

Online Learning to Rank for Recommending

Daan Odijk
Lead data scientist @ Blendle



Blendle

Mission

Help you discover and support
the world's best journalism

International

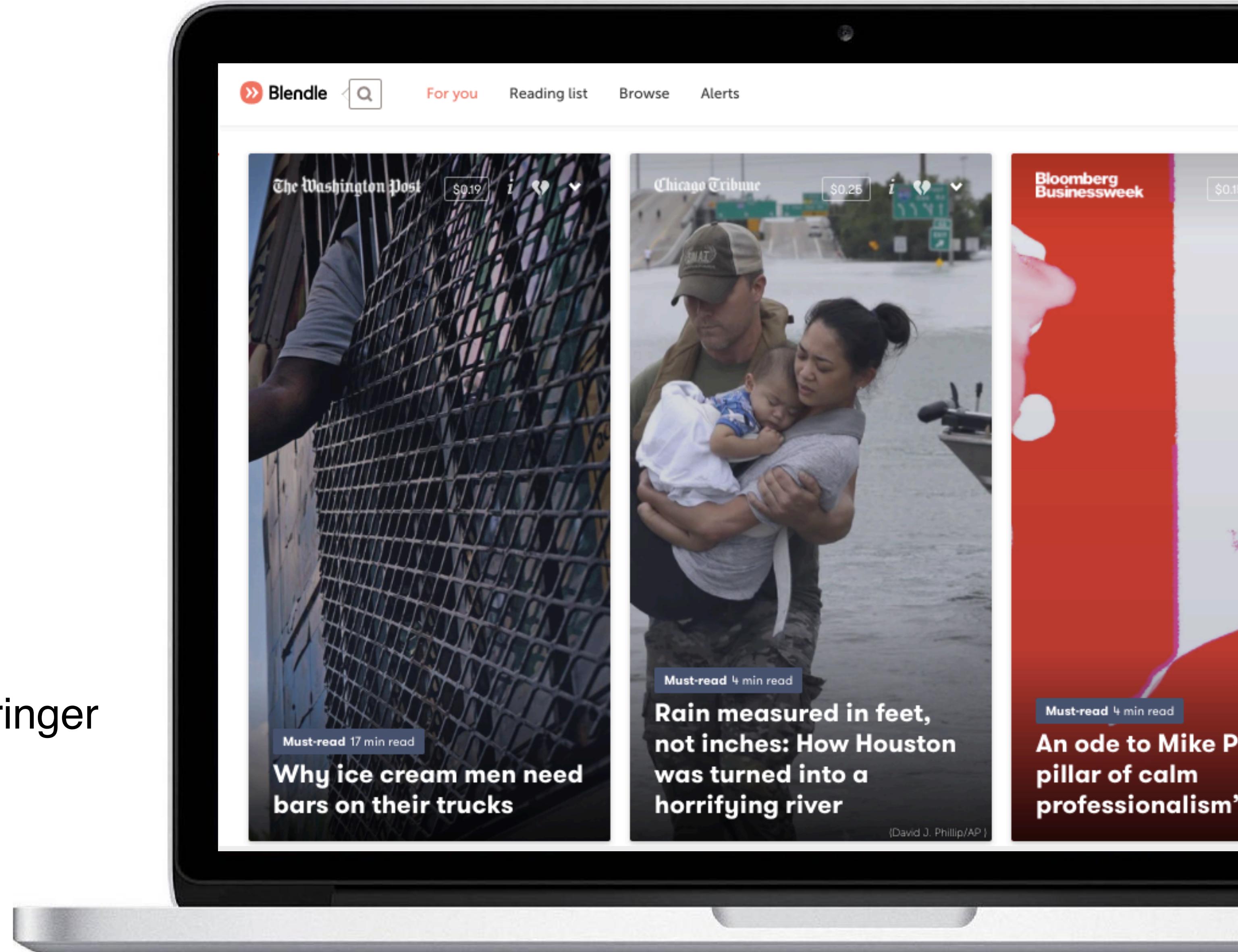
May 2014: The Netherlands
Sept 2015: Germany
March 2016: United States

Publisher-backed

a.o. NY Times, Nikkei, Axel Springer

70 employees

10 journalists & 50 developers



In Blendle you can
browse through all
quality
newspapers and
magazines

The screenshot shows the Blendle app's main screen. At the top, there's a navigation bar with the Blendle logo, a search icon, and links for "For you", "Reading list", "Browse", and "Alerts". Below the navigation is a secondary navigation bar with "Trending this afternoon", "Newsstand", "Following", "Tech & Science", "Staff Picks", and a "What do you like to read?" section. The main content area displays two news items. On the left is a thumbnail for "The New York Times" dated September 1, 2017, featuring a photo of a flooded street in Houston. The right side shows a thumbnail for "TIME" magazine dated September 11, 2017, featuring a young baseball player swinging a bat. Both thumbnails have a gold star icon at the bottom.

You only pay for what you read, with a single click

The Blendle app interface shows a news feed with various news articles from The Washington Post and other sources. The top navigation bar includes 'Blendle' with a red arrow icon, a search bar, and tabs for 'For you', 'Reading list', 'Browse', and 'Alerts'. Below the navigation, there are sections for 'Popular' and 'More from The Washington Post'. The main content area displays several news articles, including:

- The Washington Post** (Front page): Headlines include "Trump mulled a halt of Arpaio case" and "Harvey proves ruinous on Texas coast".
- Politics & The Nation**: Headline: "Trump's pardon fits a pattern: Dividing, not uniting".
- The Washington Post** (Interior page): Headline: "Fewer prescriptions for antibiotics are being written in U.S., analysis finds".
- DOYLE AUCTIONEERS & APPRAISERS**: Headline: "Forced Public Auction US FEDERAL GOVERNMENT SEIZURES".

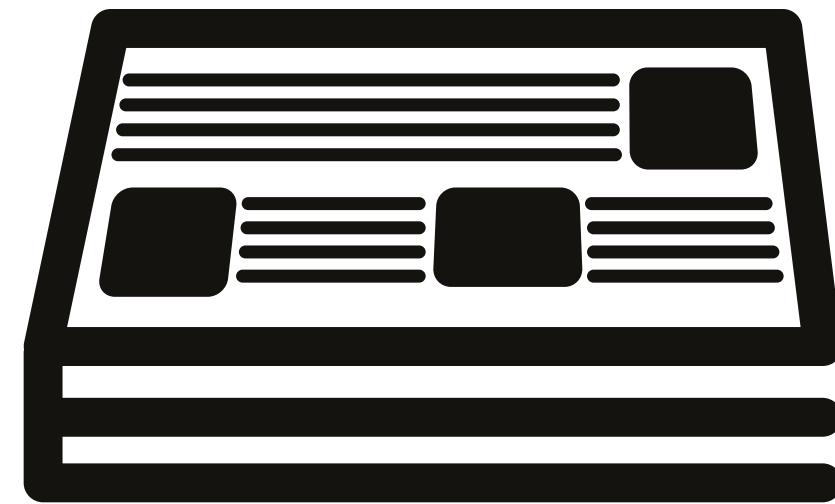
The right side of the screen shows a sidebar with a profile picture and a 'dodijk' handle.

Fewer prescriptions for antibiotics are being written in U.S., analysis finds

AMY GOLDSTEIN

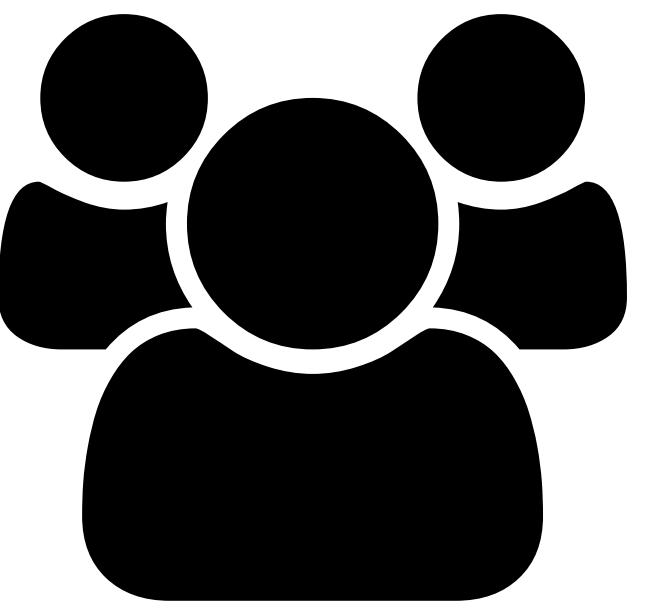
The use of antibiotics among Americans with commercial health insurance has decreased during the past several years, according to a new analysis that nevertheless shows lingering variations for different ages and in different parts of the country. The study released on Thursday provides the latest evidence of how doctors and patients have begun to heed warnings that excessive antibiotic use breeds dangerous drug resistance and “superbug” bacteria. The analysis is based on 173 million insuranc...

Scale at Blendle



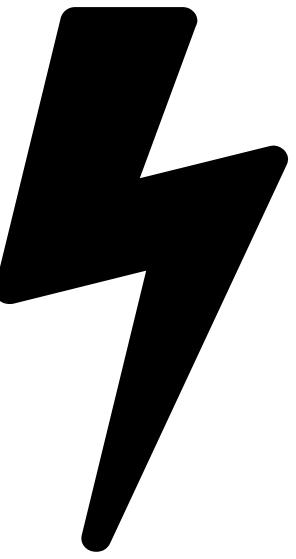
Articles

- > 6M in total**
- > 7K new every day**
- > 30% is read**



Users

- > 1M users**
- ~ 1 in 5 converts to a paying user**

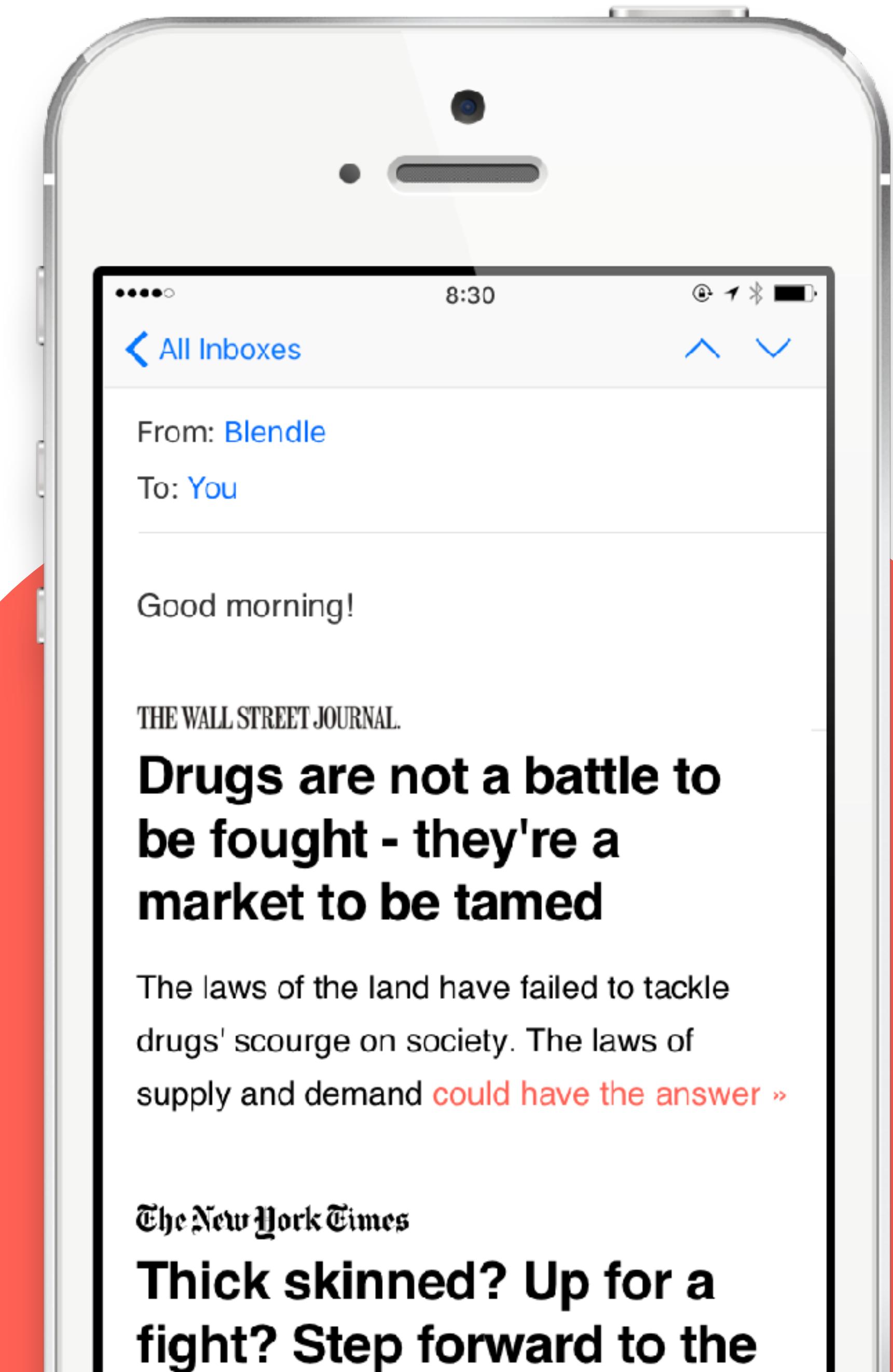


Events

- ~ 2B in total**
- > 2M new every day**

Our **editors** select the best articles for our email newsletter **every day**

Our **personalisation algorithms** create a personal bundle from this





Consider the Ice Cream Man

STORY BY BILL DONAHUE PHOTOGRAPHS BY MARVIN JOSEPH

WHAT IS IT LIKE TO DELIVER THE QUINTESSENTIAL SUMMER FOOD? NOT ALWAYS SO SWEET.

Just outside Washington, in Hyattsville, Md., there are over 200 ice cream trucks parked in a vast four-acre lot at Berliner Specialty Distributors. In the nearby corporate suite, in the airconditioned comfort of the waiting area, hangs a vintage photo of the company's co-owners, brothers Guy and Mitch Berliner, who bought the business in 1988. In the photo, they are standing beside a white Good Humor truck in Good Humor Man suits, wearing captain's hats...



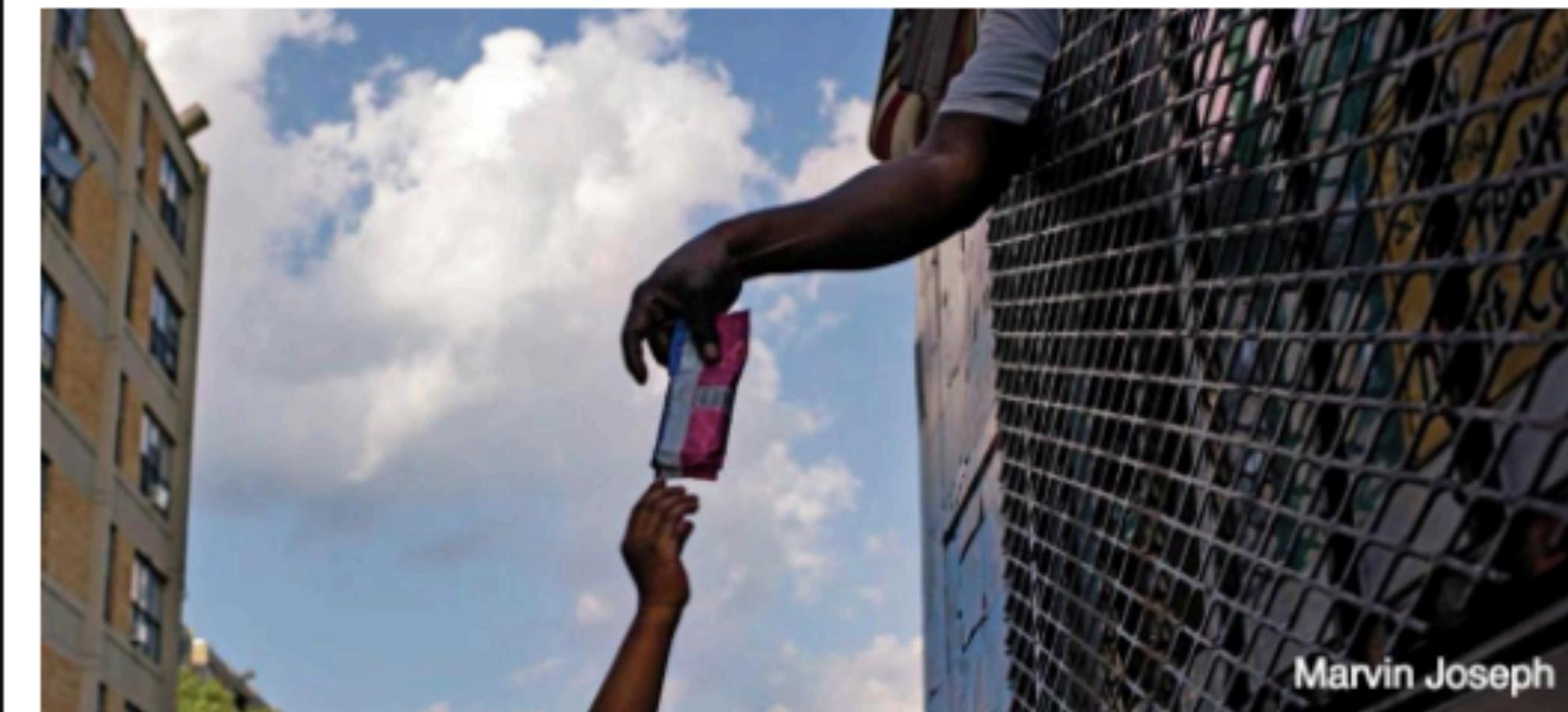
•••••

8:30

④ 1 ⚡ 🔋

The Washington Post

Why ice cream men need bars on their trucks



Marvin Joseph

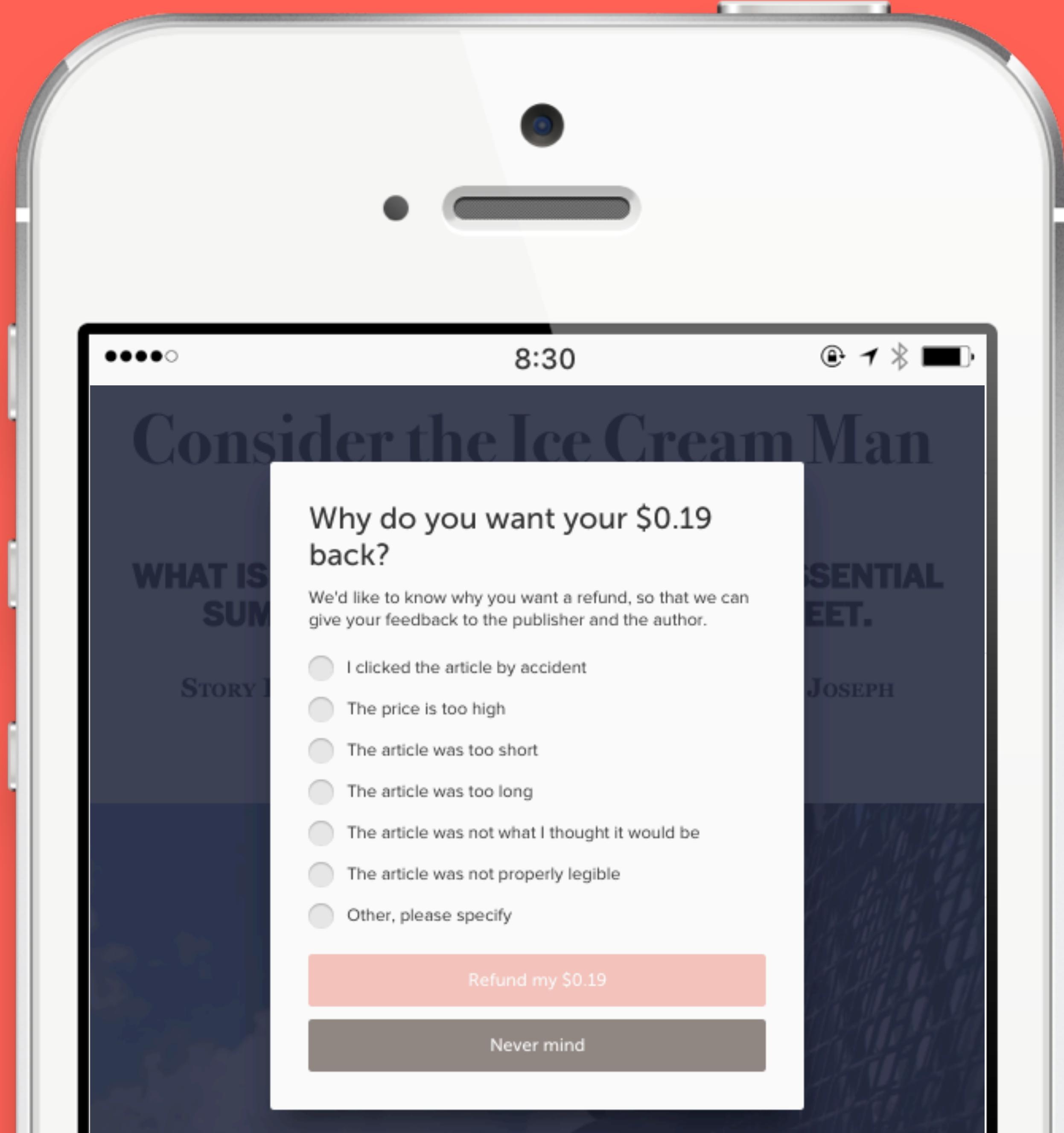
This reporter hung out with ice cream truck drivers for a week, asking them how they like their job. The question was met with a chilling pause every time. [A longer read that crushes the romantic image » \\$0.19](#)

Consider the Ice Cream Man

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LINDA.
woensdag 20 januari 2016 - 5 minuten

Lustige dames

Tv-vrouw Geraldine Kemper (25) en model Kim Feenstra (30) rollebollen graag met vrouwen, maar willen de mannen niet missen. "Als het maar geen softie is."

Tekst Eva Loesberg, fotografie Marc De Groot, styling Jos Van Heel, visagie Irena Ruben

VROUWEN

Kim "Ik val op mannen én vrouwen. Daar ben ik kort geleden pas eerlijk voor uitgekomen. Op mijn achttiende heb ik een lesbische relatie gehad."

Geraldine "Ik heb nog nooit een relatie gehad met een vrouw, maar ik speel wel met vrouwen."

RODDEL

Kim "Sinds ik in *Spruiten en Slikken* heb laten merken dat ik Geraldine heel aantrekkelijk vind, gaat het gerucht dat er iets tussen ons is gebeurd."

Geraldine "Maar daar gaan we verder niets over zeggen. Sommige dingen blijven privé."

Kim "Die blijven in de slaapkamer."

Geraldine "We doen mee aan deze LINDA.-shoot omdat we fotograaf Marc de Groot geweldig vinden. Met hem weet je

Kim "Ja, misschien was die relatie ook meer spelen. Het was sex. Het was ontdekken. Het duurde drie maanden. Vrouwen zijn zo zacht. Fijn om te voelen."

Geraldine "Ik vind sex met een vrouw ook fijn. Ik word aangetrokken door een persoon – of het nou een man of een vrouw is kan me niet schelen."

Kim "Het hippie-idee staat me aan: love everyone; geen hokjes, vrijheid."

MODE

Geraldine "We k
zou ik dat nooit
genoeg voel ik m
Kim "Of iets sex
draagt. Bij jou is
Geraldine "Jij zag
van Christian Lo
Kim "Ik vond he
Geraldine "Norm
ruitje. Simpel. C
Bezweet. In een l
maxjes. En dan h
Kim "Ik heb een
Lieslaarzen vind

COLOFON

Eindredactie Gerda Douma, Wiebe van der Hout, Roel Snijder (chef), Theo Zandstra, Janna Zuiderveld
Vormgeving Erik Hilverda
Art director Alie Veenhuizen
Telefoon cultuurreactie
058 - 2845395
E-mail cultuur@lc.nl

Delen op de interwebs

Facebook Twitter LinkedIn

Mai dit artikel naar een vriend
E-mailadres ontvanger
Waarom is dit artikel zo goed?

Lees meer uit Leeuwarder Courant?
Hele editie Lees editie
Eenmalig € 1,78

Lustige dame

Tv-vrouw Geraldine Kemper (25) en model Kim Feenstra (30) rollebollen graag met vrouwen, maar willen de mannen niet missen. "Als het maar geen softie is."

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Ajax
gisteren

Mét Tete, Bazoer, Riedewald en El Ghazi, het kwartet op een zijspoor bij Ajax.

DAGBLAD NOORDEN € 0,09

Grote jongens, nu in Jong Oranje

zeist Jong Oranje speelt binnen een week cruciale interlands tegen Turkije en Cyprus om het jeugd-EK van 2017 nog te halen.

Mét Tete, Bazoer, Riedewald en El Ghazi, het kwartet op een zijspoor bij Ajax.

Een gek gezicht? Ja, toch wel. Riechedly Bazoer, Jairo Riedewald, Kenny Tete en Anwar El Ghazi stonden gistermiddag gebroederlijk naast elkaar op het veld van het trainingscomplex in Zeist. Niet bij het grote Oranje, maar bij Jong Oranje. Een elftal dat ze...

Ajax
gisteren

Prima voor Ajax, zou je zeggen.

AD € 0,15

Jaar geleden nog bij grote jongens, nu in Jong Oranje

DANIËL DWARSWAARD
ZEIST

Jong Oranje speelt binnen een week cruciale interlands tegen Turkije en Cyprus om het jeugd-EK van 2017 nog te halen. Mét Tete, Bazoer, Riedewald en El Ghazi, het kwartet op een zijspoor bij Ajax.

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The map illustrates the migratory route of European eels. It shows the continent of Europe with major river systems highlighted in green. Arrows indicate the flow of eels from rivers like the Rhine, Elbe, and Danube through the North Sea, across the Atlantic Ocean, up the Mediterranean Sea, through the Suez Canal, and finally westward towards the Azores. The word 'EUROPA' is printed across the center of the map.

Mysterieuze migratie van paling in kaart gebracht

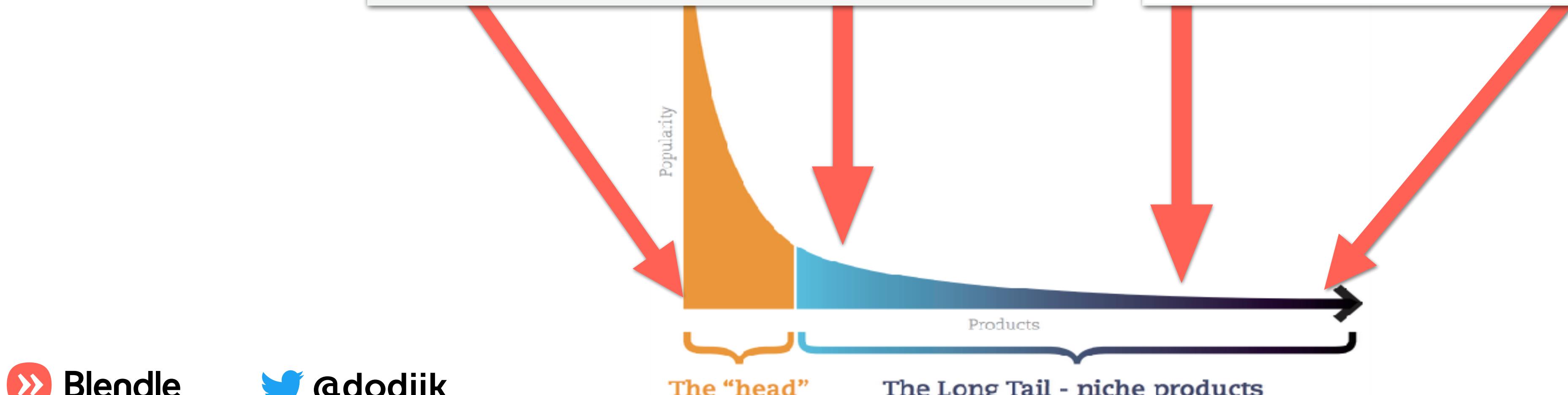
Met behulp van zenders zijn wetenschappers erin geslaagd de paling te volgen op zijn route van geboorte naar volwassenheid.

VAN ONZE VERSLAGGEVER JENTE OTTENBURGHS

AMSTERDAM

Europese palingen zwemmen meer dan 5.000 kilometer - twee keer de afstand tussen Amsterdam en Moskou - naar hun voortplantingsgebied in de Atlantische Oceaan. Een internationaal team van wetenschappers heeft deze migratierroute nu in detail gereconstrueerd. Vanuit diverse Europese rivieren zwemmen de palingen naar de Azoren vanwaar ze koers zetten richting hun eindbestemming. Dat

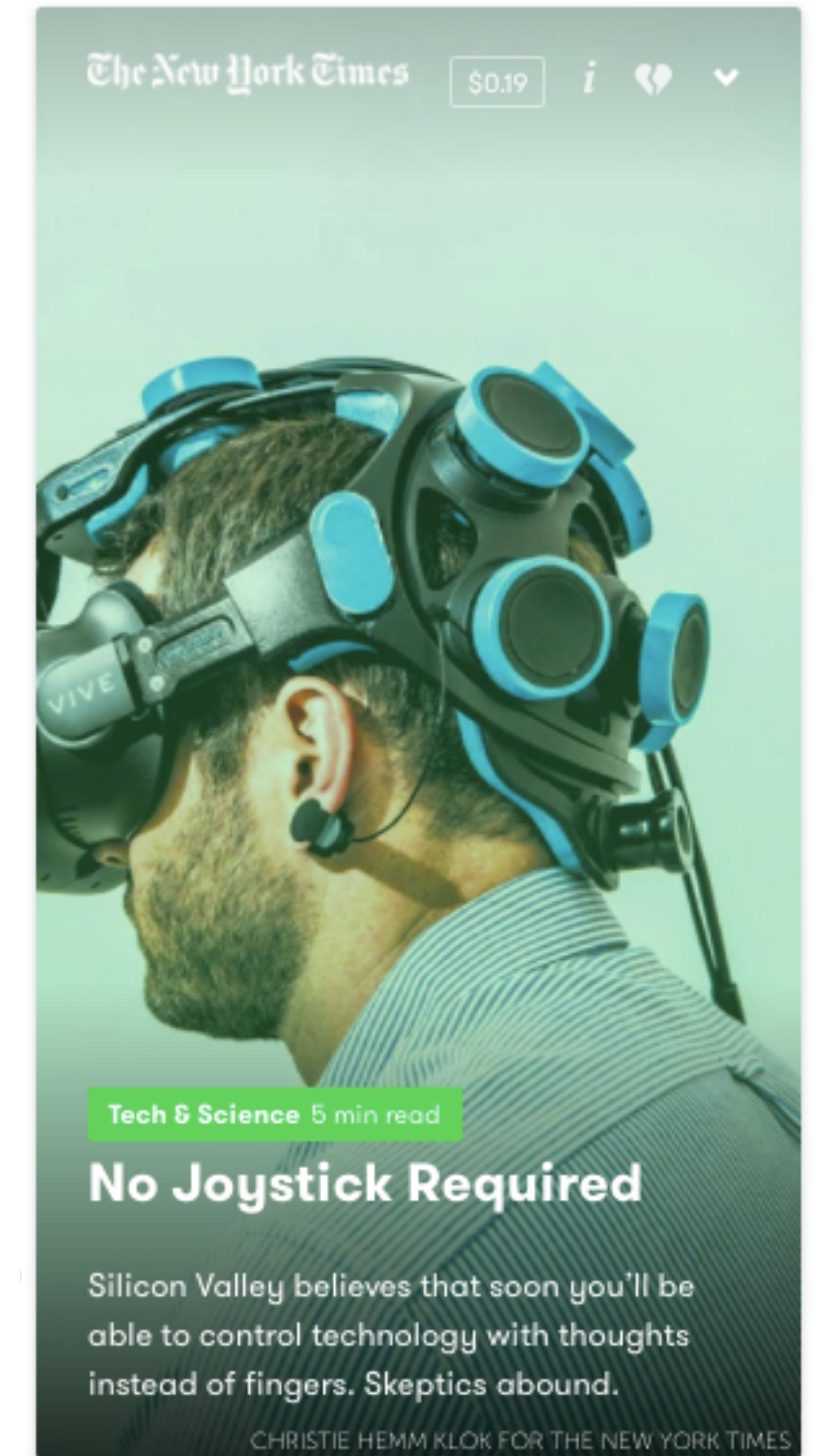
schrijven de o...
tijdschrift Sci...
De route biologisch vra...
bescherming v...
ging het niet...
Europese kust...
stichting Duur...
niet betrokken...
is het Europese...
huidige maat...
harde gegeve...
onderzoek b...
beschermingsr...
Tijdens zij...
zoute oceanen...
worden gebore...
de Atlantische...
golfstroom vo...
vasteland, een...
zwemmen de j...



Prioritised Selection

Random Forest classifier trained on a year of editorial picks

Clustered based on Cosine similarity with TF.IDF vectors

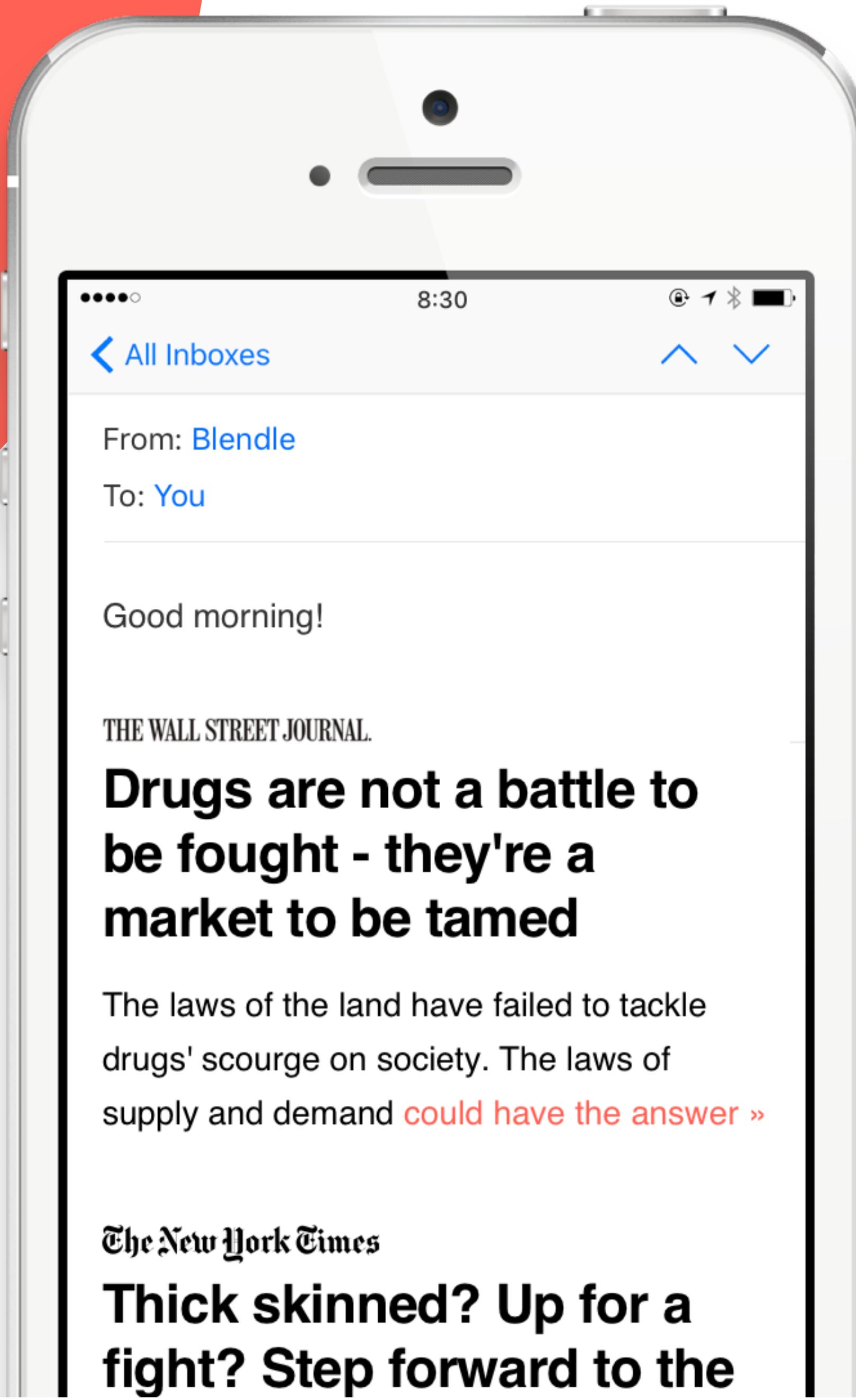


Short shelf life

Sales ↑

Today

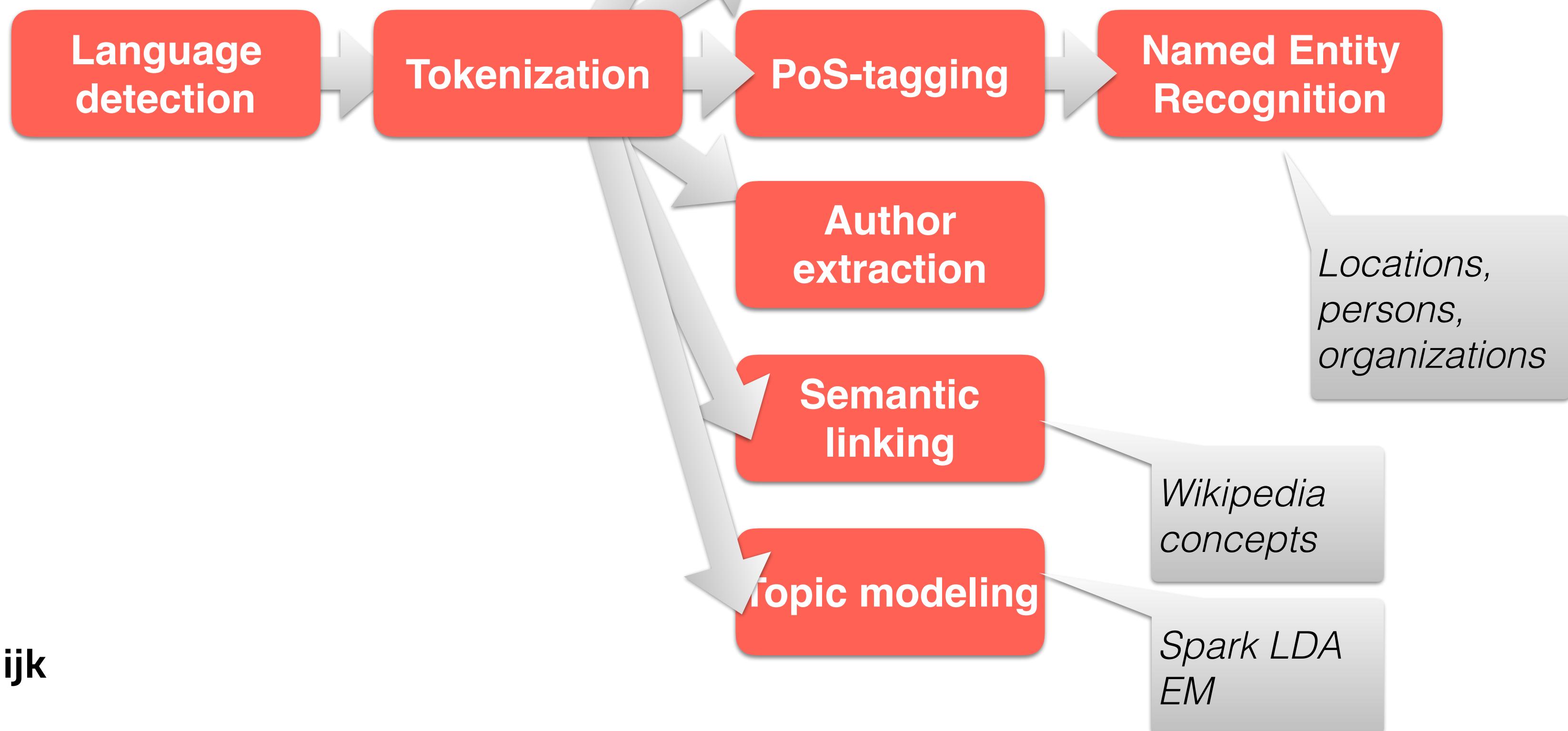
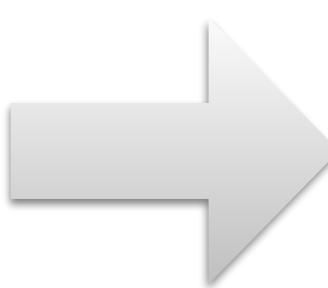




Daily cold start

- >7K new articles every night
- Our newsletter is an important traffic driver
- No usage info to *rank* the newsletter before we *send* the newsletter

Article enrichment pipeline



User Profiling



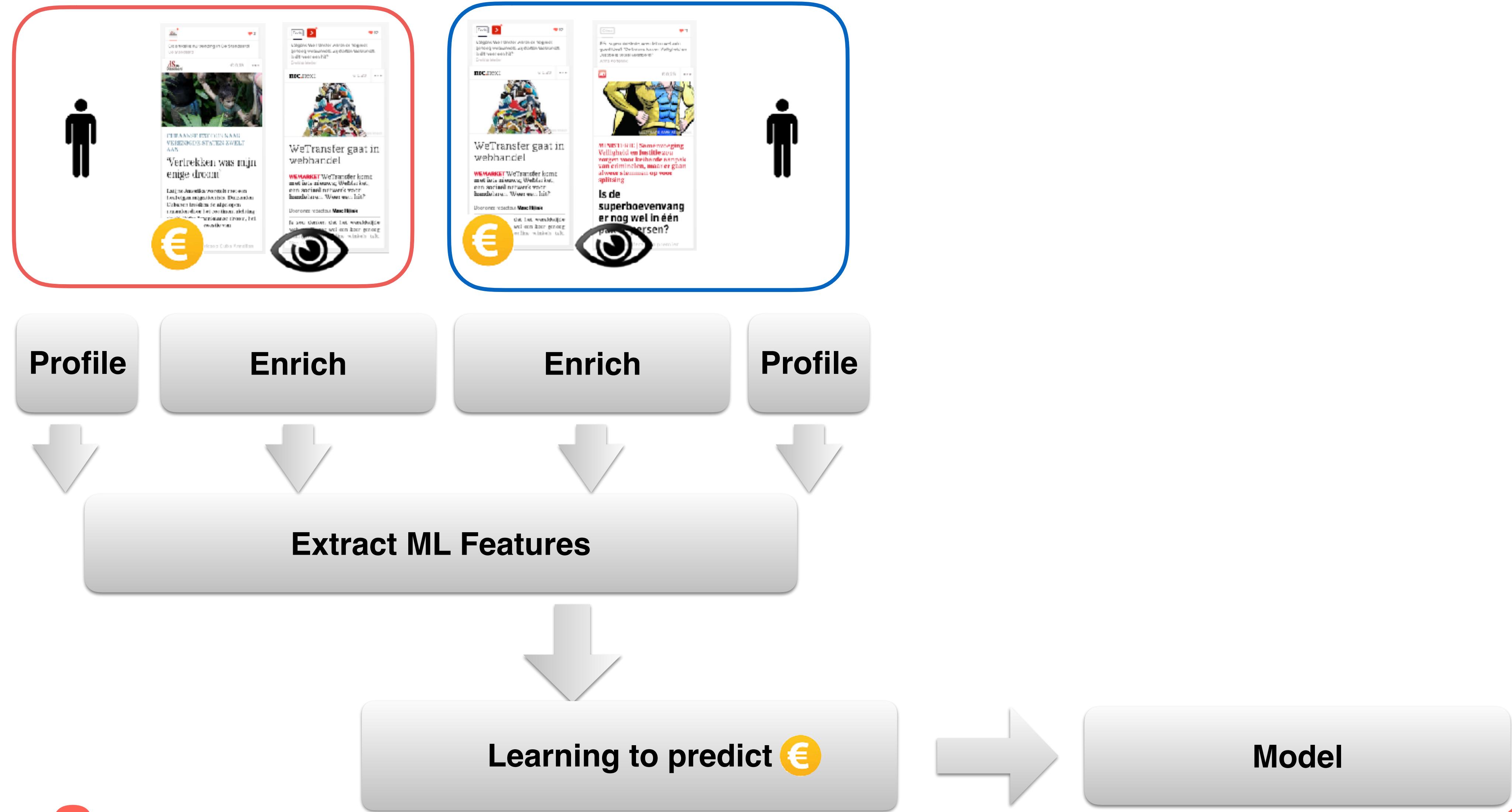
Enrich

Aggregate

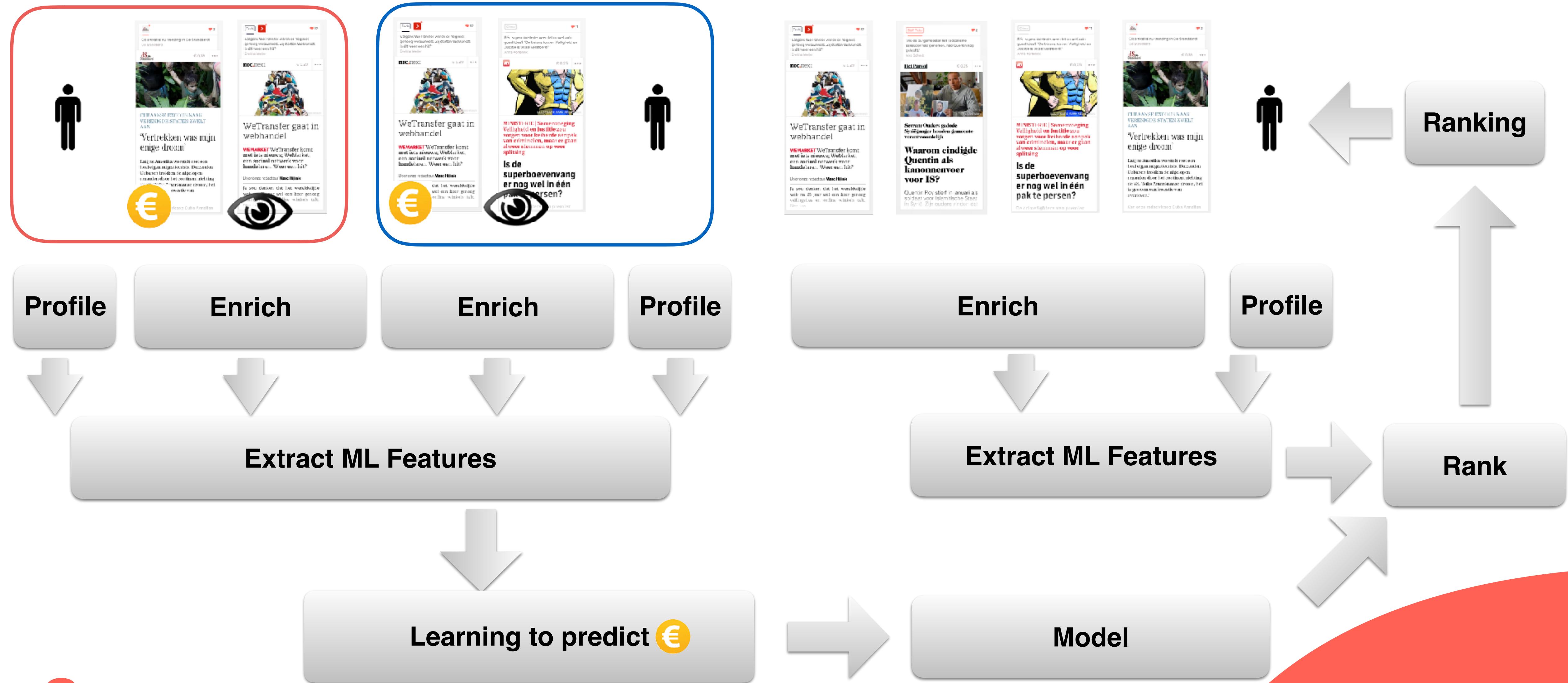
Profile

- Reads
- Views
- Negative feedback

Learning to rank: preference learning



Learning to rank: preference learning

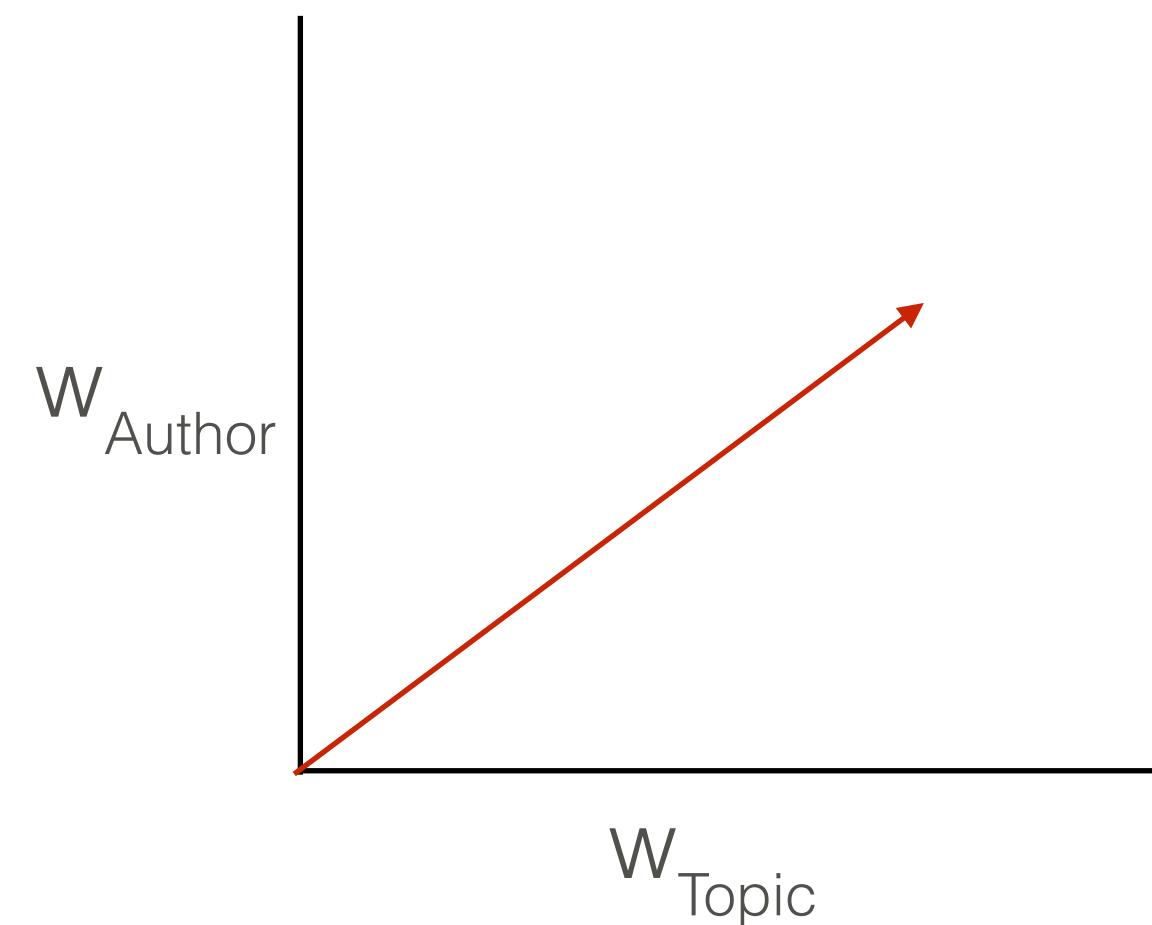


Online Learning to Rank

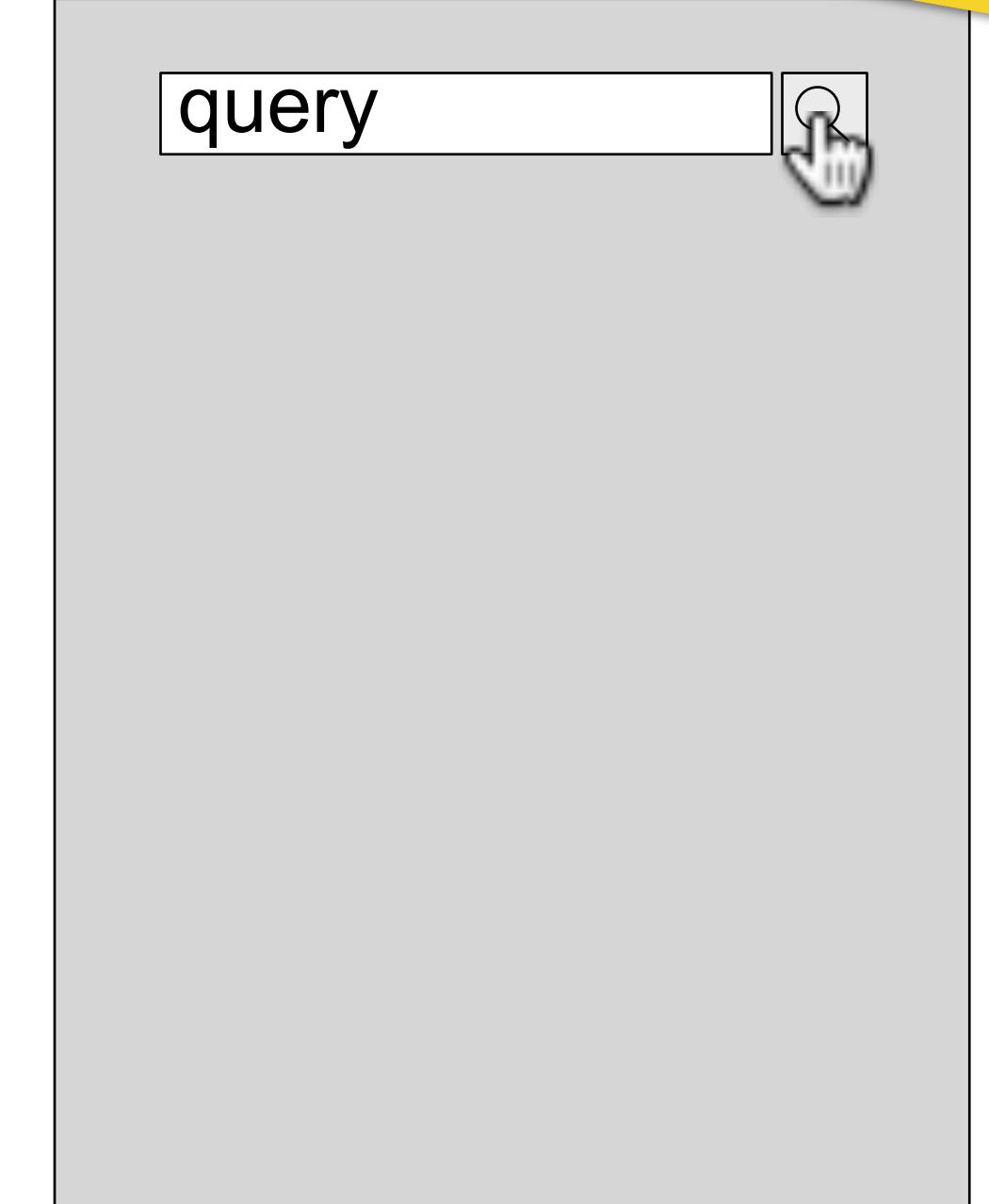
- Learning with a user in the loop
- Daily updates to our model

Dueling Bandit Gradient Descent

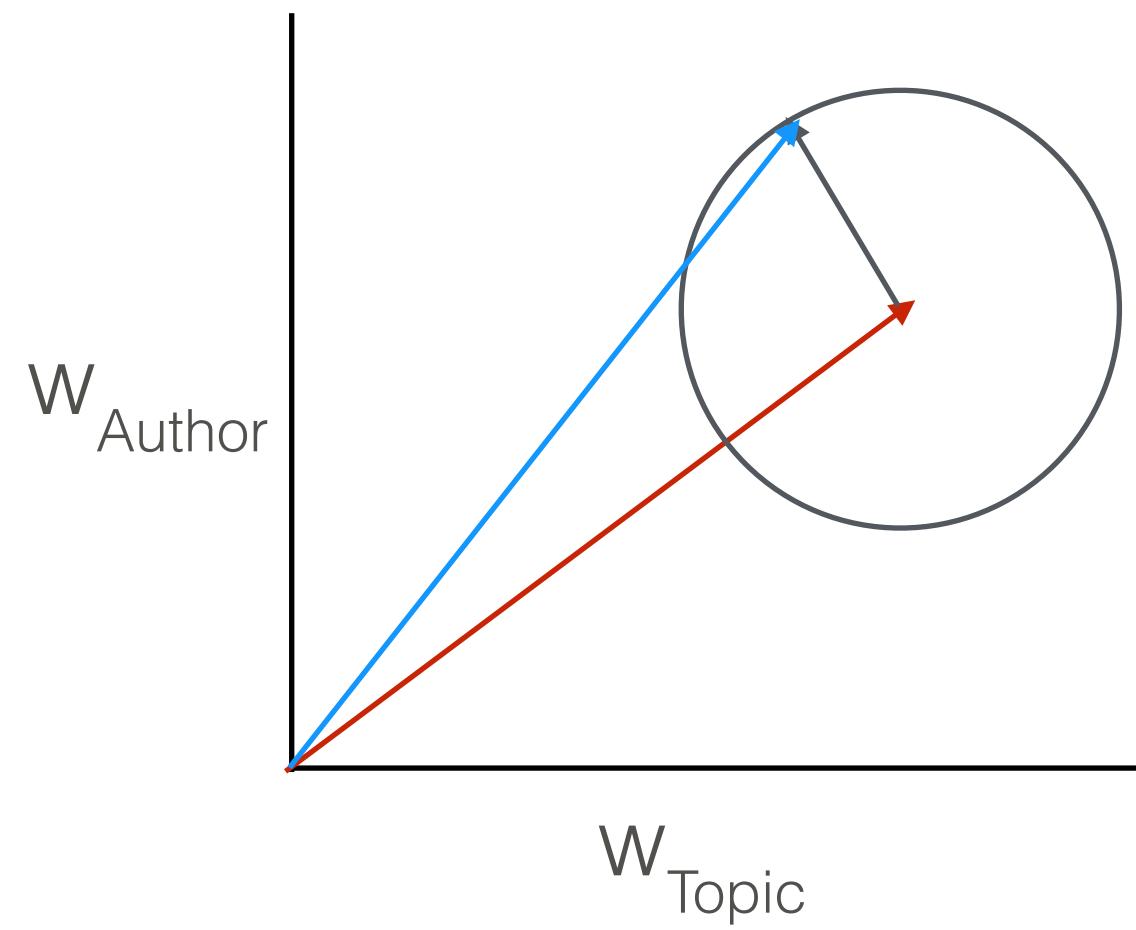
Exploitative Ranker



For Blendle the user
is the query



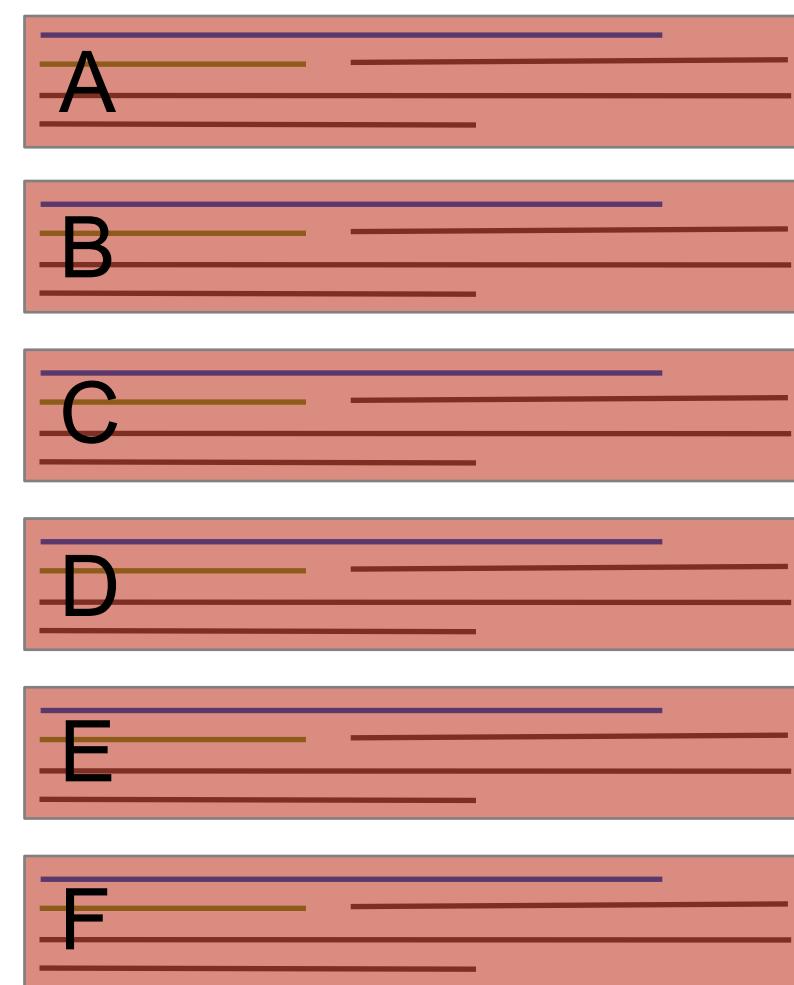
Explorative Ranker



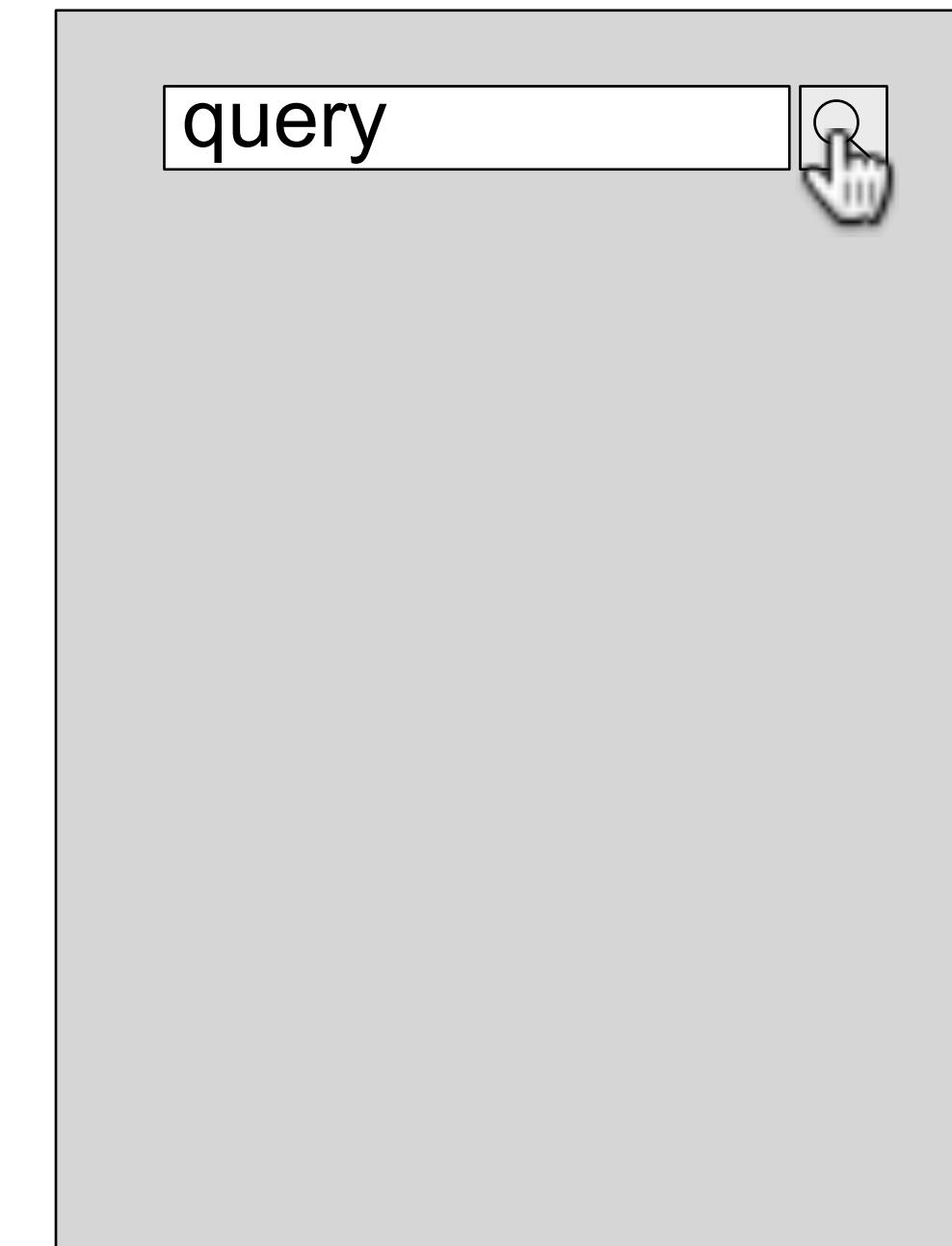
[Yue et al., 2009; Hofmann et al., 2011]

TeamDraft Interleave

Exploitative Ranking



Interleaved Ranking

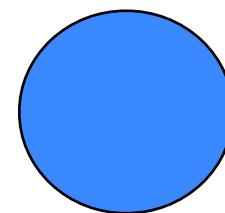


Explorative Ranking

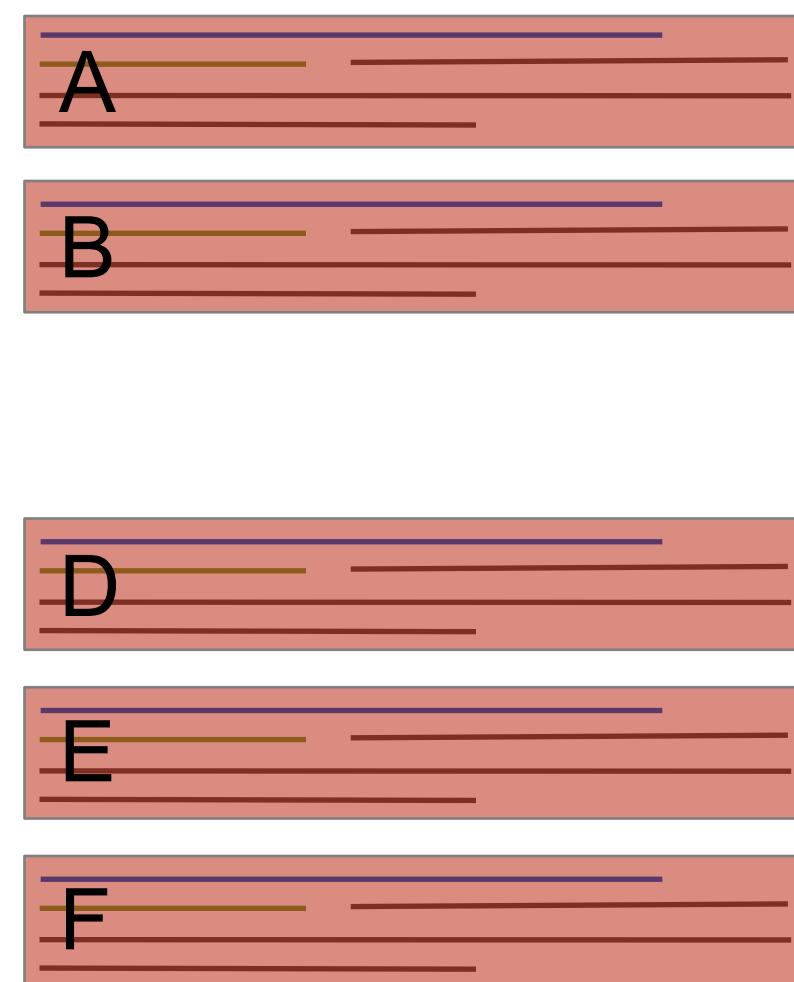


Radlinski, F., Kurup, M., & Joachims, T. (2008). How does clickthrough data reflect retrieval quality? In CIKM '08.

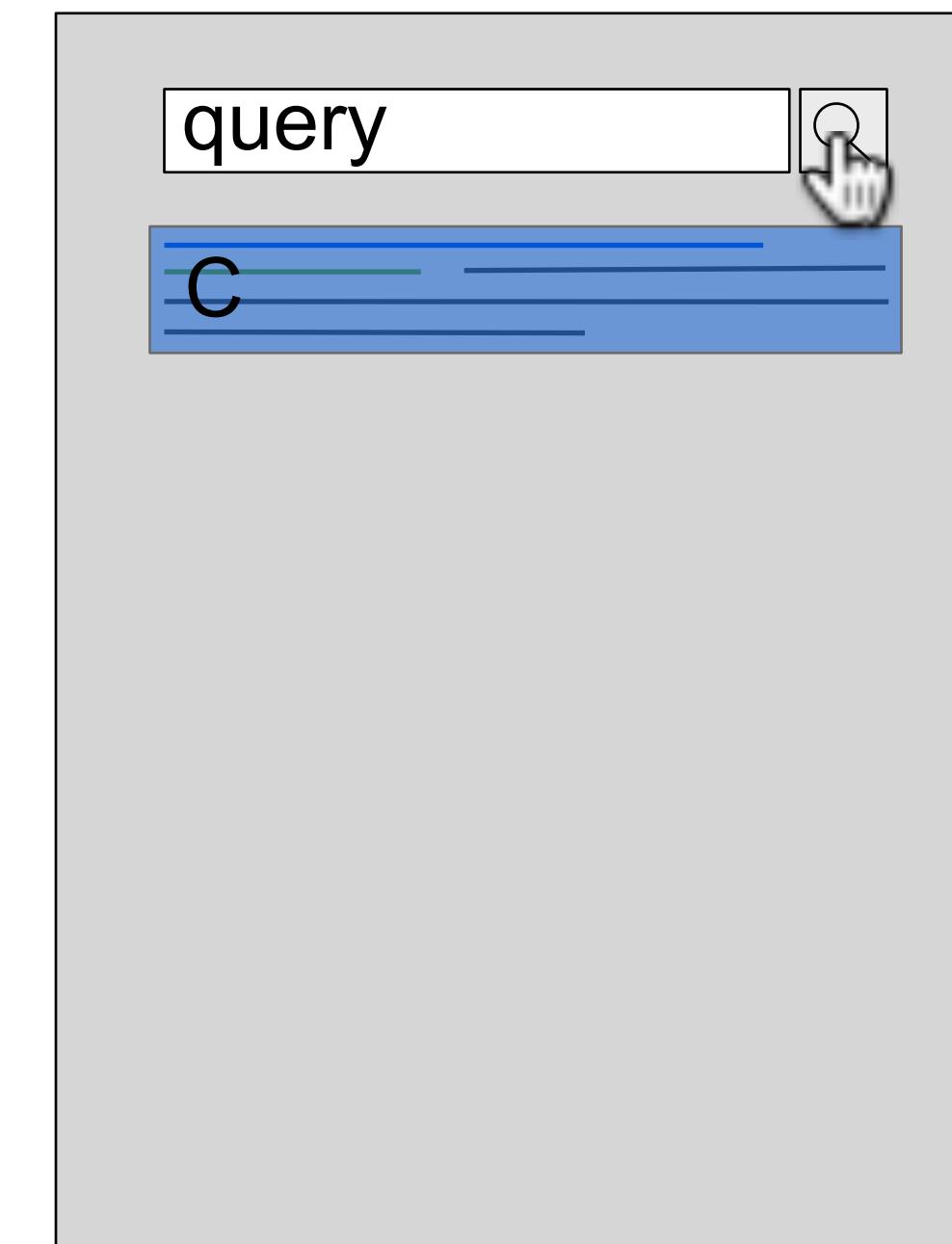
TeamDraft Interleave



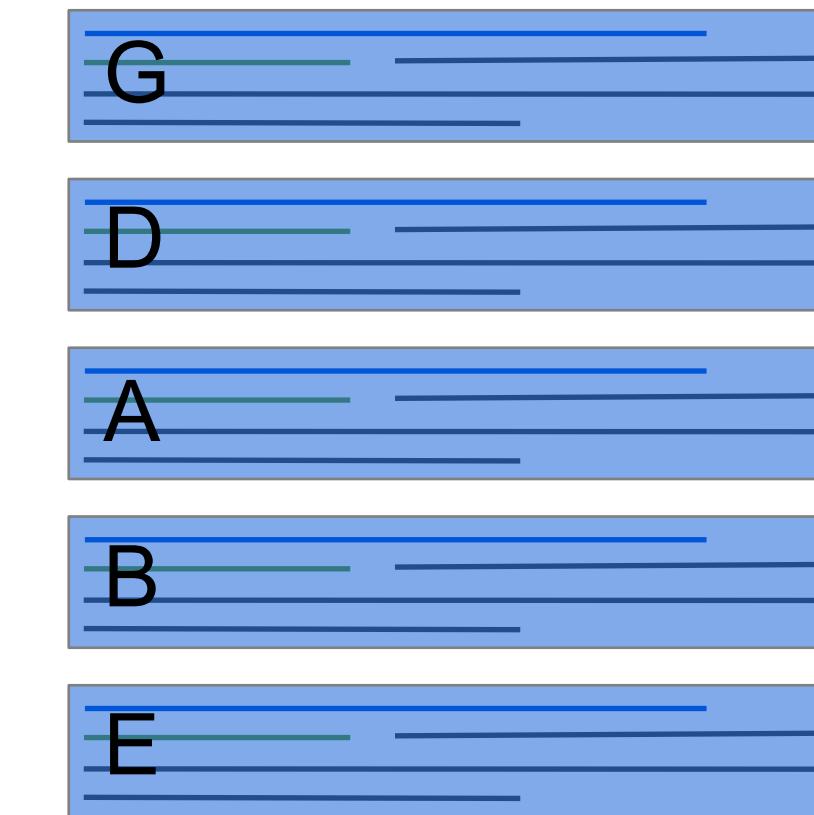
Exploitative Ranking



Interleaved Ranking

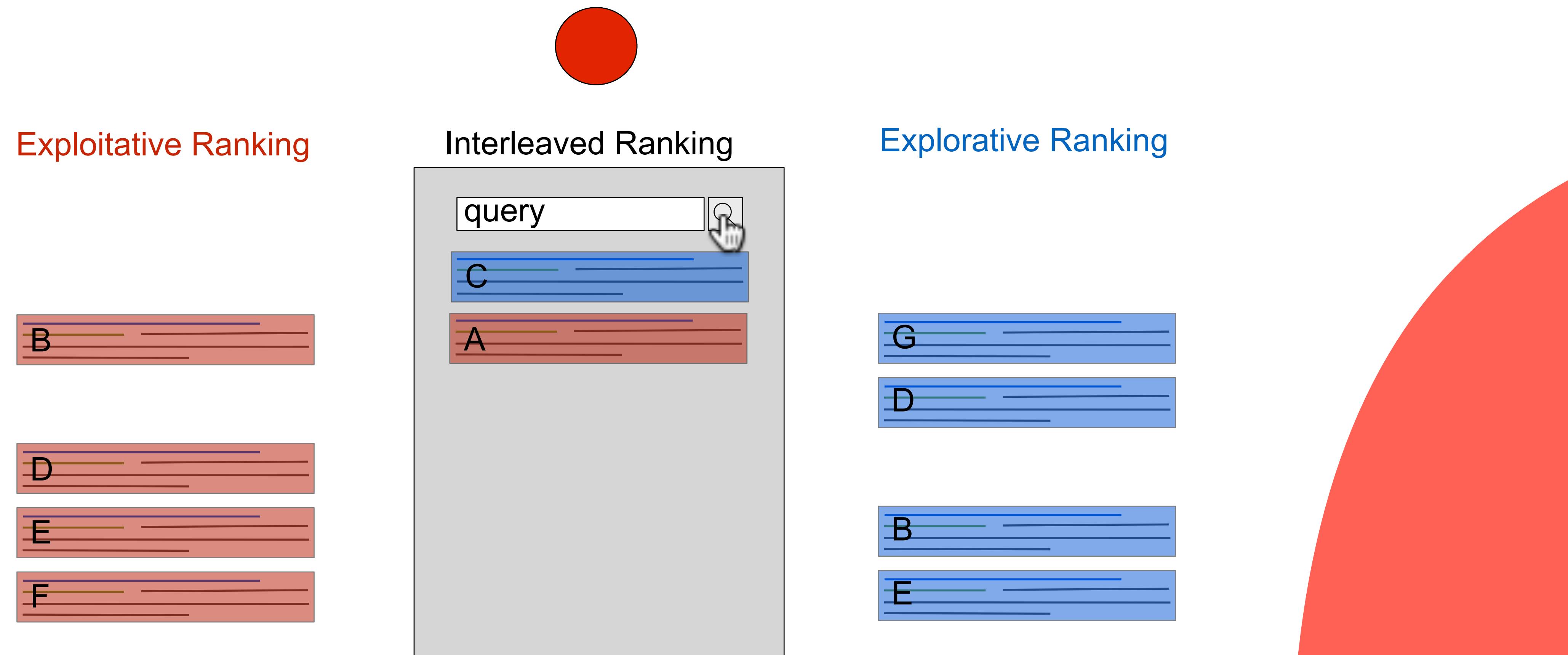


Explorative Ranking



Radlinski, F., Kurup, M., & Joachims, T. (2008). How does clickthrough data reflect retrieval quality? In CIKM '08.

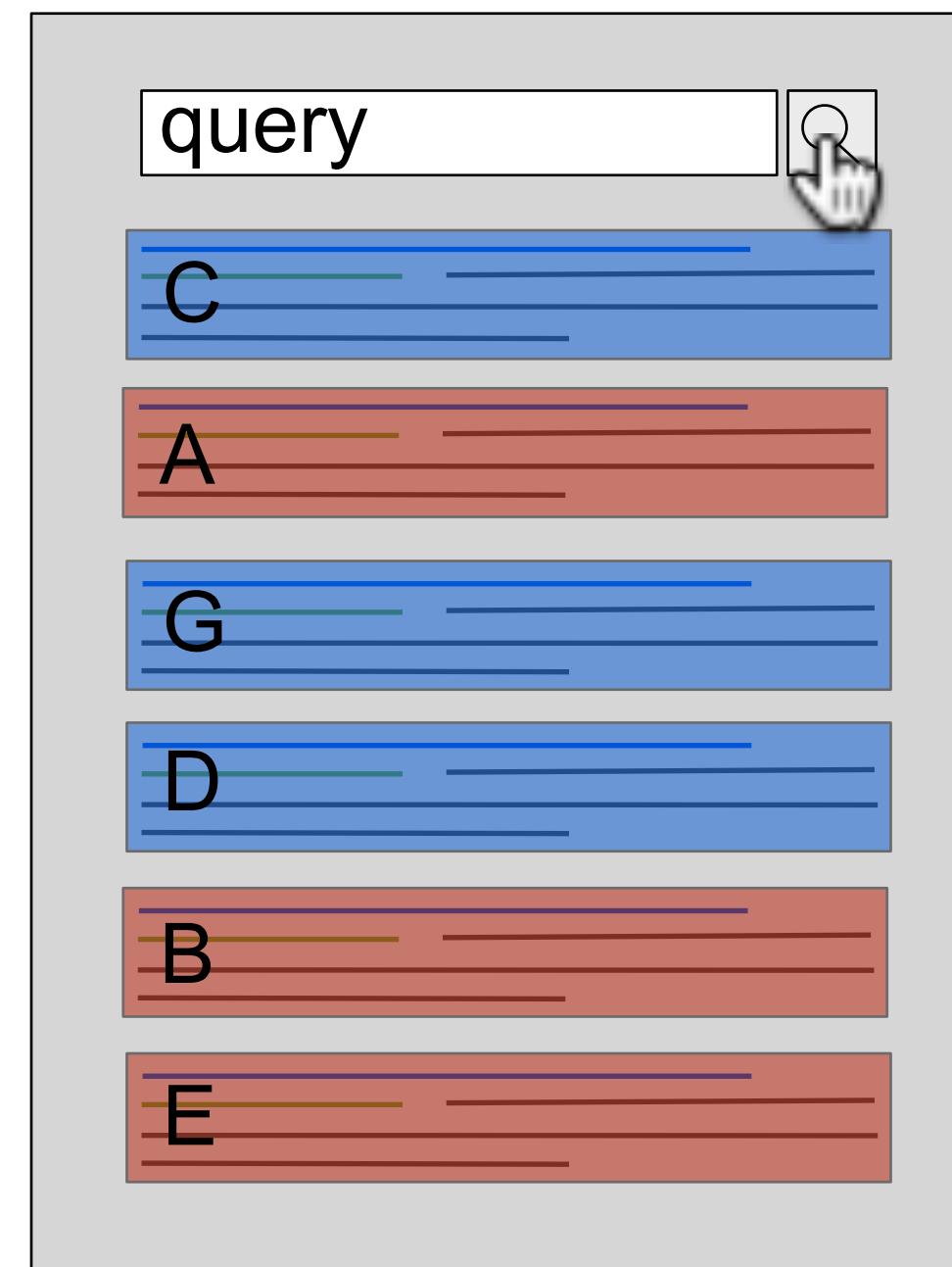
TeamDraft Interleave



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TeamDraft Interleave

Interleaved Ranking

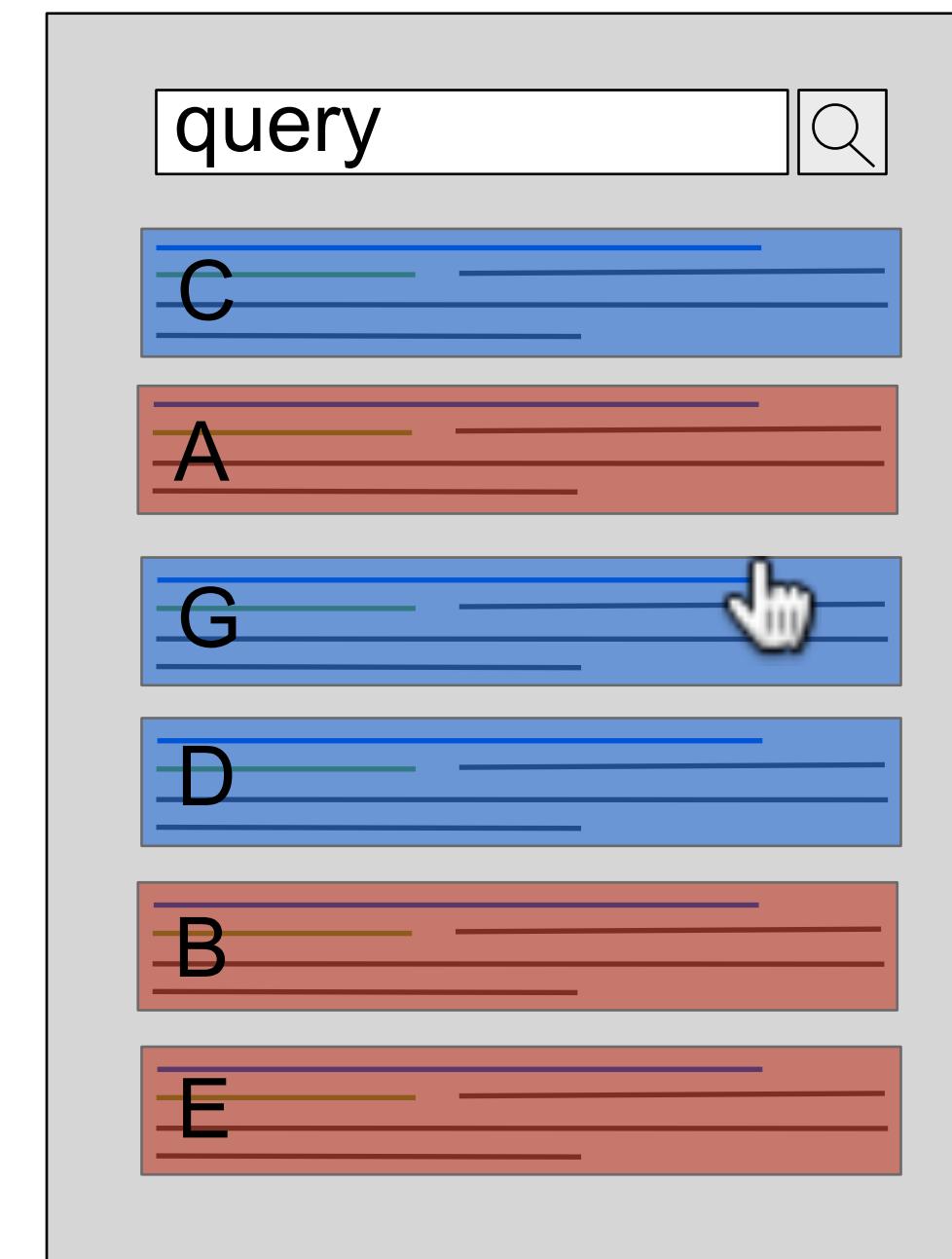


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TeamDraft Interleave

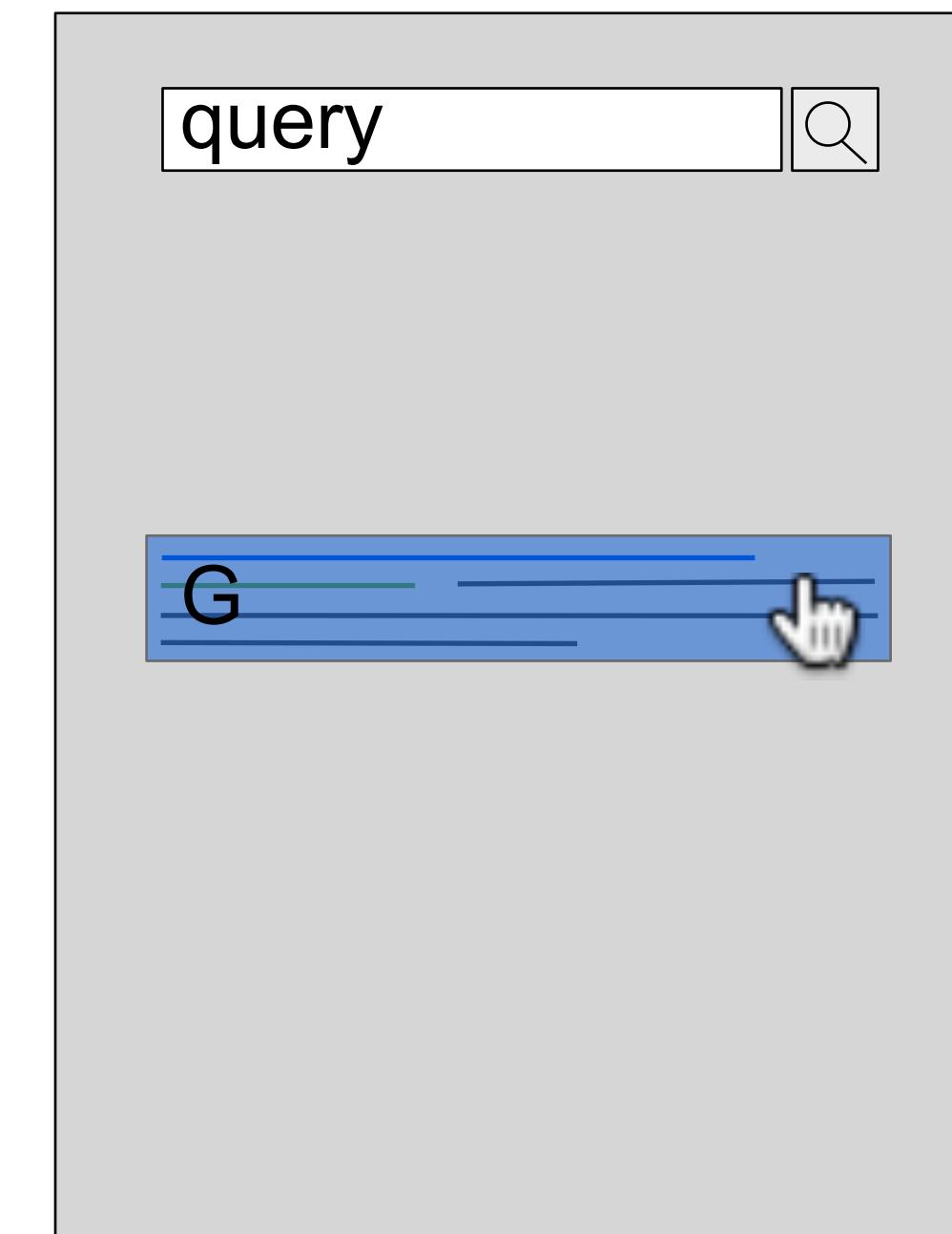
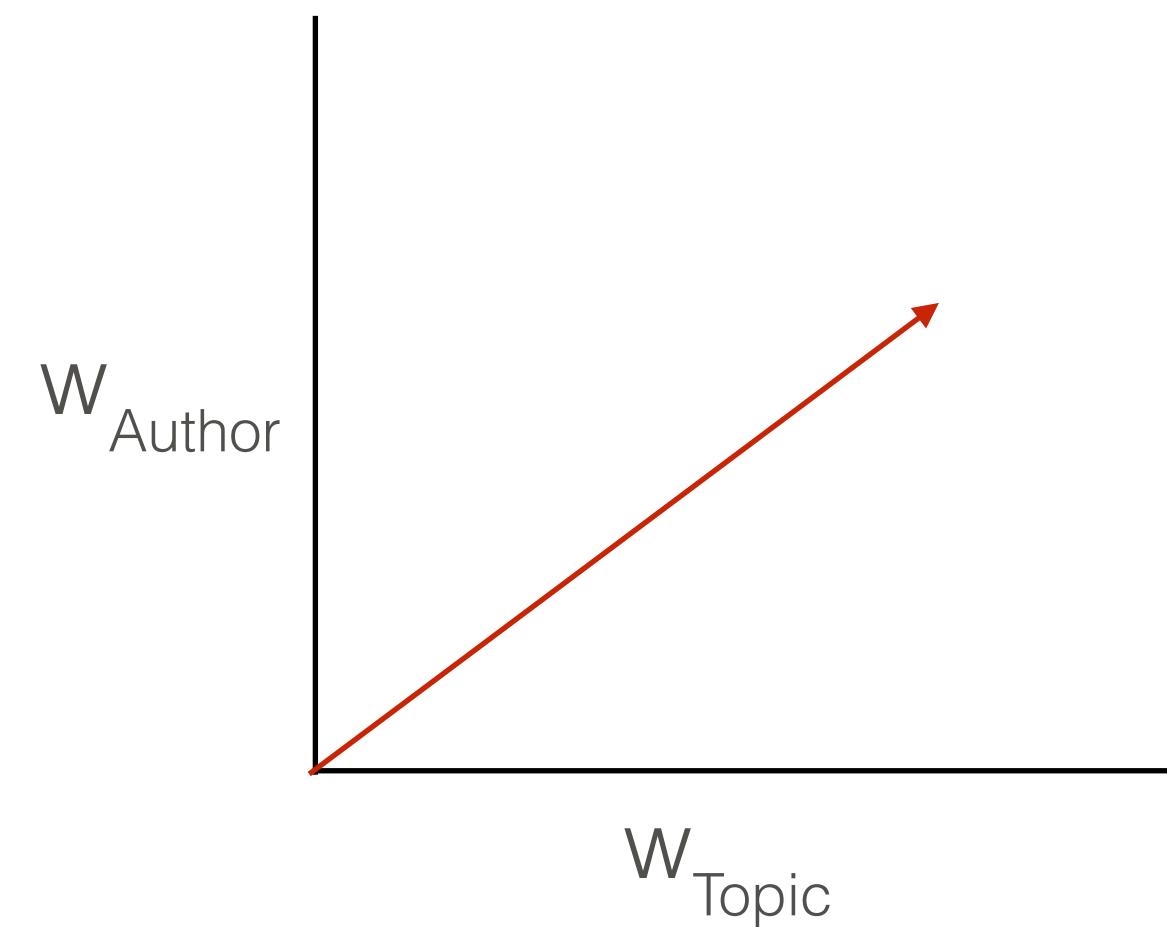
note: the interleaving method is NOT part of DBGD, it just provides feedback

Interleaved Ranking

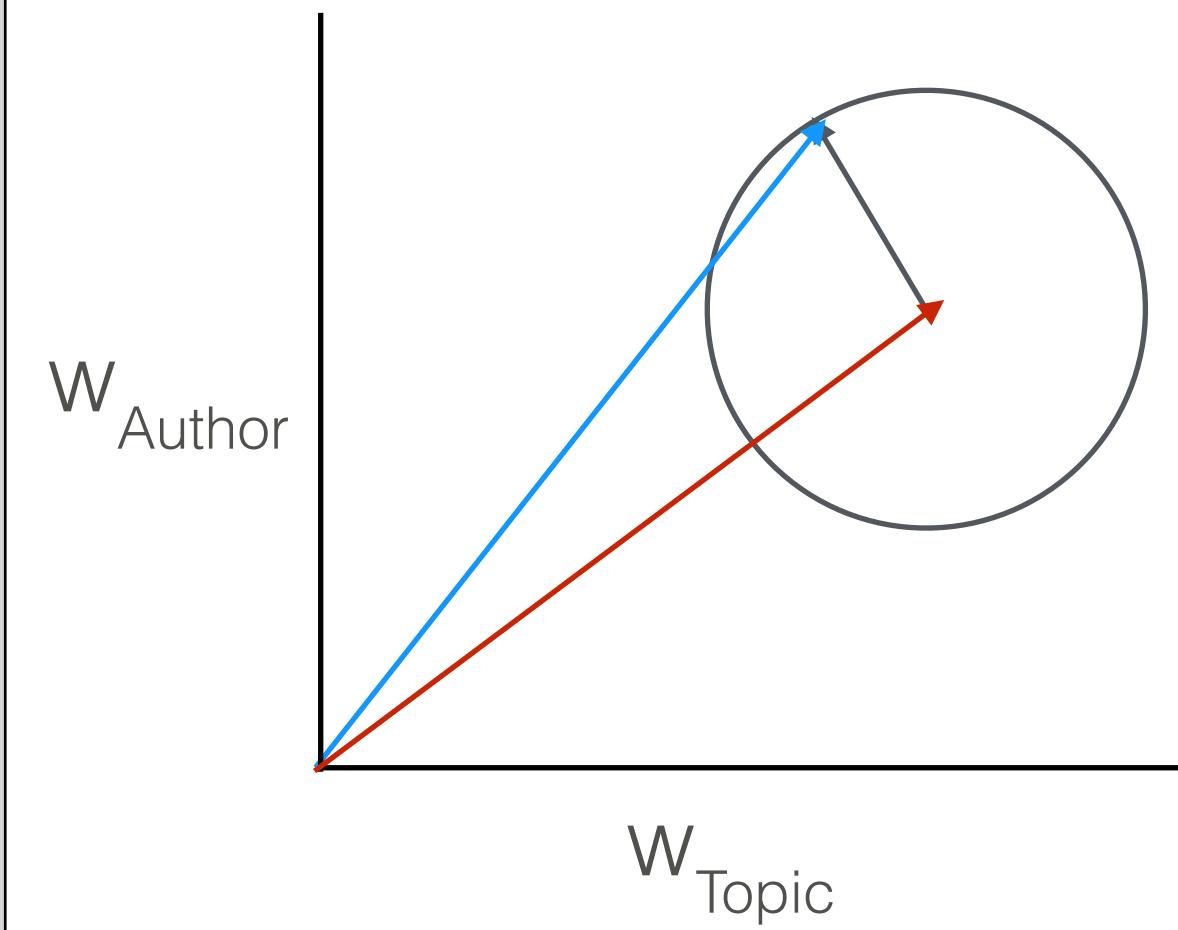


Dueling Bandit Gradient Descent

Exploitative Ranker



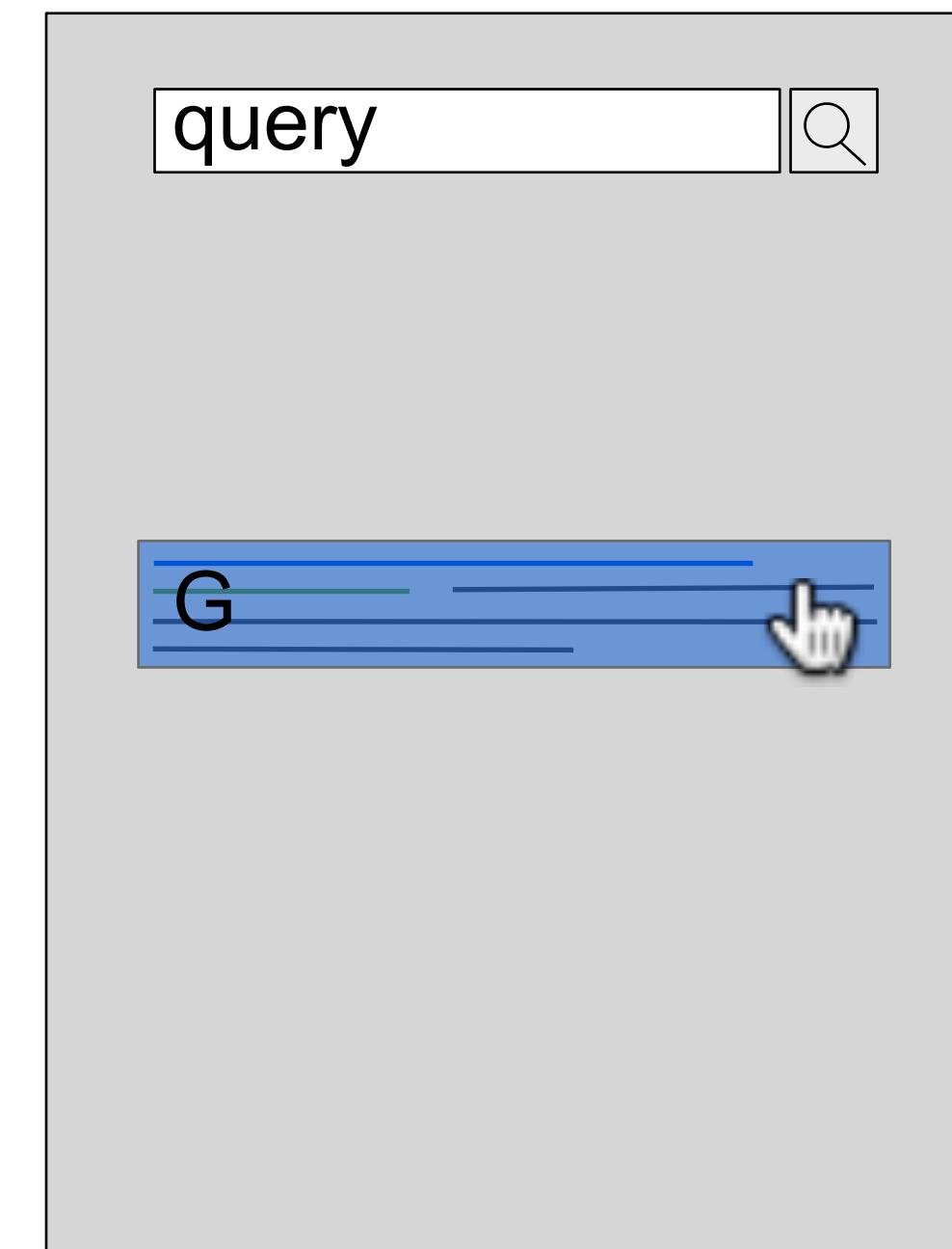
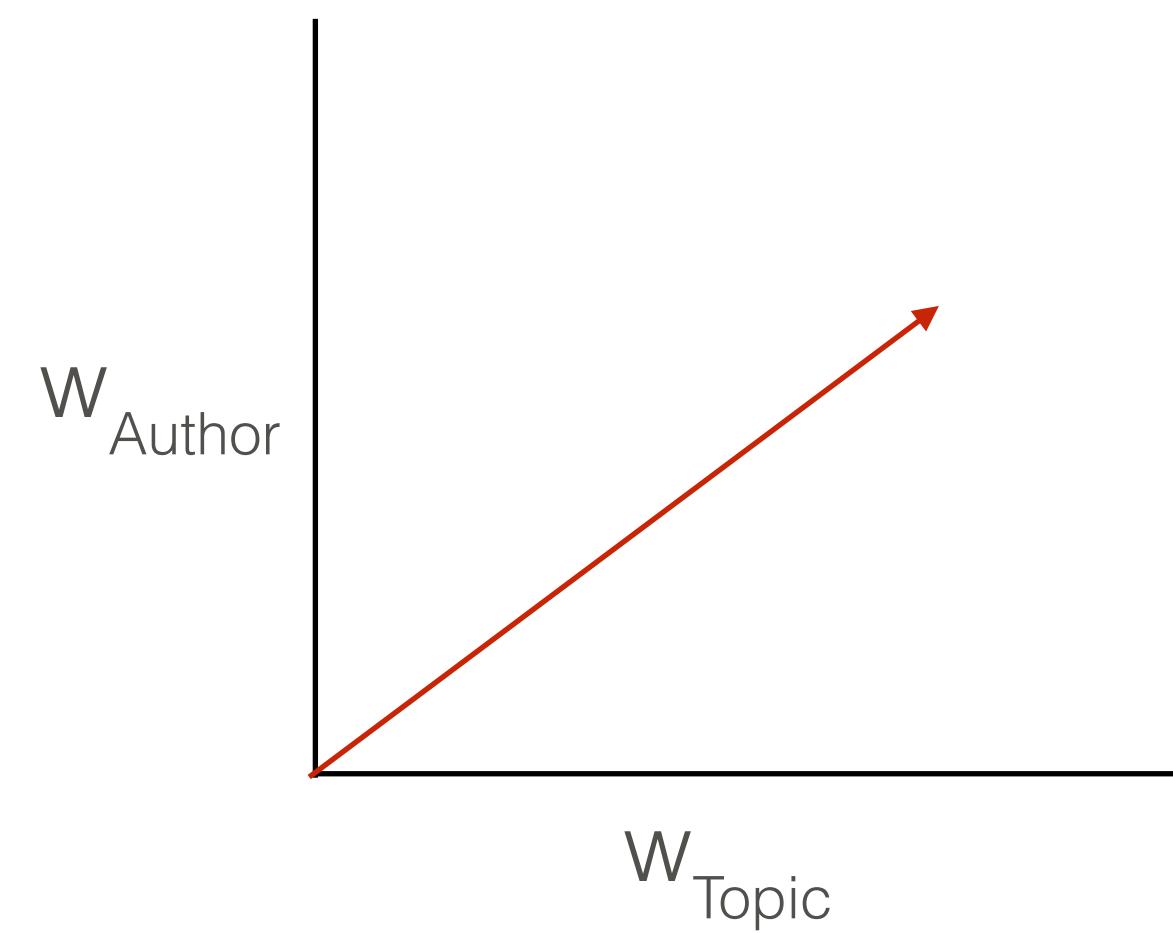
Explorative Ranker



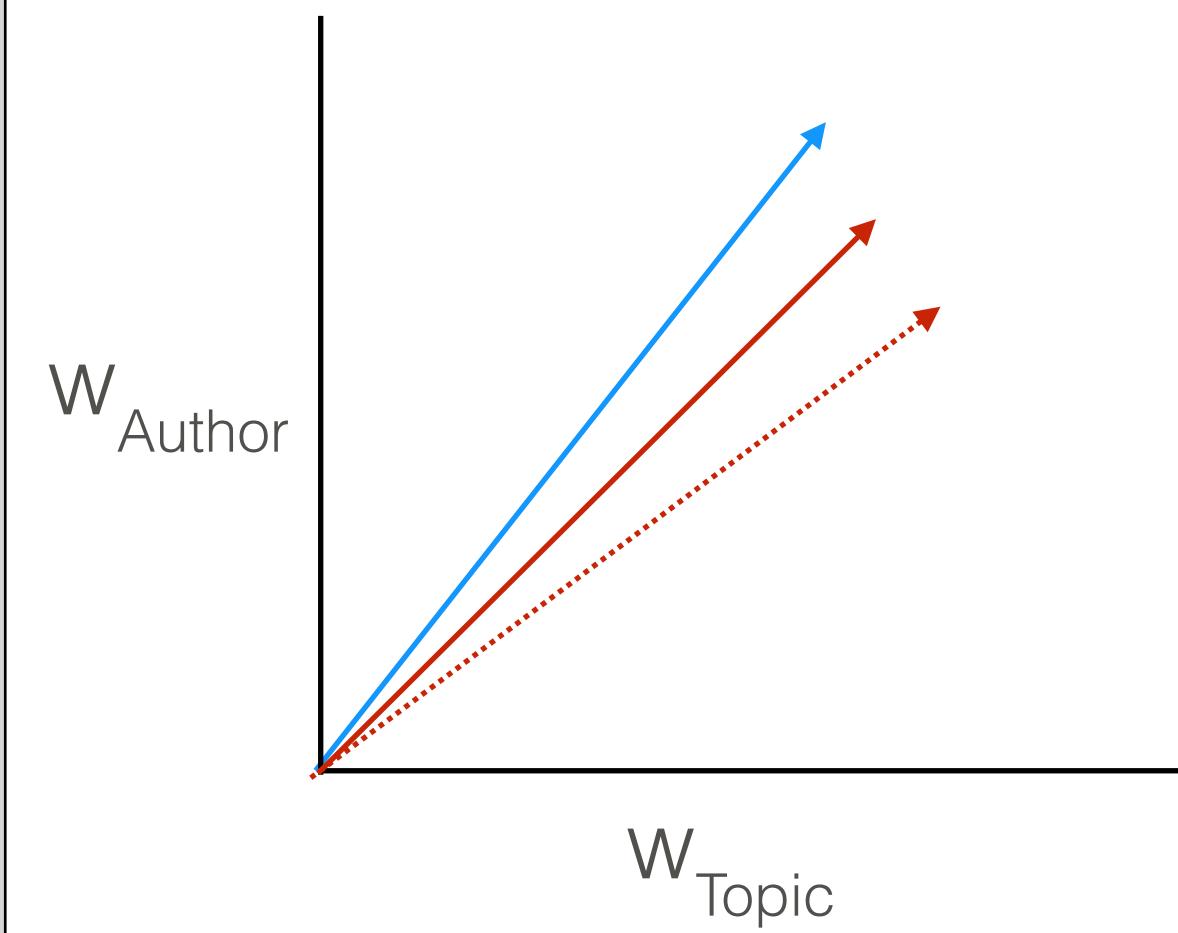
[Yue et al., 2009; Hofmann et al., 2011]

Dueling Bandit Gradient Descent

Exploitative Ranker



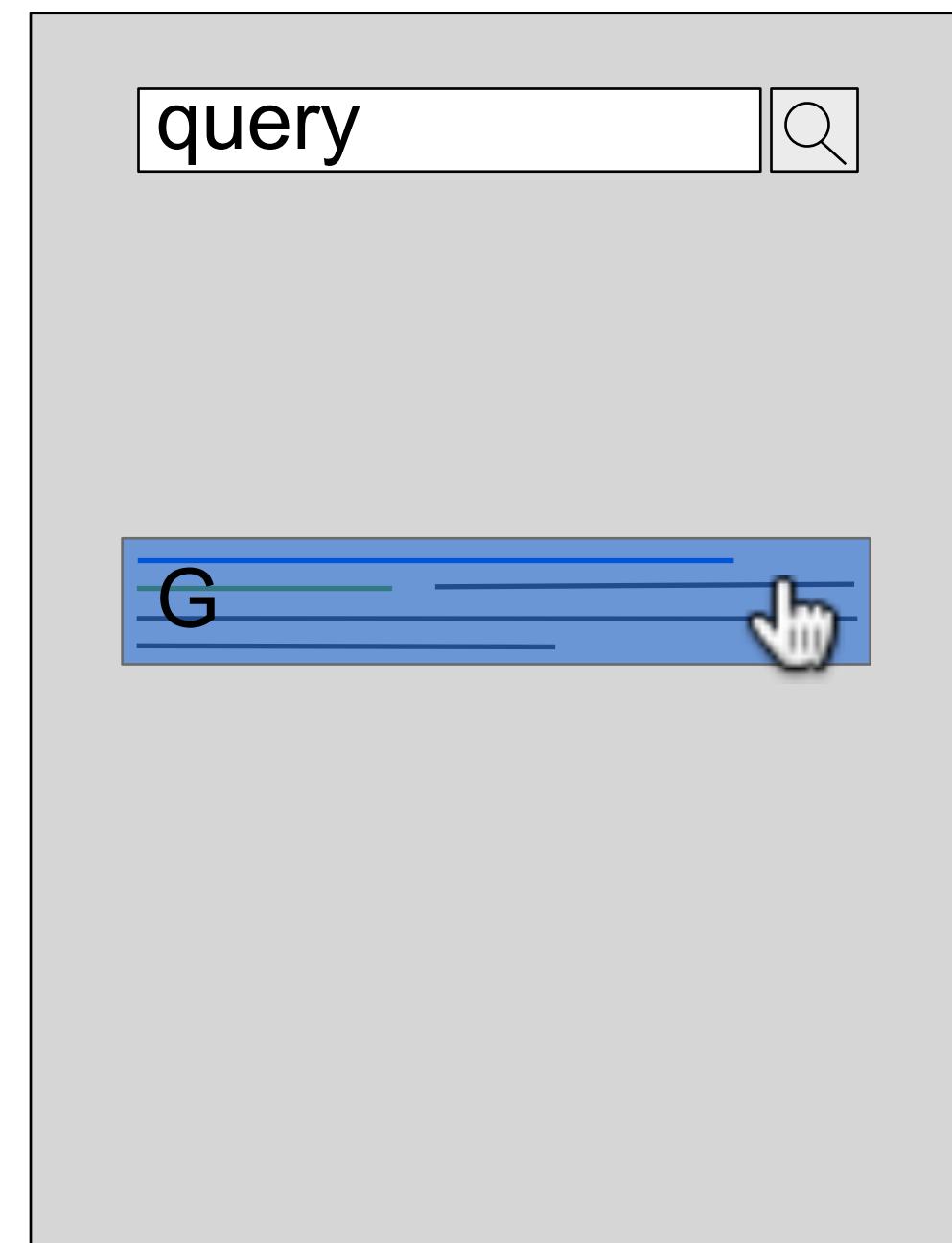
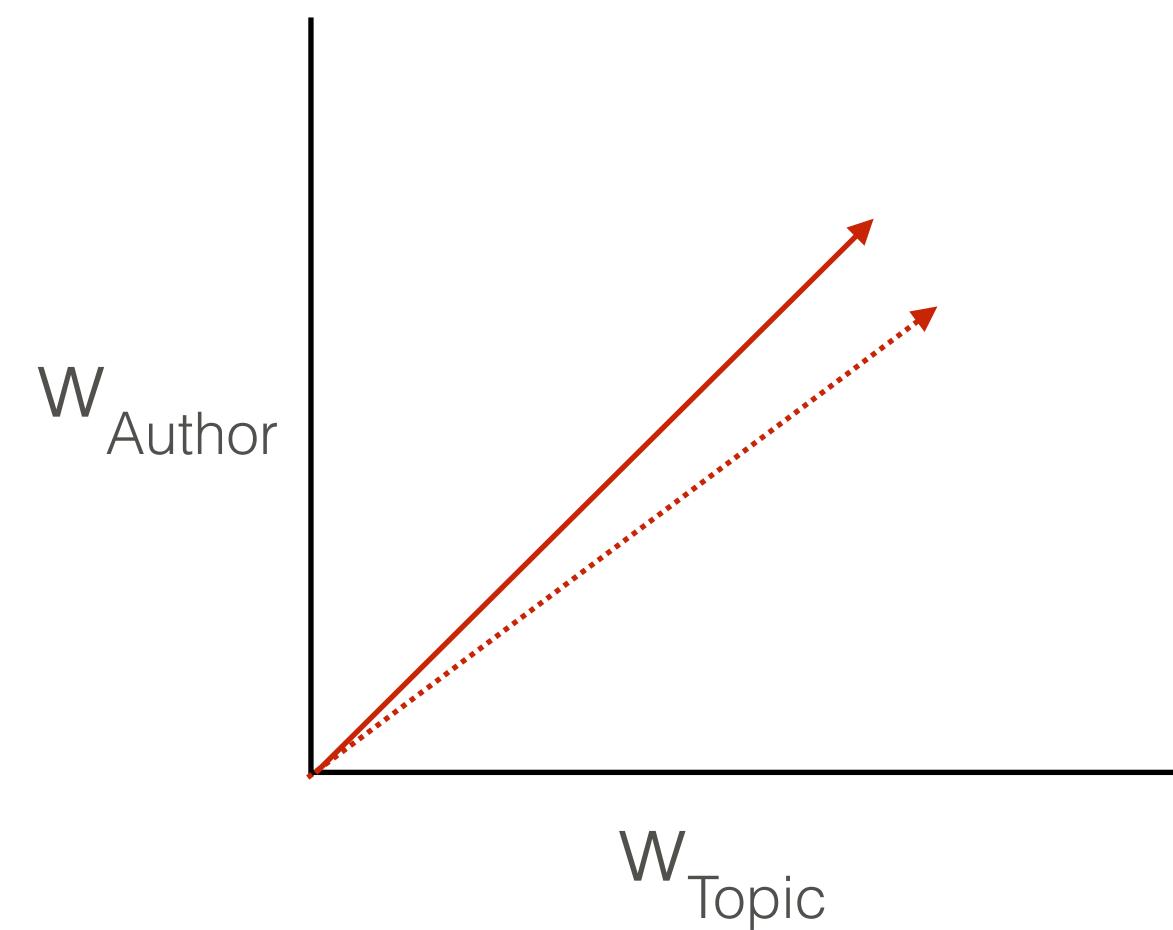
Explorative Ranker



[Yue et al., 2009; Hofmann et al., 2011]

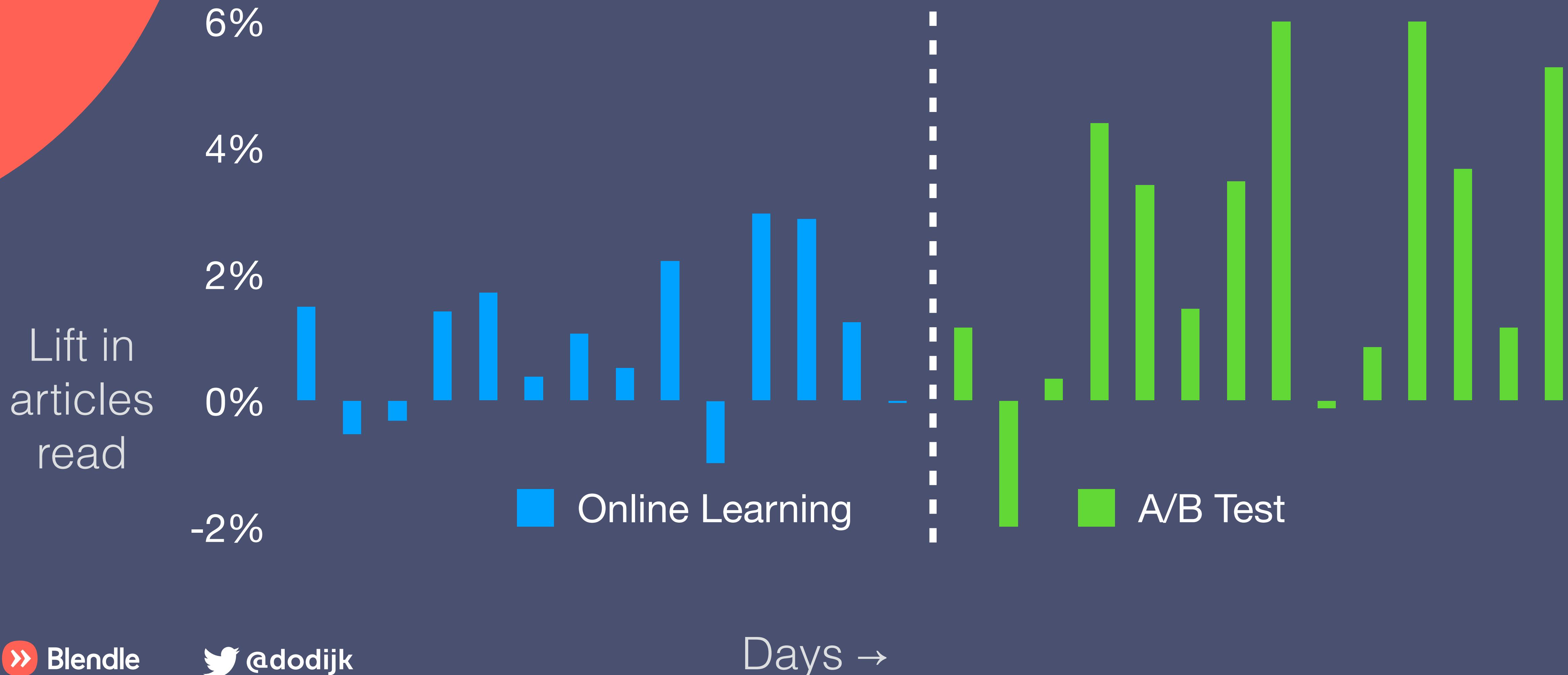
Dueling Bandit Gradient Descent

Exploitative Ranker



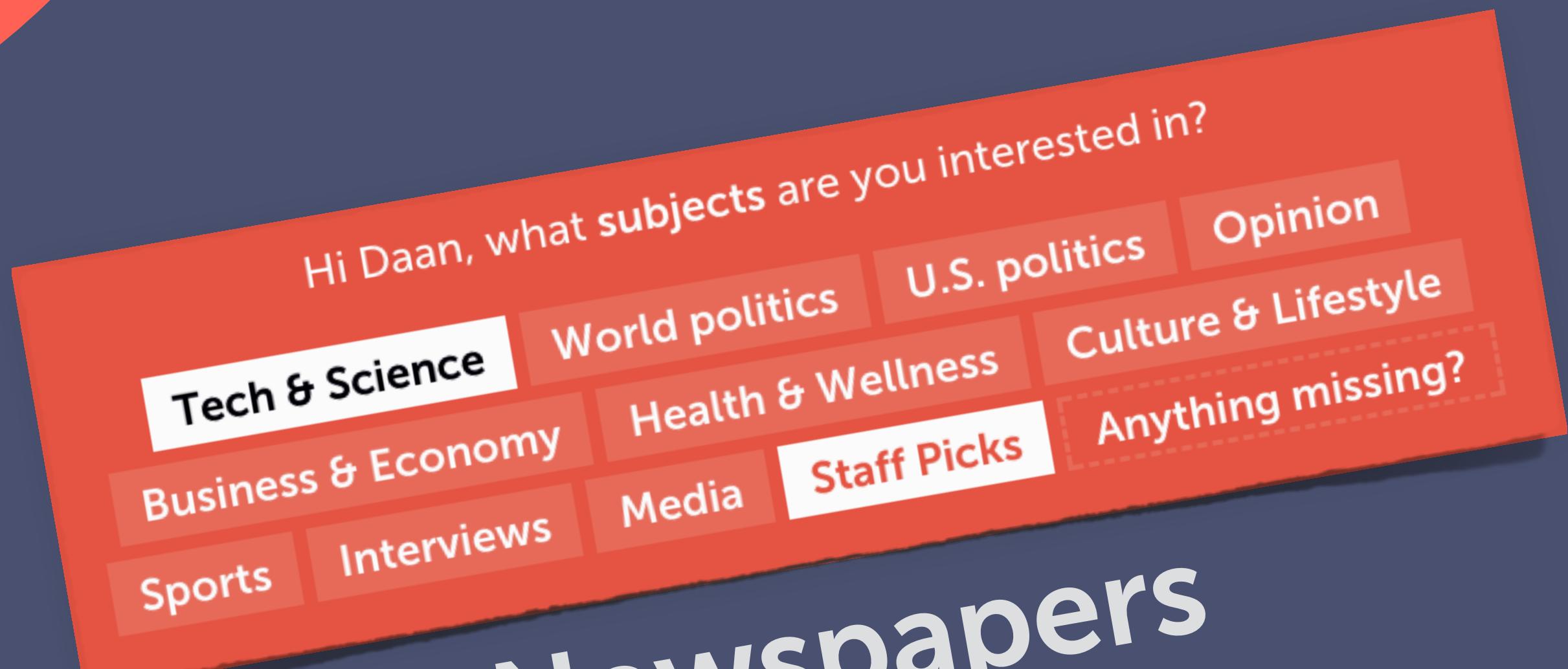
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Online Evaluation

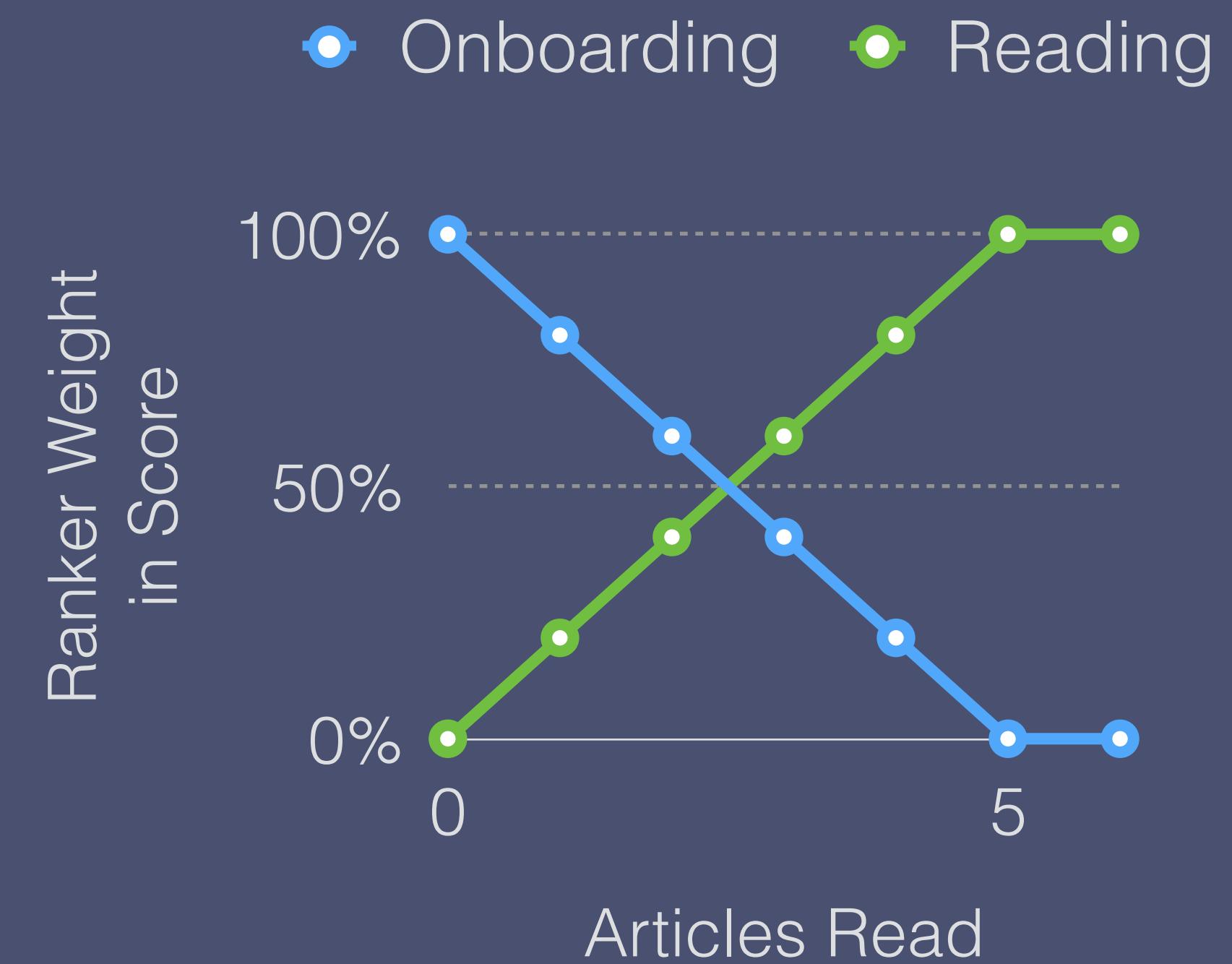


User Cold Start

User Cold Start

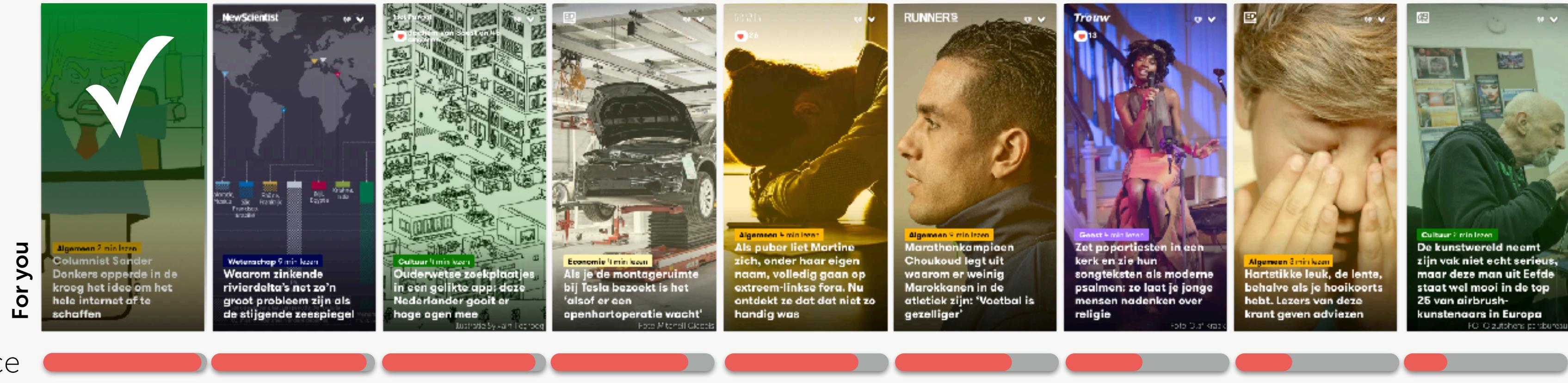


+ Newspapers

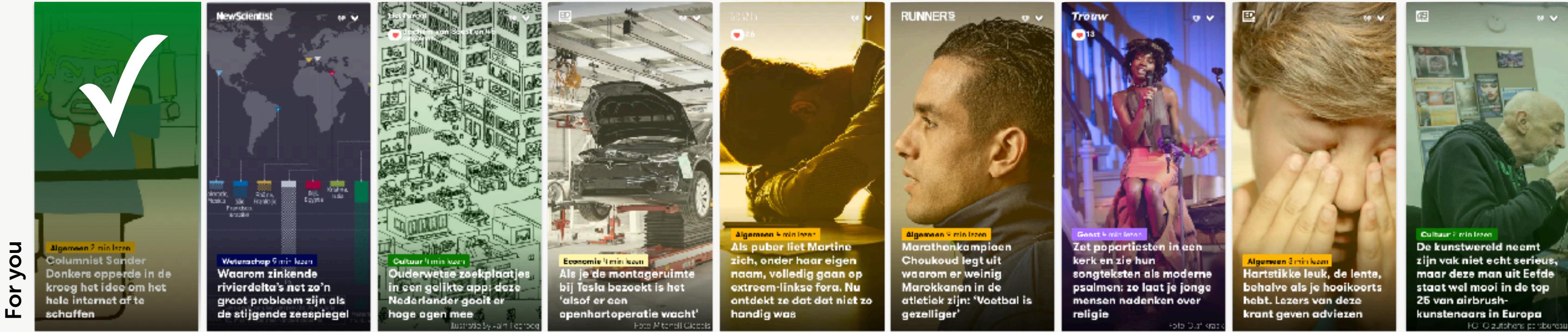


5% lift in
articles read

Diversification



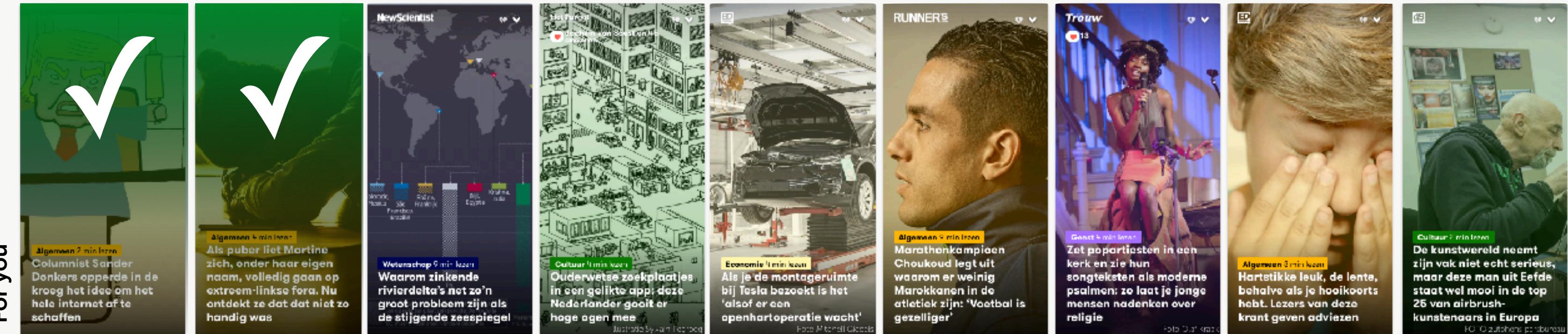
Diversification



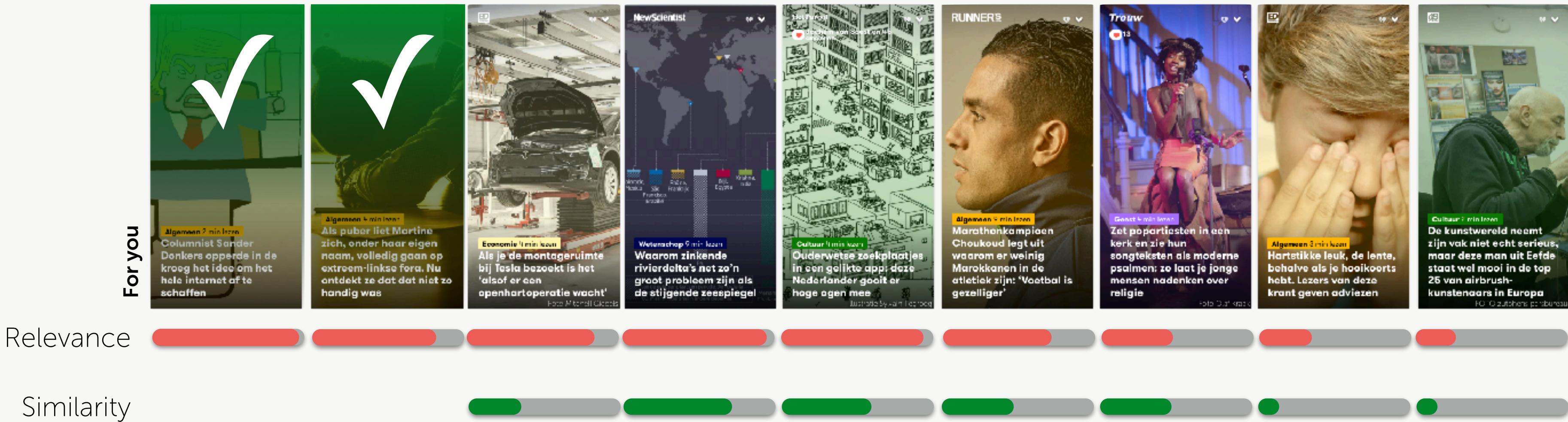
Relevance

Similarity

Diversification

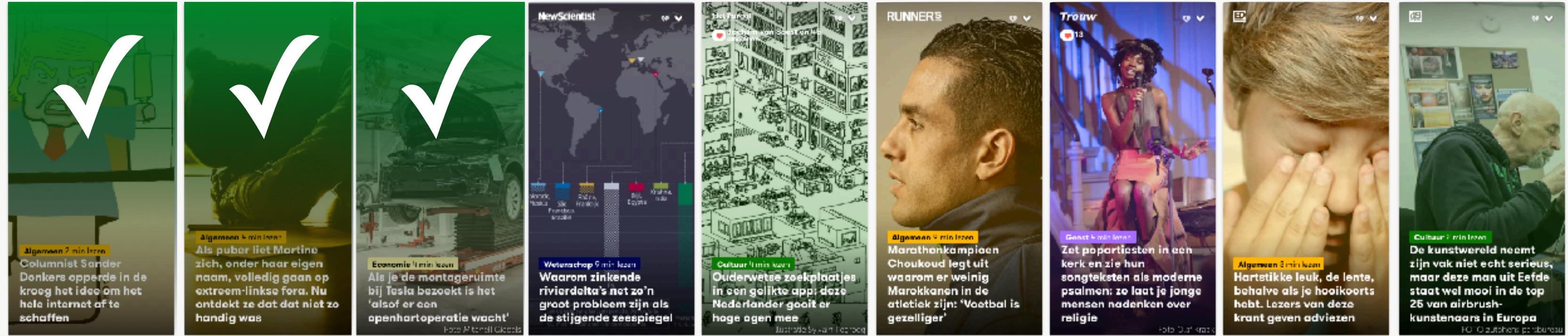


Diversification



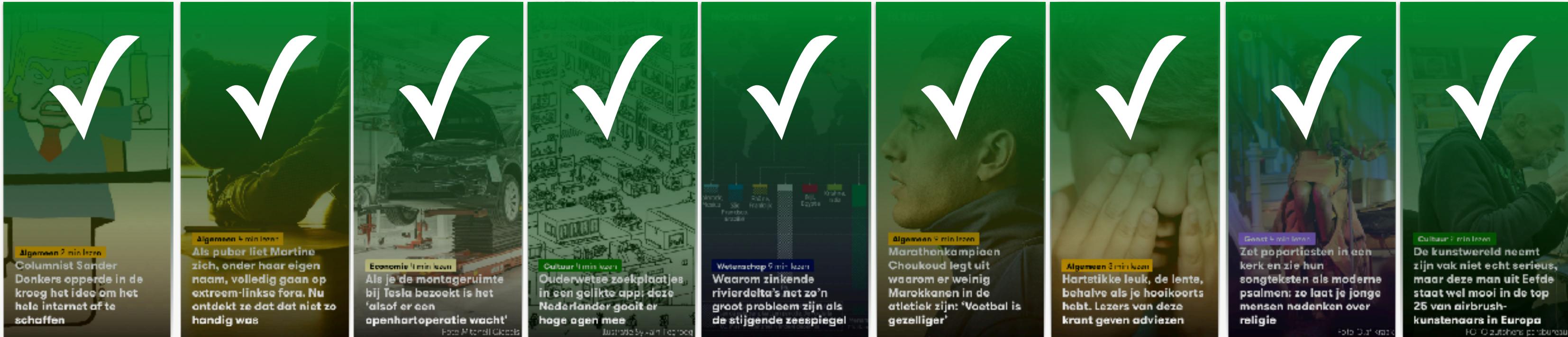
Diversification

For you

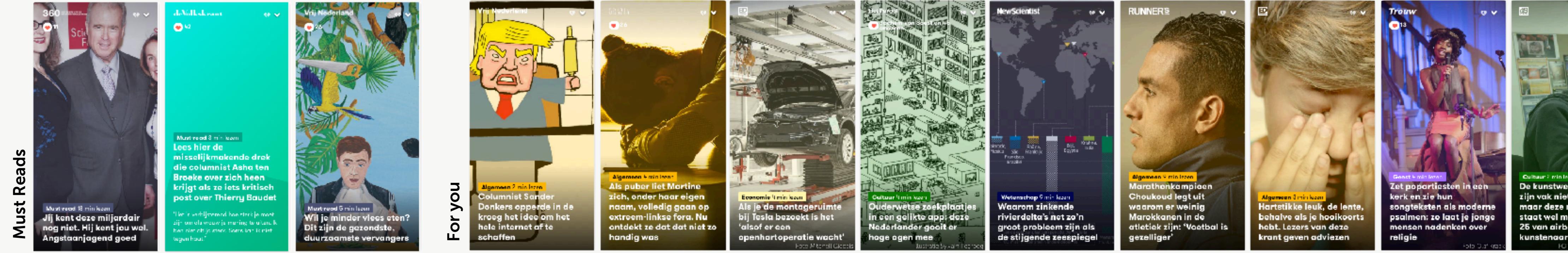


Diversification

For you

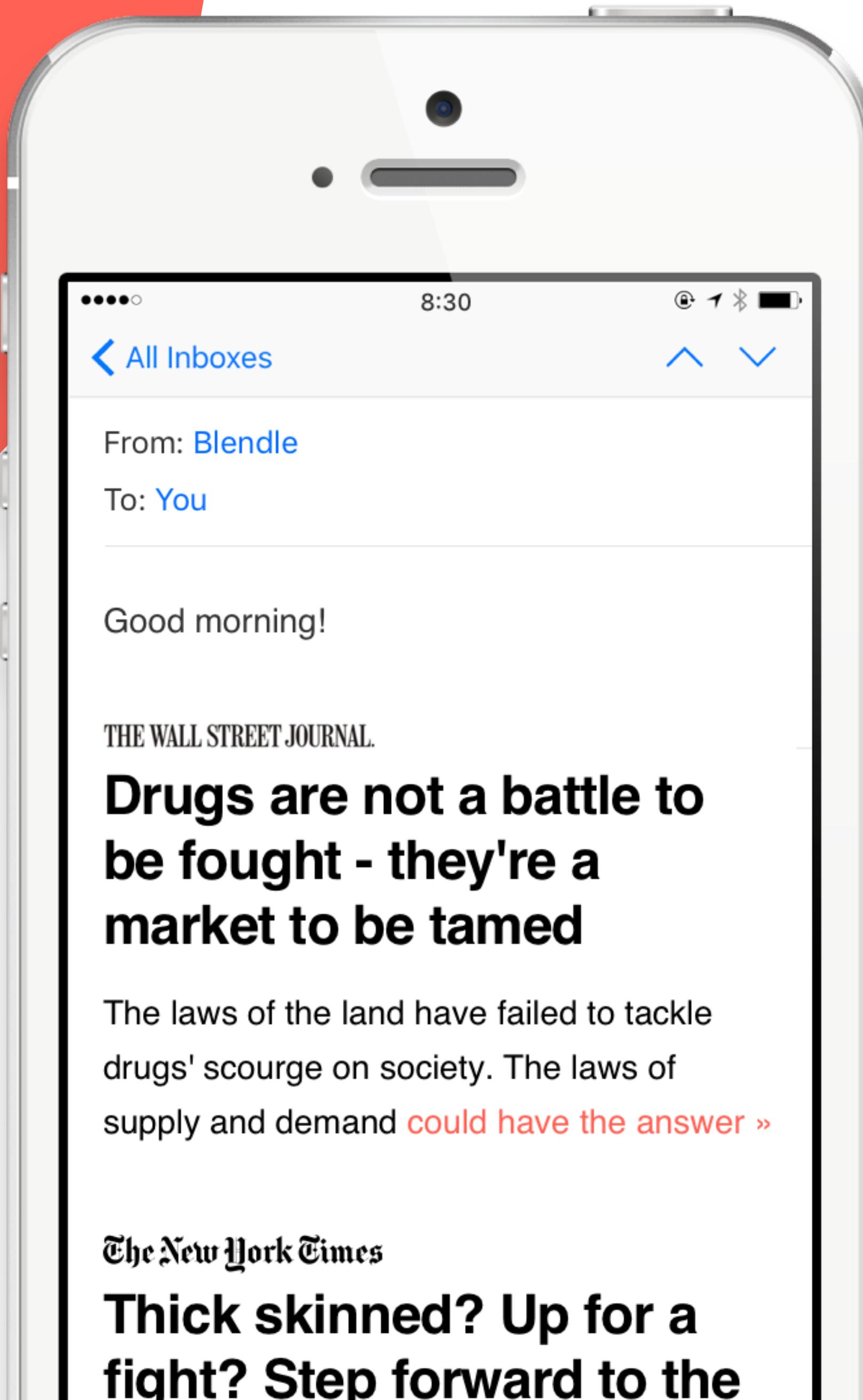


Filter Bubbles



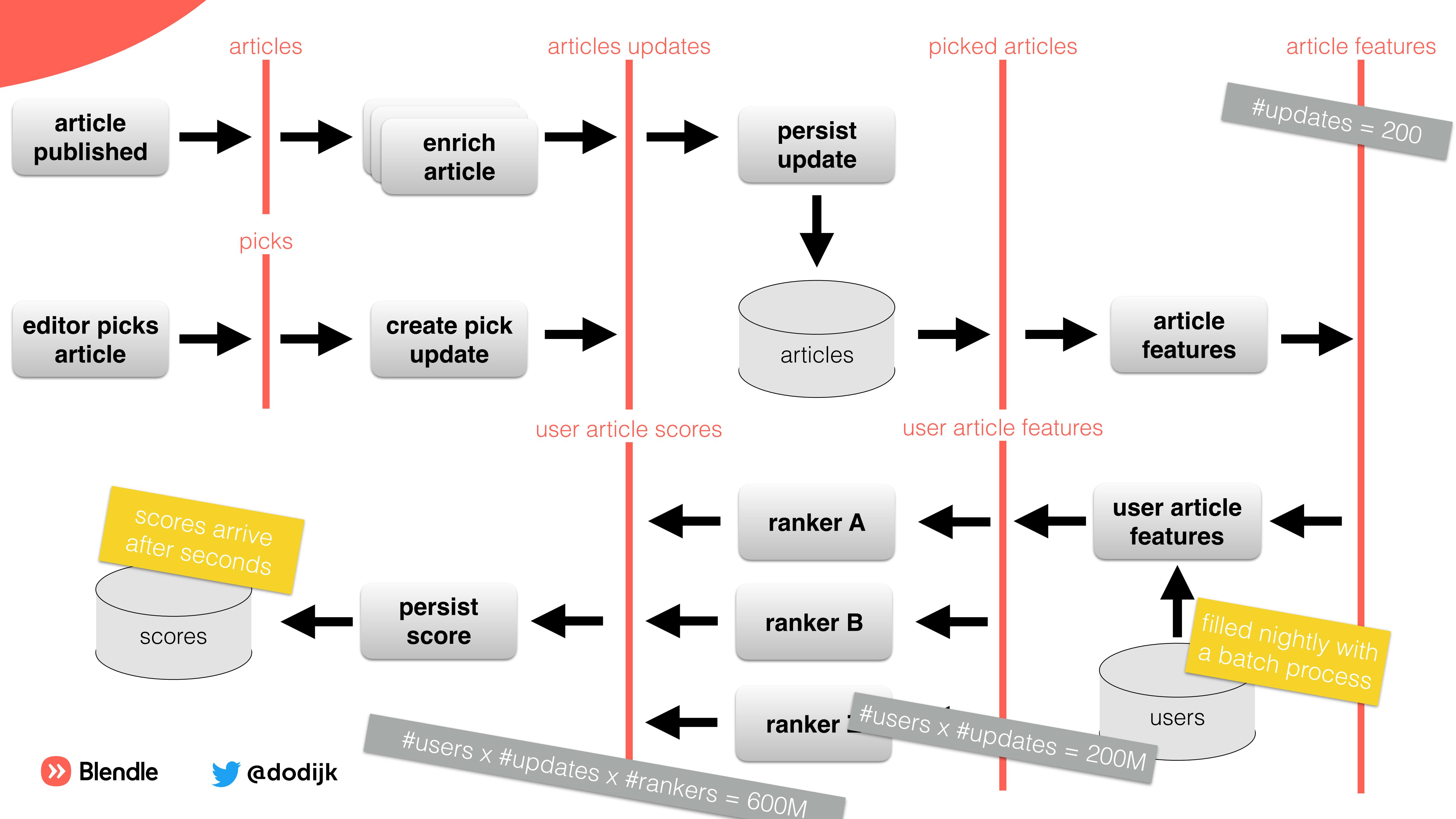
- » Breaking Bubbles
- » Editorial selection
- » Must reads
- » Diversification
- » Little effect of popularity

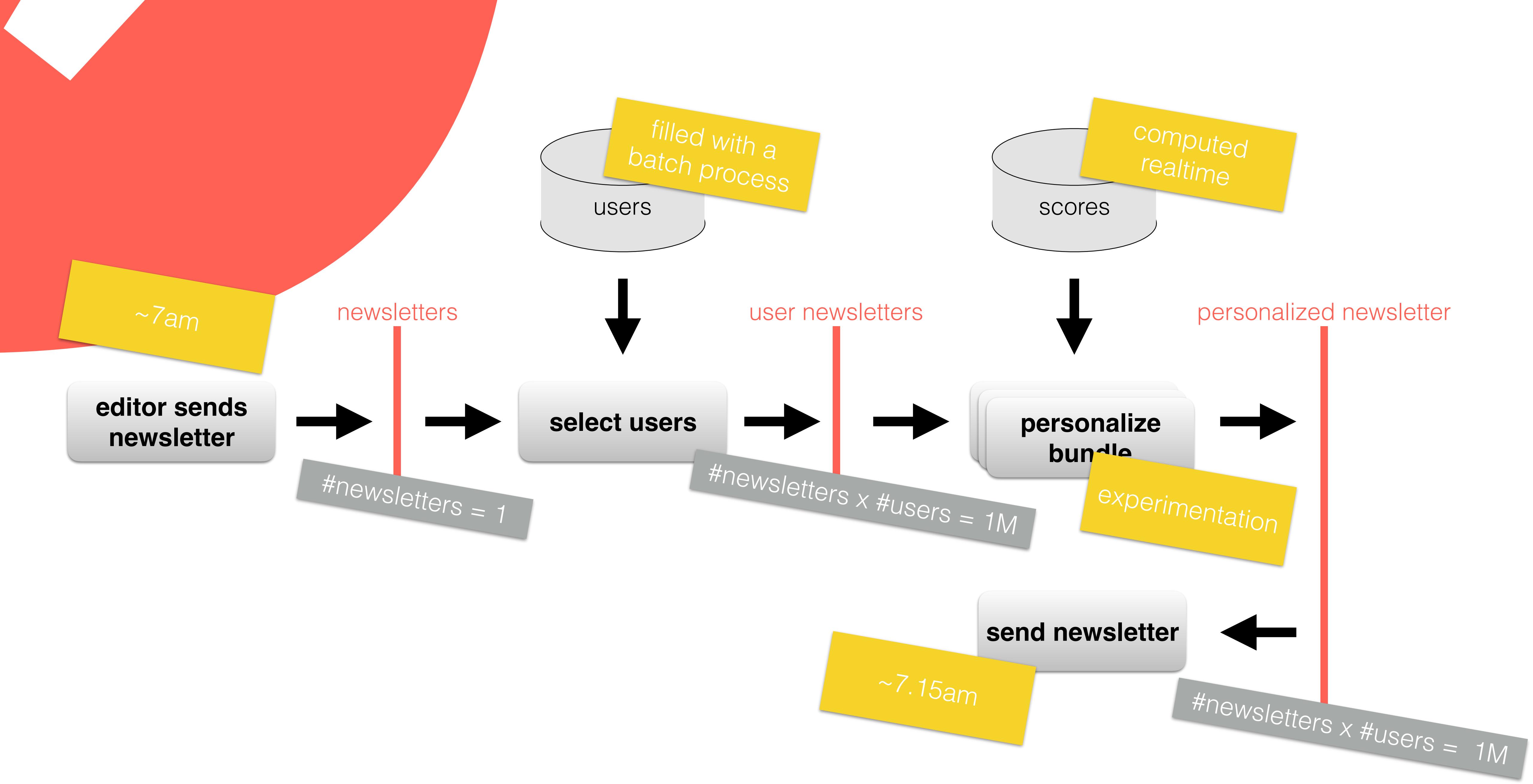
- » Making Bubbles
- » Onboarding
- » Reading history
- » Explicit feedback



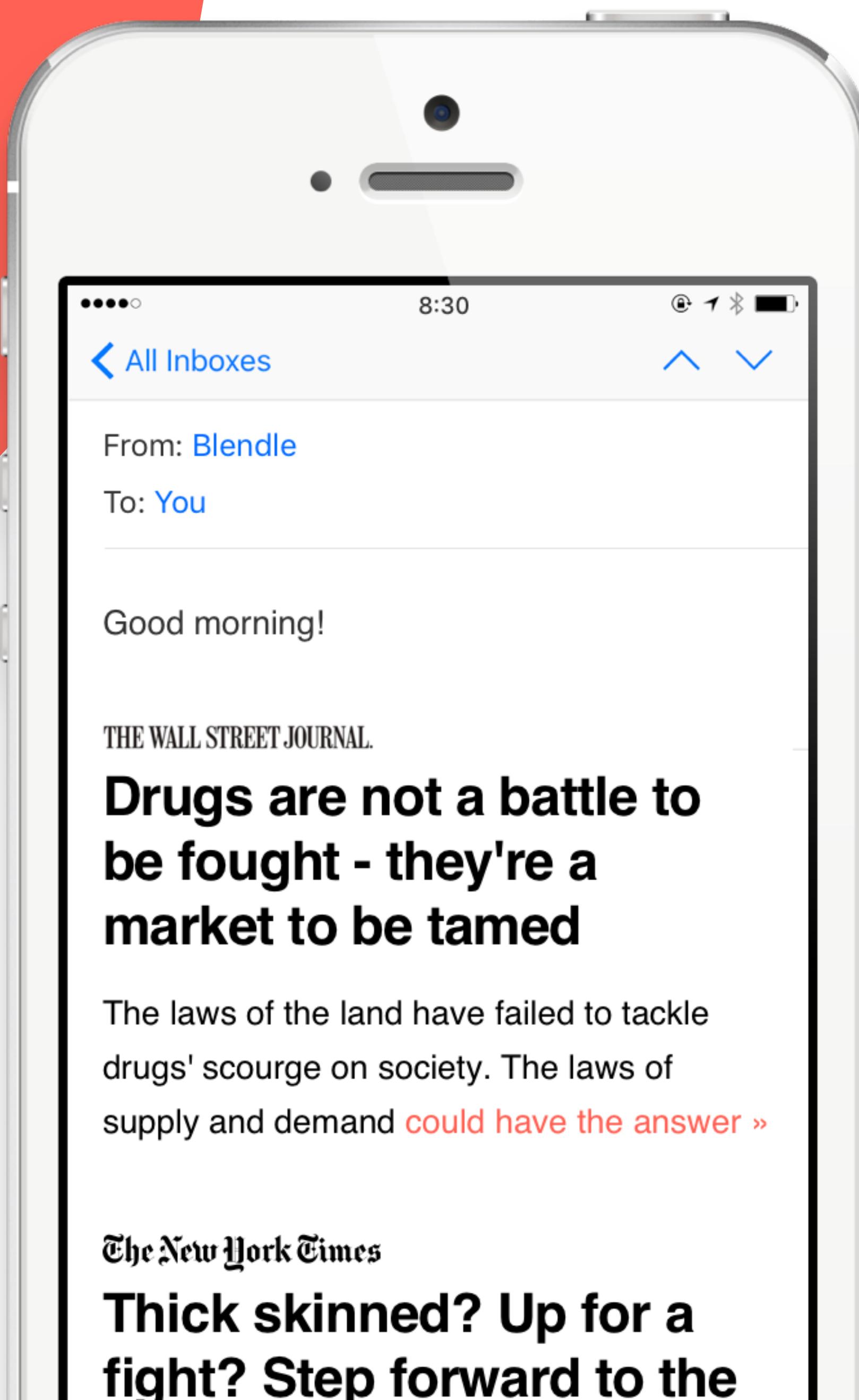
Timing problem

- Our editors wake up at 5am and are done reading at 7am
- Which is also when we want to send our newsletter
- We simply can't wait for a batch process

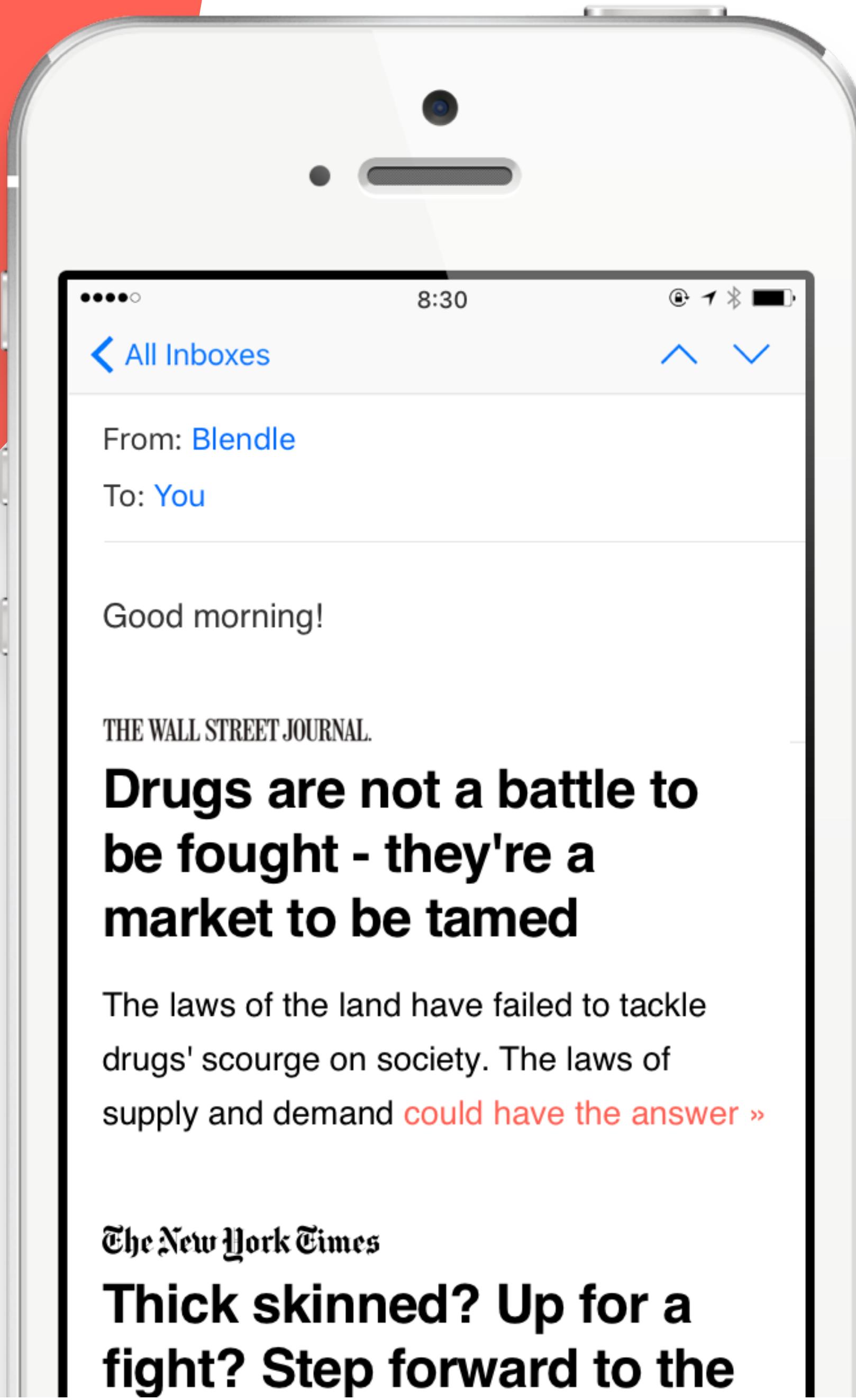




Cold start problem



- So we enrich our content



Timing problem

- So we precompute as much as possible

Explanations: #FATREC

Why this article?

Because you seem to like a long read article every now and then.

Vlaanderen Nederland

Wetten en regels hoeft je niet daarvan te nemen. **Waarom dit artikel?** Omdat je wel van een langer artikel op z'n tijd lijkt te houden.

Je leeft om te werken Je werkt om te leven

W > L **L > W**

Prive en werk lopen door elkaar Prive en werk zijn strikt gescheiden

Het onbekende is gevaarlijk Het onbekende is interessant

Eén ding tegelijk, planning belangrijker dan relaties Veel tegelijk, relaties gaan voor planning

Iemand die je niet of amper kent, nodig je niet snel thuis uit Iemand die je niet of amper kent, nodig je best snel thuis uit

Algemeen 6 min lezen

Een Nobelprijs winnen, zo doe je dat

Dit is natuurlijk makkelijker gezegd dan gedaan. Stap één: 'Streep "de Nobelprijs winnen" direct van je bucketlist af.'

Algemeen 4 min lezen

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1. The Privacy
2. Big Money's Presidential
3. The Geograph

TIME

The Brief

Big Money's Tiny Impact on the Presidential Campaign

Michael Scherer

This was supposed to be a great year to buy an election. Thanks to recent court rulings, after all, billionaires are allowed to spend freely to elect their chosen candidate. But so far, money has not seemed to matter. As the numbers reveal, there is little correlation between independent ad spending (which often comes from super PACs and special-interest groups) and primary results, especially for Donald Trump.

CEO Book fight

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Cover Story
Code Case

The FBI wants to protect your privacy. Apple CEO Tim Cook says that about may not be true right now.

By Lee Grossman

The Lonesome Death of Mikhail Lebedev

Vladimir Putin's former spokesman died in a D.C. hotel room in November. He was found dead in his room at the Hotel TIME reported.

By Simon Shuster

Putin and Lebedev during happier times

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Barack Obama and Misty Copeland in conversation

By Meera Khandan

Bitter sweet success

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By Karen Abuzaid

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