Designing a reproducible NLP workflow for social media sentiment and topic modeling

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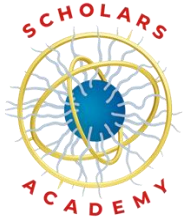
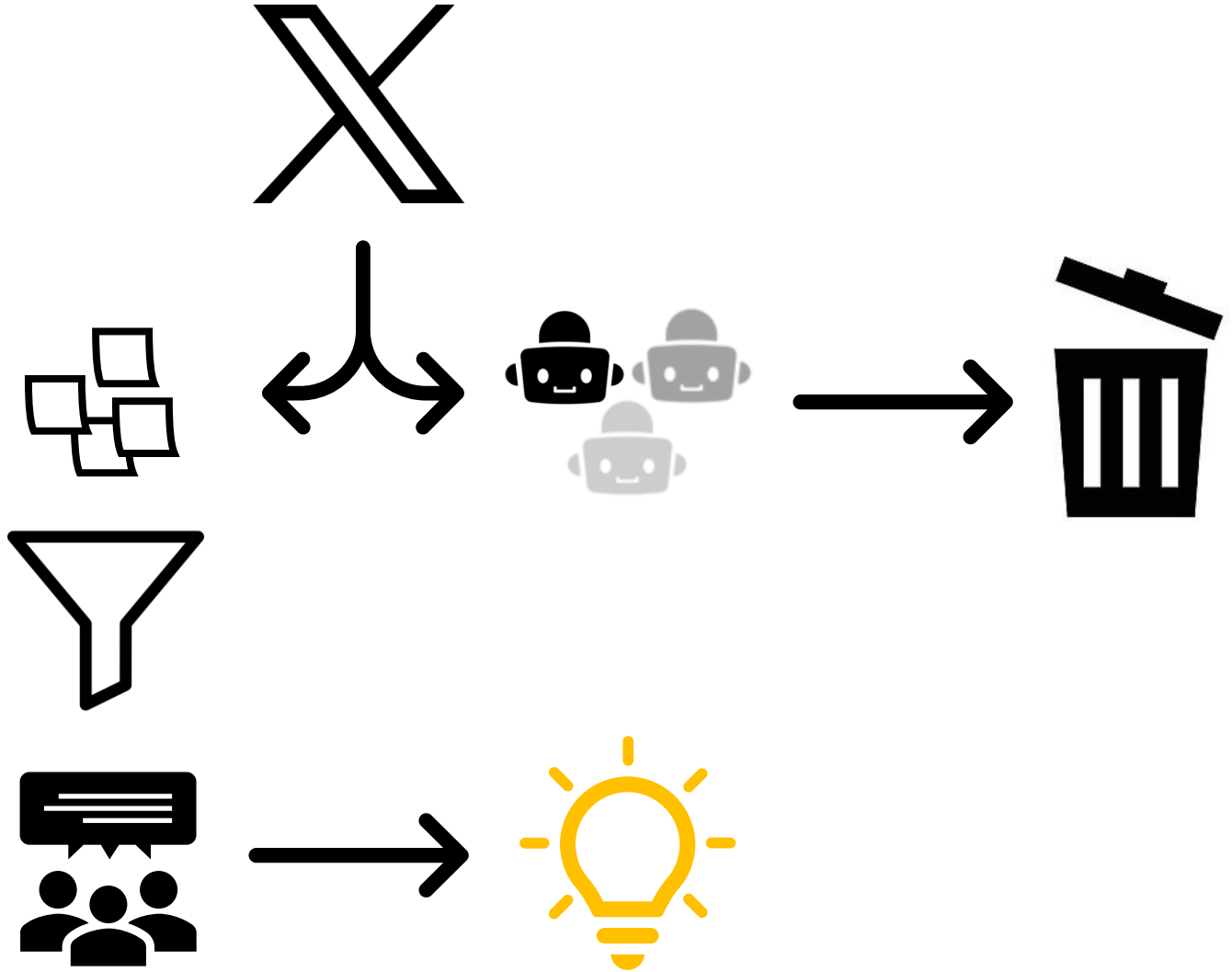
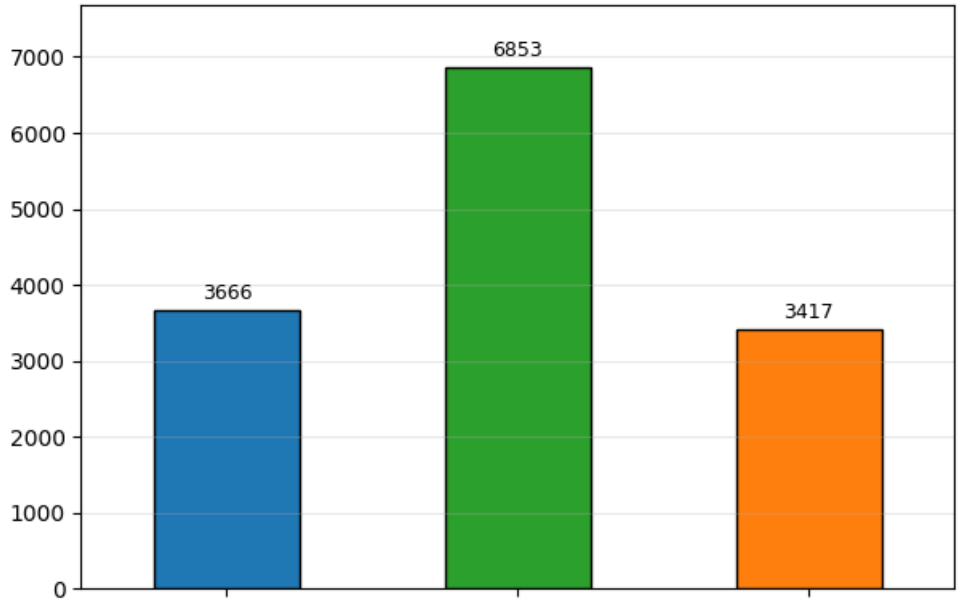
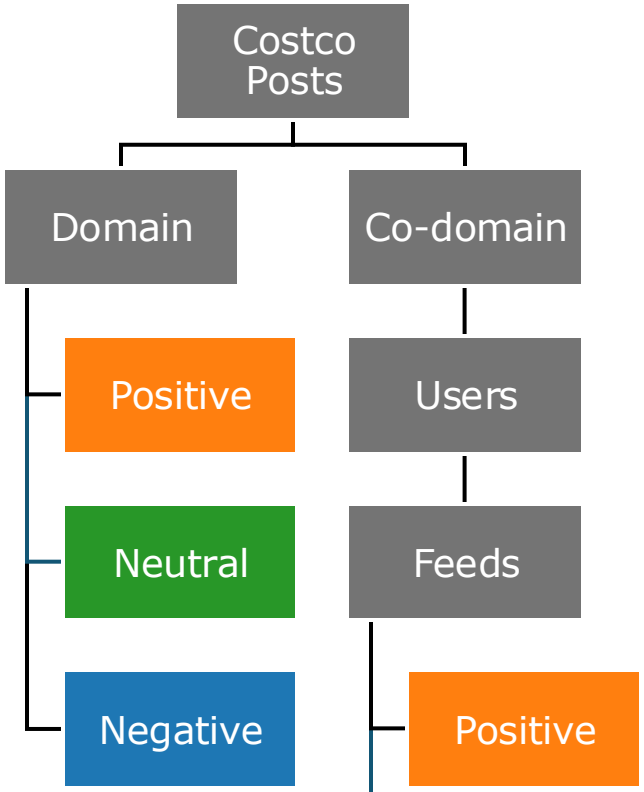


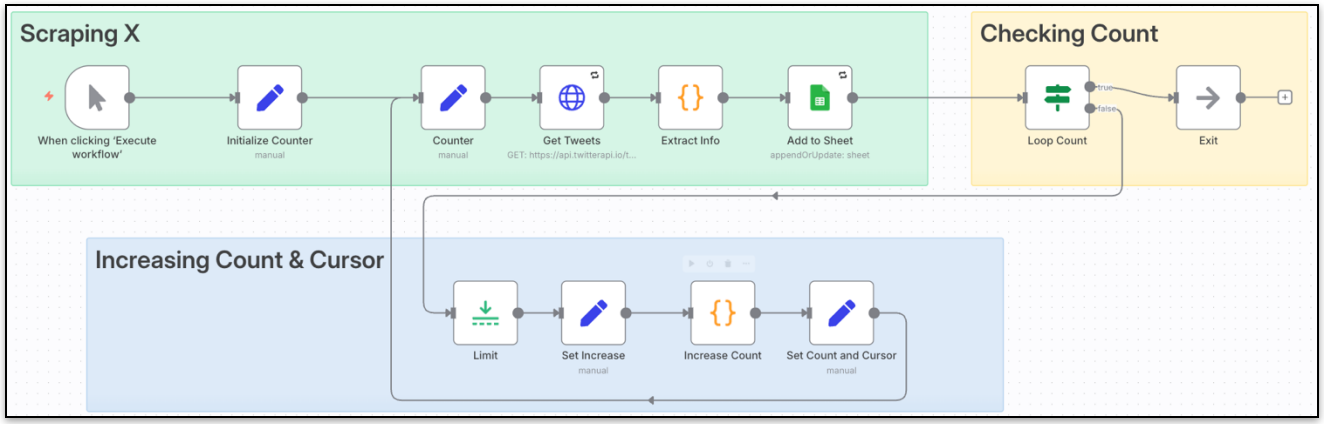
- Social media ≈ the world's biggest focus group.
- But the signal is buried.
- How can we extract this information?
- Our answer: a reproducible NLP workflow.
- Question: does co-domain context help or dilute insights?



- ~60K posts via twitterv2.io + n8n (automated pulls).
- Three entities: NFL, UK PM (Keir Starmer), Costco.
- 5-day collection windows; **domain** vs **co-domain** sampling.
- Code, figures, and outputs → GitHub.







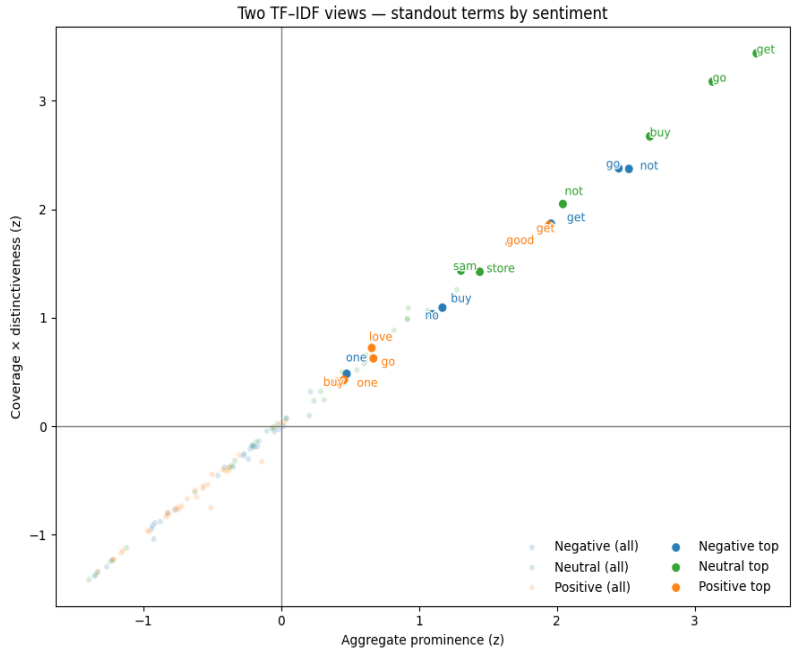
- Standard cleaning; RoBERTa sentiment (pos/neu/neg)

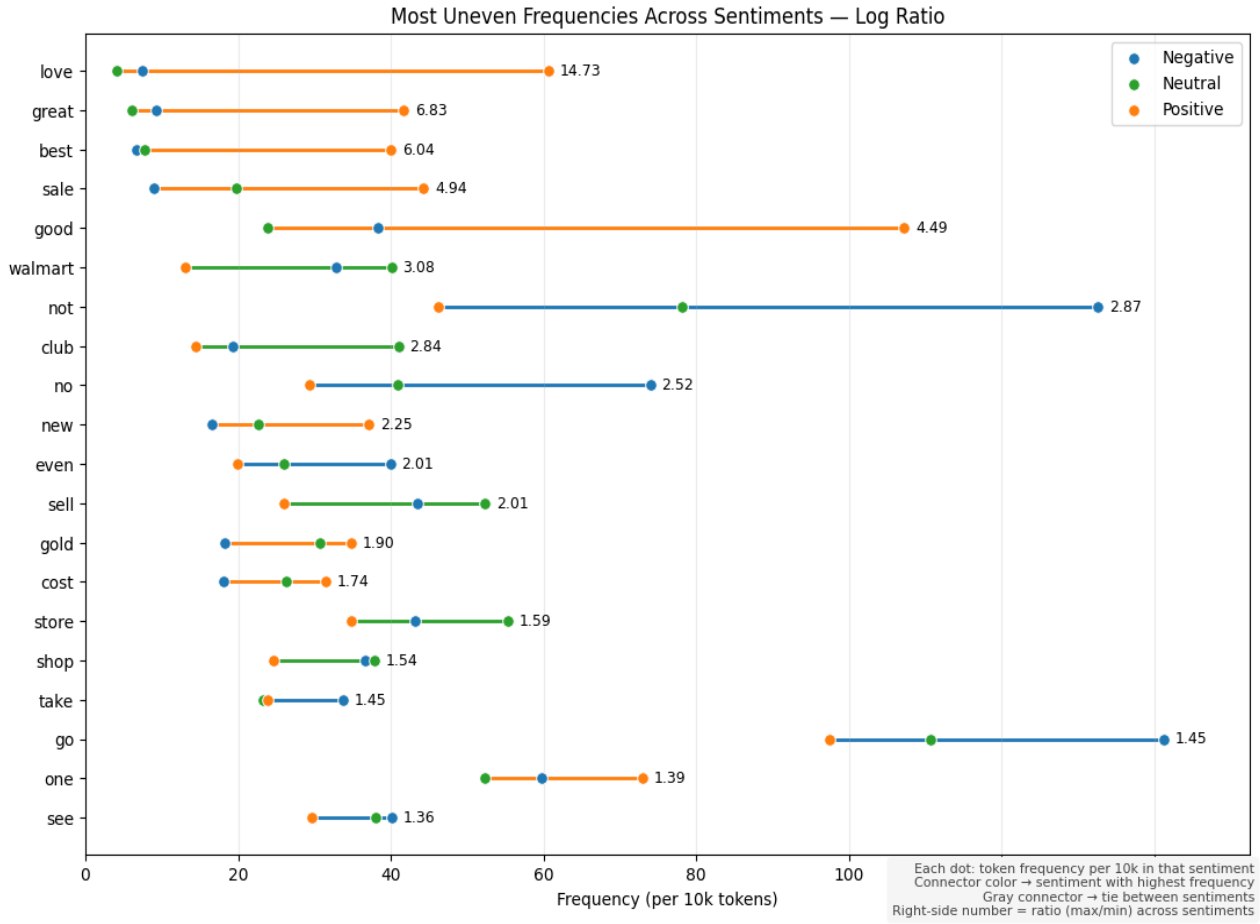
- Key terms via two TF-IDF views
  - Aggregate = sum across documents
  - Sentiment-weighted = coverage x rarity

$$TFIDF_{t,d} = tf_{t,d} \times log\left(\frac{N}{|\{d \in D : t \in d\}|}\right)$$

t = term
d = document
tf = frequency of term t in document d

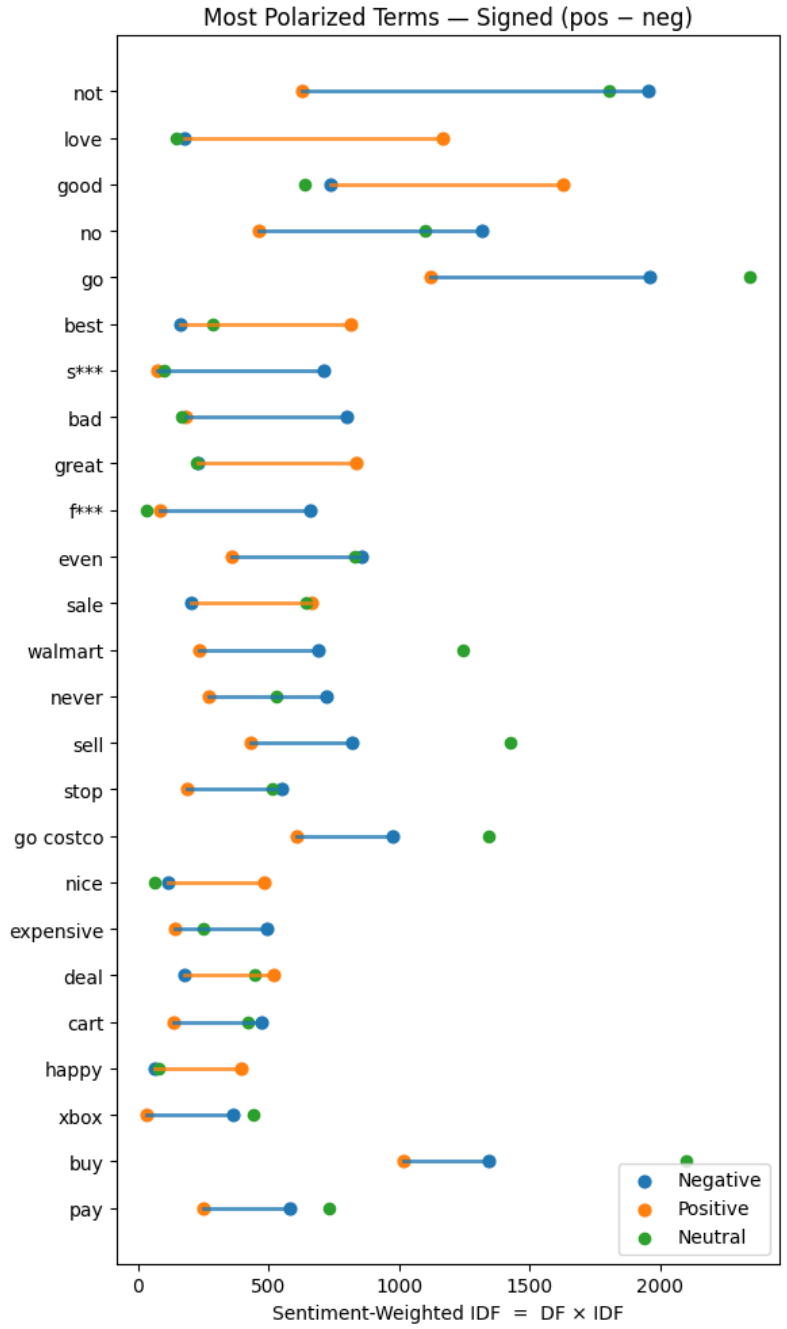
N = total number of documents
D = number of documents d containing term t

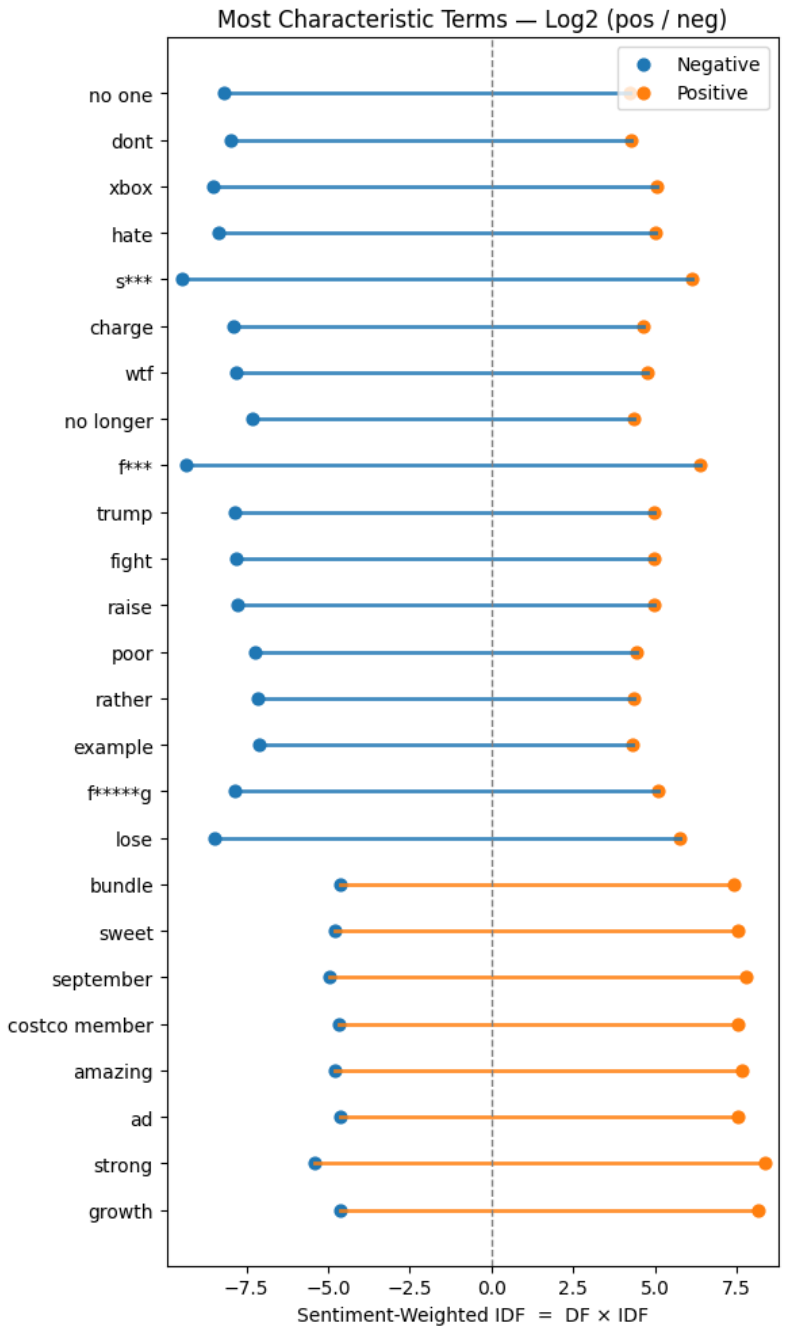




Content	@Ronxyz00 Case of coconut water was $10 last week at Costco. Today was 12.79$
Content_clean	case of coconut water was 10 last week at costco today was 12 79
text_for_sent	@USER Case of coconut water was $10 last week at Costco. Today was 12.79$
tokens	case of coconut water was last week at costco today was
lemmas	case of coconut water be last week at costco today be
no_stop	case coconut water last week costco

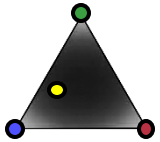
- Additional insights when adjusting n-grams parameter.
  - **Positive**
    - fsd v14
    - costco deal
    - caramel brownie sundae
    - costco pumpkin pie
    - costco gold
      - costco gold bar
  - **Negative**
    - park lot
    - line costco gas
    - costco sam
    - costco walmart
    - costco silver
      - costco silver bar





$$P(\boldsymbol{W}, \boldsymbol{Z}, \boldsymbol{\theta}, \boldsymbol{\varphi}; \alpha, \beta) = \prod_{i=1}^{K} P(\varphi_i; \beta) \prod_{j=1}^{M} P(\theta_j; \alpha) \prod_{t=1}^{N} P(Z_{j,t} \mid \theta_j) P(W_{j,t} \mid \varphi_{Z_{j,t}}),$$

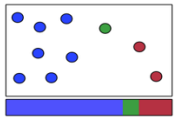
Document



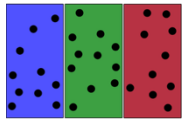
Document

Word

Topics - Dirichlet Distributions



Topic

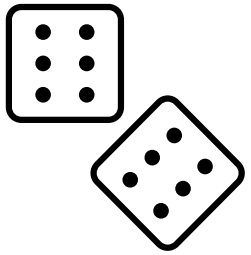


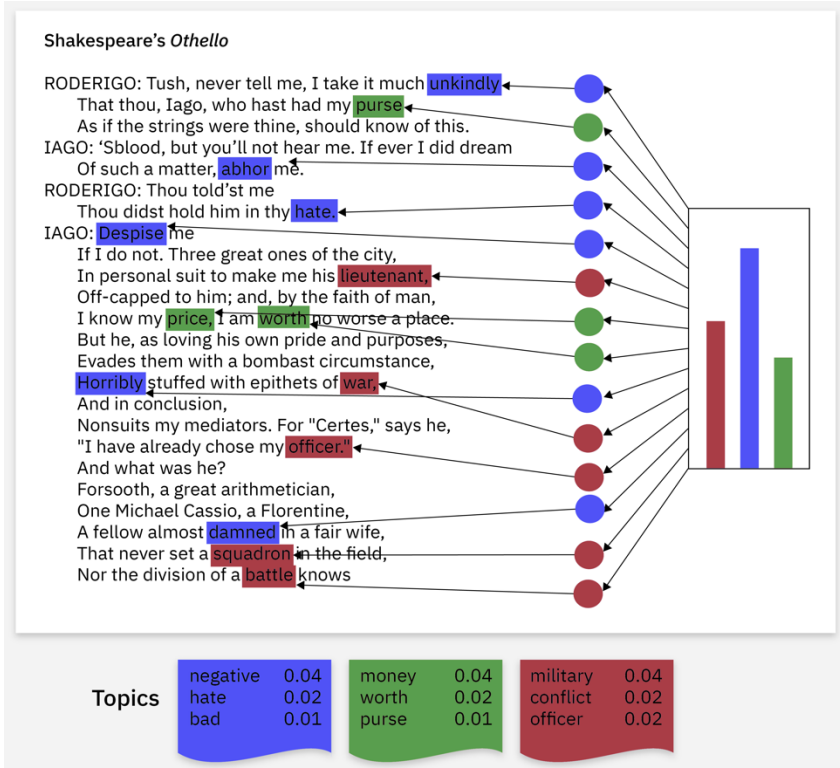
Word

Sampling - Multinomial Distributions

$\boldsymbol{W}$	Identity of word w in document d
$\boldsymbol{Z}$	Identity of topic of word w in document d
$\boldsymbol{\theta}$	Probability of topic k occurring in document d
$\boldsymbol{\varphi}$	Probability of word w occurring in topic k
α	Prior weight of topic k in a document
β	Prior weight of word w in a topic

Latent Dirichlet Allocation (LDA)





- Hot dog price/changes as shorthand for "is Costco still on our side?" and overall value perception.

Costco hot dog as value symbol

- Repeated focus on price vs. quality/safety of staples (rotisserie chicken, meat, etc.).
- Reliability and transparency here act as trust levers.

Price and quality concerns (esp. chicken/meat)

- Cross-shopping Costco, Trader Joe's, BJs, etc.
- Parents weighing bulk value, convenience, and "healthy enough" options for kids.

Store choice & family/bulk tradeoffs

- Interest in halal/healthier options, protein sources, specialty goods.
- Signals whether Costco aligns with specific dietary, cultural, or lifestyle needs.

Niche products, ethics, and lifestyle

- Joining/renewing justified by savings on batteries, tools, pantry staples, etc.
- Small frictions in staple items can tip sentiment on overall membership value.

Membership ROI, everyday essentials

- Direct comparisons on stock, electronics, and service.
- Perception is shaped by concrete outcomes (what's on shelves, issue resolution).

Costco vs. Sam's performance

What worked

- Reproducible workflow
- Domain-first sampling
- LLM summarization

Use with care

- Co-domain corpus metrics
- n-gram interpretation
- Alternative document sources (call logs, etc.)

Next steps

- Extend snapshot to time series
- Explore multimodal (images)
- Compare LDA to graph-based topic methods

References

Herk, N. (2025, March 14). *How to Actually Scrape Twitter/X Data with n8n* [Video]. YouTube. https://www.youtube.com/watch?v=lEo7IAgj0UY

Starmer, J. (2020, March 18). *Latent Dirichlet Allocation* [Video]. YouTube. https://youtu.be/T05t-SqKArY?si=ZxP2DZt9vDicqIsc

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