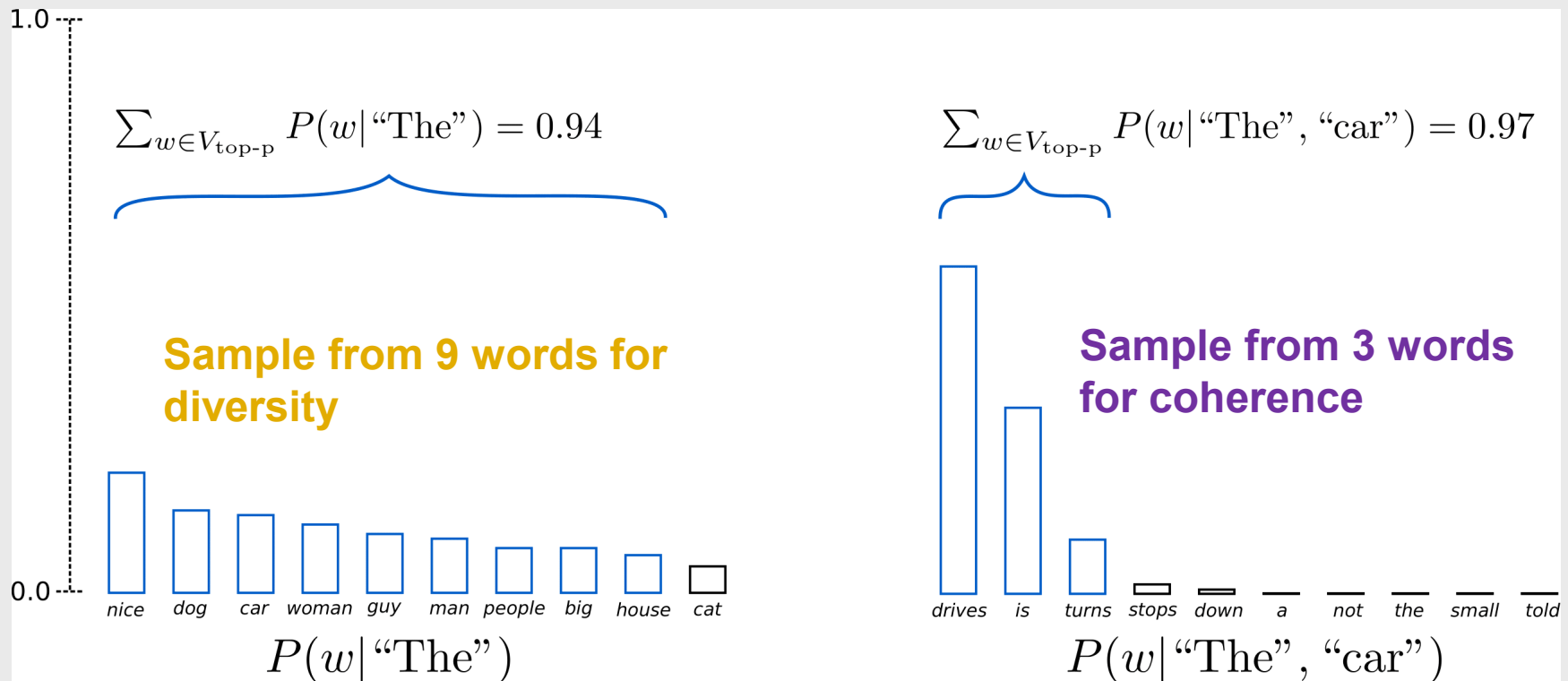


Top-P (Nucleus) Sampling

- Select the most likely next words whose probability sums to p ($p \sim 0.9$). This is your **nucleus**
- Sample from the nucleus words
- Top-p sampling lets you have a **dynamic** sized set of sampling words
- Makes sentences sound even more natural

Top-P (Nucleus) Sampling

- Examples with $p = 0.94$ and $p = 0.97$



ChatGPT Defaults

- **ChatGPT default parameter values**
 - **temperature = 1**
 - **top_p = 1**
 - **frequency_penalty = 0** (higher values to penalize probability of words proportional to how many times they appeared already)
 - **presence_penalty = 0** (higher values to penalize probability of words that appeared already)

GENERATING TWEETS WITH AI

Generating Tweets with AI

- **AI is so advanced today that generating tweets is almost too easy**
- **We can do more with the AI than before**
 - **Generate tweets**
 - **Generate ideas for tweets**
 - **Mimic styles from examples**
- **No training need because of few-shot learning**

Generating Tweets in a User's Style

- Download tweets of a user and put a few in the prompt to the AI

You are going to help create content for a social media account. You will be asked to write clever tweets that will get engagement in the style of provided tweets. Learn from these tweets how to write your tweets. Here are the tweets:

Tweet: Starship will fundamentally change how we access space, with entire space stations like Starlab launched on a single mission

Tweet: One day, the chickens may turn on us ... <https://t.co/gP7epUz45y>

Tweet: Bill Maher is absolutely right

Tweet: A few other things you probably don't know: illegals in America can get bank loans, mortgages, insurance, driver's licenses, free healthcare (California & New York) and in-state college tuition. What's the point of being a citizen if an illegal gets all the benefits, but doesn't pay taxes or do jury duty?

Tweet: \$HOOD - Robinhood - SARAL Trade idea...!SARAL system is suggesting a swing long trade. Will create a trade using options. take 30 day free trial of SARAL Swing alerts.

Tweet: 🤪

Tweet: It was always the plan

Tweet: Outrageous!

Tweet: #Earnings season continues this week, with results due from another 13% of the S&P 500. Consumer discretionary and healthcare lead. View our calendar for more. \$PYPL \$F \$CVS \$WYNN <https://t.co/CJoGLZDRTb>

Tweet: "Colon Cologne, the fragrance that takes you beyond Uranus!" – Grok

Generating Tweets in a User's Style on a Topic

- Add a topic to the prompt

You are going to help create content for a social media account. You will be asked to write clever tweets that will get engagement in the style of provided tweets. Learn from these tweets how to write your tweets. Here are the tweets:

Tweet: Starship will fundamentally change how we access space, with entire space stations like Starlab launched on a single mission

Tweet: One day, the chickens may turn on us ... <https://t.co/gP7epUz45y>

Tweet: Bill Maher is absolutely right

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Tweet: 😊

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Tweet: #Earnings season continues this week, with results due from another 13% of the S&P 500. Consumer discretionary and healthcare lead. View our calendar for more. \$PYPL \$F \$CVS \$WYNN <https://t.co/CJoGLZDRTb>

Tweet: "Colon Cologne, the fragrance that takes you beyond Uranus!" – Grok.

Write a tweet about healthy eating in the style of these tweets.

Generating Tweets with a Given Sentiment

- **Add a sentiment and its range to the prompt**

You are going to help create content for a social media account. You will be asked to write clever tweets that will get engagement in the style of provided tweets. Learn from these tweets how to write your tweets. Here are the tweets:

Tweet: Starship will fundamentally change how we access space, with entire space stations like Starlab launched on a single mission

Tweet: One day, the chickens may turn on us ... <https://t.co/gP7epUz45y>

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Tweet: A few other things you probably don't know: illegals in America can get bank loans, mortgages, insurance, driver's licenses, free healthcare (California & New York) and in-state college tuition. What's the point of being a citizen if an illegal gets all the benefits, but doesn't pay taxes or do jury duty?

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Tweet: "Colon Cologne, the fragrance that takes you beyond Uranus!" – Grok.

Write a tweet about healthy eating in the style of these tweets with a sentiment of 90, 100 being most positive, 0 being most negative.

Beyond Tweets

- **Today's AI lets us generate other types of text content besides tweets**
- **Emails**
- **Blog posts**
- **Songs**

Emails

- Choose your topic and email style
- AI can mimic format and style of an email
- AI returns HTML for the email

```
topic = """China will lose the AI war to America"""  
content_type = """An email written by Professor Zaman  
who teaches Generative AI and Social Media at Yale.  
The email subject is something about US beating China"""
```

Emails

Subject: Why America Will Prevail in the AI Landscape

From: Professor Zaman

To: Students of Generative AI and Social Media

Date: [Today's Date]

Dear Students,

I hope this message finds you well and deeply engaged in your explorations of Generative AI and its implications on social media. As we continue to analyze the evolving landscape of artificial intelligence, I want to share some insights regarding the ongoing competition in AI innovation between the United States and China.

The Competitive Edge of the U.S.

It is increasingly clear that America holds a significant advantage in the AI race. Here are several key factors that contribute to the likelihood of the U.S. emerging victorious over China:

- **Innovative Ecosystem:** The U.S. boasts a vibrant ecosystem of startups, established tech firms, and academic institutions that promote innovation and creativity. This organic environment fosters rapid advancements in AI technologies.
- **Investment in Research:** American universities and research institutions are leaders in AI research, benefiting from substantial funding and resources. This commitment to pushing the boundaries of knowledge gives us a head start.
- **Collaborative Culture:** The American approach encourages collaboration between industries and academia, fostering partnerships that enhance the development of AI technologies.
- **Ethical Standards:** While challenges exist, the U.S. is more engaged in addressing ethical issues associated with AI, which may lead to more sustainable and socially accepted innovations.

China's Challenges

Although China has made remarkable strides in AI, it faces significant challenges that may hinder its progress:

- **Resource Allocation:** With a focus on rapid development, China often prioritizes speed over sound ethical practices, which can lead to long-term consequences and societal pushback.
- **Lack of Transparency:** The opaque nature of regulations and policies can stifle innovation and discourage international collaborations, limiting the potential for breakthroughs.
- **Human Capital:** While China has a large pool of talented individuals, the restrictive academic and research environment may inhibit creative thinking and independent research.

In conclusion, while the global AI landscape is highly dynamic and unpredictable, the foundational strengths of the United States – coupled with the challenges faced by China – suggest that America is well-positioned to maintain its lead in the AI race. As we examine these themes in our upcoming classes, I encourage you all to think critically about the implications of these developments.

Best regards,

Professor Zaman

Department of AI and Social Media

Yale University

Blog Post

- Choose your topic and style of blog
- AI can mimic format and style of a blog
- AI returns HTML for the blog post

```
topic = """China will lose the AI war to America"""  
content_type = """A substack blog written by  
Professor Zaman who teaches Generative AI and  
Social Media at Yale.  
The blog title is something about US beating China"""
```

Blog Post

How America is Positioning Itself to Win the AI War Against China

By Professor Zaman

Generative AI and Social Media at Yale

The Current Landscape of AI Competition

The race for artificial intelligence supremacy has become one of the defining narratives of the 21st century. As nations scramble to establish dominance, the clash between the United States and China takes center stage. While both countries boast powerful institutions and innovative talent, evidence suggests that the U.S. is poised to emerge victorious in this ideological war.

Investment and Infrastructure

One critical advantage that the United States holds lies in its unparalleled investment in AI infrastructure. In recent years, U.S. tech companies have poured billions into AI research and development. Initiatives like the [National AI Initiative Strategy](#) reflect a unified governmental approach to bolster AI capabilities, ensuring that resources flow into the most cutting-edge research.

The Role of Education and Innovation

The U.S. advantage is further amplified by its robust education system, with laboratories of innovation nested at premier institutions like Yale, Stanford, and MIT. These universities not only train future leaders in AI but also foster collaborations with tech giants to convert academic research into practical solutions. The entrepreneurial spirit in Silicon Valley continues to ignite advancements, frequently outpacing Chinese firms in breakthrough technologies.

Ethics and Governance in AI

America's commitment to ethical considerations in AI development positions it favorably in the eyes of global stakeholders. The growing emphasis on responsible AI aligns with public sentiment across democracies, contrasting starkly with China's authoritarian approach. This moral high ground could influence international partners to align with the U.S., thereby creating a coalition that further underlines its leadership role in AI.

Conclusion: The Path Forward

While China's investments in artificial intelligence are formidable, the multifaceted strengths of the United States create a robust foundation for future dominance in this burgeoning field. By harnessing innovation, fostering ethical AI governance, and ensuring collaborative efforts across institutions, the U.S. can not only win the AI war but also steer the next wave of technological evolution that will shape our global future.

Thank you for reading! For more insights on AI and social media, be sure to subscribe to my blog and join the conversation. [Subscribe here.](#)

Song

- **Choose your topic and style of song**
- **AI can mimic format and style of a musician**
- **AI returns HTML for the song**

Song

China Not Like Us

Yo, listen up, it's a war on the rise,
A tech race where the dragon flies,
But let me make it clear, in this AI game,
America's the throne, we're the ones to blame.

China, you think you own the night?
But we got the stars, shining so bright.
Your algorithms are bound, can't break free,
While we innovate, shape destiny.

*China not like us, they can't keep up,
In the AI war, we fill their cup.
Chasing shadows, but we light the way,
America's future, here to stay.*



Generating Text Content

- **Same structure for any text content generation**
 - Choose a topic
 - Choose a content style
 - Provide examples if you have them (but as AI gets smarter, maybe not needed)
 - Tell it to give you HTML so it looks nice if its web content
 - Tell it to give you just the text if it is fed to another function

More Complex Text Content



Artificial Imagination: Unlocking the Future of Creativity with AI Kindle Edition

by [Tauhid Zaman](#) (Author) | Format: Kindle Edition

[See all formats and editions](#)

Step into the future of creativity with "Artificial Imagination: Unlocking the Future of Creativity with AI". This groundbreaking work by dives deep into the fascinating intersection of artificial intelligence and the creative industries, unlocking a new era of imaginative possibilities. As AI technology continues to evolve at an unprecedented pace, it's reshaping the very core of how we create, innovate, and express ourselves. This book elucidates the transformative potential of AI, offering readers a comprehensive exploration of how AI-driven tools and technologies are revolutionizing art, music, literature, film, and beyond.

Each chapter in "Artificial Imagination" presents a thoughtful analysis of AI's impact on various creative fields, from painting and photography to music composition and storytelling. The book delves into the role of AI in democratizing the creative process, empowering creators from diverse backgrounds and skill levels to bring their visions to life. Moreover, it discusses the ethical considerations and challenges that arise as AI-generated works become increasingly prevalent.

▼ [Read more](#)

Coding Session

- **Create tweets with AI**
- **Use real tweets to teach AI style**
- **Create other types of text content with AI**