

News in the Age of Algorithmic Recommendation

**Nick Rockwell, Chief Technology Officer
The New York Times**

The New York Times



**Founded in 1851.
3,790 employees.
1550 journalists.
125 Pulitzers.**

**In 2018:
55,000 stories published.
We reported from 160 countries.
87,000 people attended a Times event.
More than 200 Million downloads of The Daily.
34 Twitter mentions from one White House reader.**

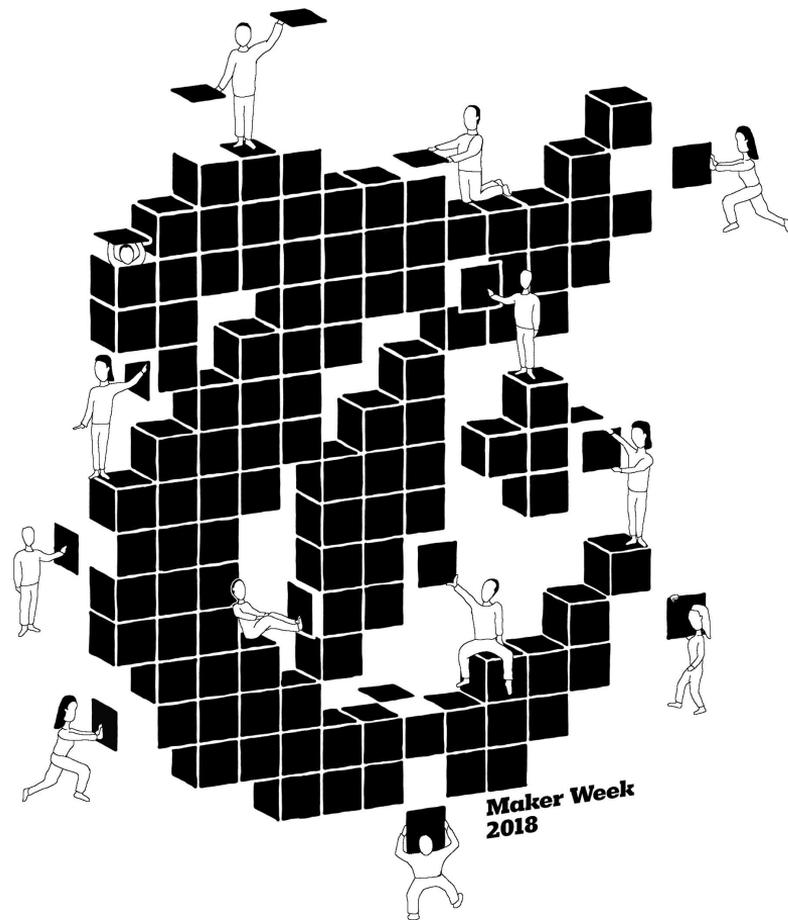
“ We seek the truth and help people understand the world.

This mission is rooted in the belief that great journalism has the power to make each reader's life richer and more fulfilling, and all of society stronger and more just. ”

Times Digital

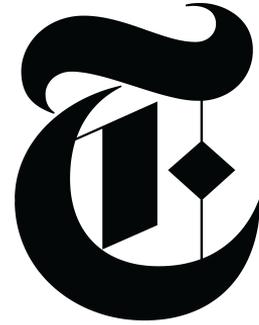
Twenty years into our digital revolution, we have turned the corner as a digital business. It is working.

- 3.4 Million digital subscribers.
- New digital products, expansion into audio.
- We will reach our 2020 goal of \$800M in digital revenue, early.



New Ambition: 10M Subscribers.

NETFLIX



Can we become a truly scaled, global subscription business, and take our place alongside the digital giants?

Recommendation

Key Driver for the Giants



NETFLIX



Strategy

Drive engagement and propensity to subscribe through **personalized recommendation**.

Improve engagement and retention via **personalization**. Preference data also drives content investment decisions.

Deepen engagement through visual discovery via **related content**, and **recommendations**.

Results

30% of plays from recommendations, 40 million Discover Weekly users.

80% of plays from recommendations. Netflix attributes \$1B in annual value to recommendations.

Pinterest attributes 40% of it's engagement to its related pins recommendation feature.

Investment

\$100M Echo Nest acquisition, 80+ data scientists on staff.

Team of 300+ dedicated to content discovery, a \$150M yearly investment

Team of 250 dedicated to discovery, and ~40 data scientists on staff

The Times has been cautious.

- Some recirculation modules on article pages are personalized.
- Articles within some below-the-fold modules on the home page are contextually ranked.
- Your Weekly Edition newsletter contains some personalized recommendations.

Home Page



- Bar One is personalized under some conditions.
- Curation is the core value proposition.
- Layout is complex and difficult to automate.

ENGLISH ESPAÑOL 中文 Account

The New York Times

Thursday, March 21, 2019 Today's Paper

World U.S. Politics N.Y. Business Opinion Tech Science Health Sports Arts Books Style Food Travel Magazine T Magazine Real Estate Video

The Daily Listen to 'The Daily'
A path to curing H.I.V.

The 'In Her Words' Newsletter
We explore the psychology that keeps men in positions of power.

The Argument Listen to 'The Argument'
What would a fair college admissions system look like?

S&P 500 +0.67% ↑
Dow +0.56% ↑
Nasdaq +0.89% ↑

45°F
48°-42°
New York, NY

BOEING CRASHES

Doomed Jets Lacked 2 Safety Features That Boeing Sold as Extras

- The planes that crashed in Ethiopia and Indonesia weren't equipped with optional safety features that could, in part, have helped the pilots detect erroneous readings.
- Now the company is making one of those features standard.

2h ago 1353 comments



Confusion, Then Prayer, in Cockpit of Doomed Lion Air Jet

Indonesian investigators described the sounds emanating from the cockpit as the flight crew fought to take control of a plane that kept bucking downward.

March 20 841 comments

Ethiopian Airlines had the Boeing 737 Max 8 simulator. The captain of the doomed flight had not received training on it.

1h ago

MOSQUE ATTACKS

New Zealand Announces Ban on Weapons Used in Massacre That Killed 50

- Prime Minister Jacinda Ardern said all military-style semiautomatic weapons and all high-capacity ammunition magazines would be outlawed.
- The country's plan, which comes six days after attacks on two mosques, stands in contrast to the resistance to similar calls for restrictions in the U.S.

3h ago 931 comments



The police charged the suspect with murder for the death of a person who was still alive.

Opinion >

Elisabeth Rosenthal

Why Should Americans Be Grateful for \$138 Insulin? Germans Get It for \$55

Only by the bizarre logic of the American pharmaceutical industry does this drug count as any kind of generic.

54m ago



Robyn Powell

Even in Grief, I Still Have Pride

Being part of the disability community means constantly losing friends and allies. I don't expect that to change.

2h ago

Tim Wu

The Democrats Have a Complexity Problem

Bret Stephens

Palestinian Lives Don't Matter*

The Editorial Board

What Happens When Lawmakers Run Out of Abortion Restrictions to Pass

J.J. Prescott and Sonja B. Starr

Your Criminal Record Shouldn't Last a Lifetime

Nicholas Kristof

New Zealand Shows the U.S. What Leadership Looks Like

Farhad Manjoo

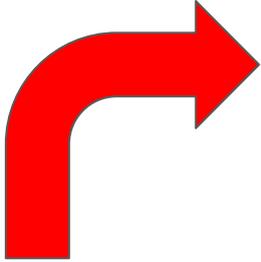
The White-Extinction Conspiracy Theory Is Bonkers

Jennifer Finney Boylan

I Wasn't Crazy. The World Really Was Getting Darker.

The Editorial Board

Condemned to Repeat the History of Bank Failures?



Smarter Living >



The Right Way to Ask, 'Can I Pick Your Brain?'

Smarter Living March 18



Share a Bed Without Losing Sleep

Wirecutter March 18



How Not to Be a Snowplow Parent

Family 1h ago 71 comments



Common Electrical Safety Problems (and How to Solve Them)

Real Estate March 8 254 comments



6 Things to Bring to an All-Inclusive Resort

Travel March 5

Features



Daniel Dorsa for The New York Times

He's the Star of 'Tootsie' on Broadway.

Why He's Not Just Another Broadway Star



Overlooked No More: A Rights Advocate for Alaskan Natives

Elizabeth Peratrovich and her husband rallied Natives to ensure the passage of the first U.S. anti-discrimination law. She never received a Times obituary, until now.

Obituaries March 20



Wedding Crashers Just Want to Have Some Fun

Ah, the reception. Free food. Free drinks. What's not to love? Wait, says the couple: Who's that stranger eating our food and drinking our alcohol?

Weddings 6h ago



Best of Late Night: 'Beefing With a Dead Man'



Review: Hearing the Roar of Racism



Contextually ranked "Smarter Living" module.

Why?

- Importance of hierarchy on the home page.
- Judgment and curation as a core value proposition.
- Lack of clarity around strategic impact/fit.
- Concern over creating a filter bubble.
- Perfectionism.

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Does this support the mission?

Walter Benjamin on Digital Media

“ The technique of reproduction detaches the reproduced object from the domain of tradition.

And what is really jeopardized when the historical testimony is affected is the authority of the object.

Technical reproduction can put the copy of the original into situations which would be out of reach for the original itself. Above all, it enables the original to meet the beholder halfway, ”

Walter Benjamin, “The Work of Art in the Age of Mechanical Reproduction.”

**How Is the World
Changing?**

2011

The Digital Landscape

An open, desktop-based internet with nascent digital subscription models.

The Times's Business Model

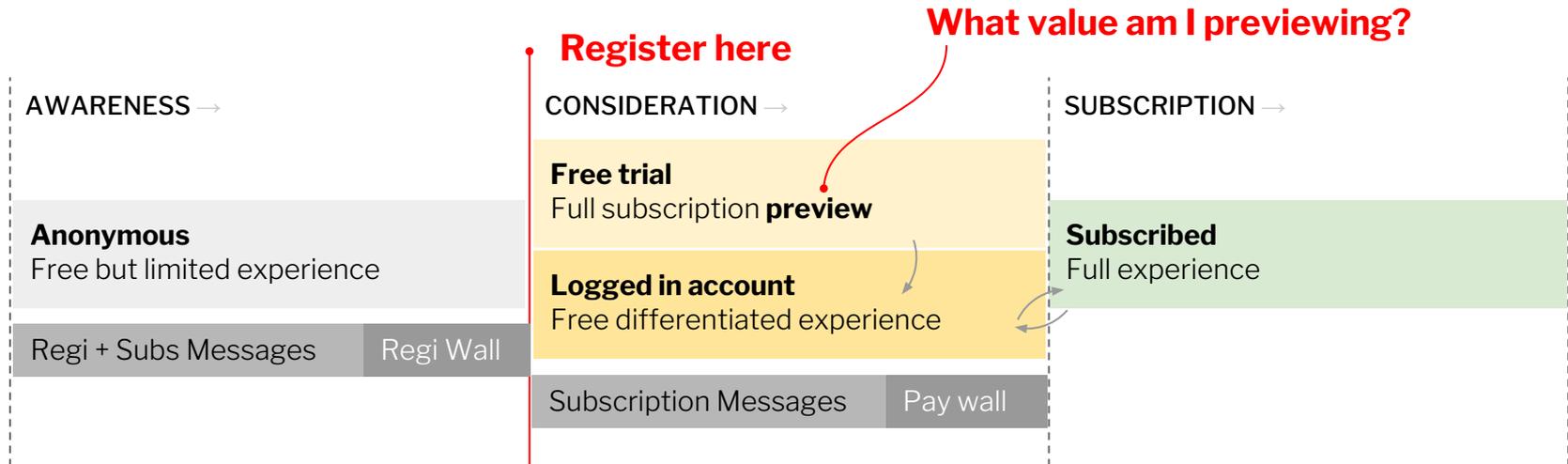
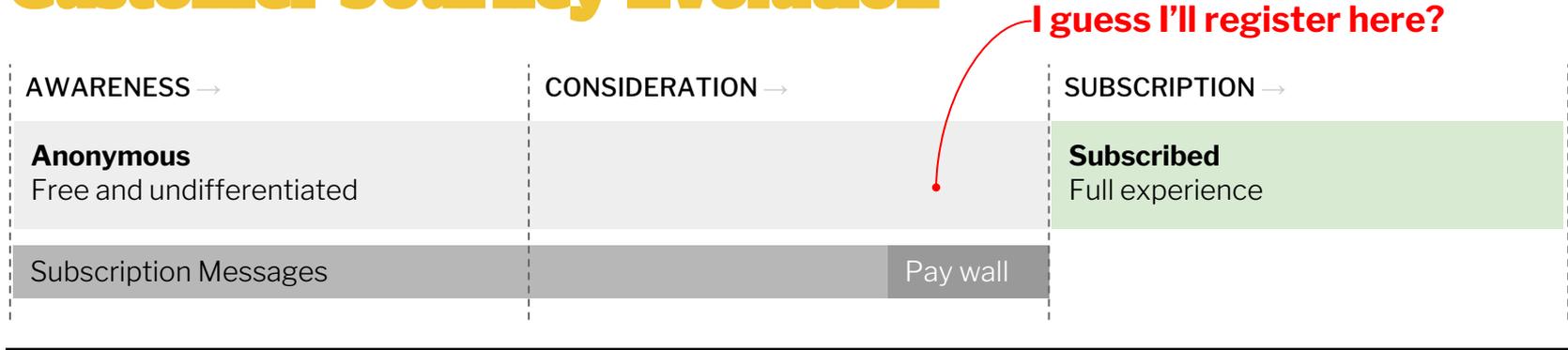
An advertising-led business with predominantly print-driven economics.

Today

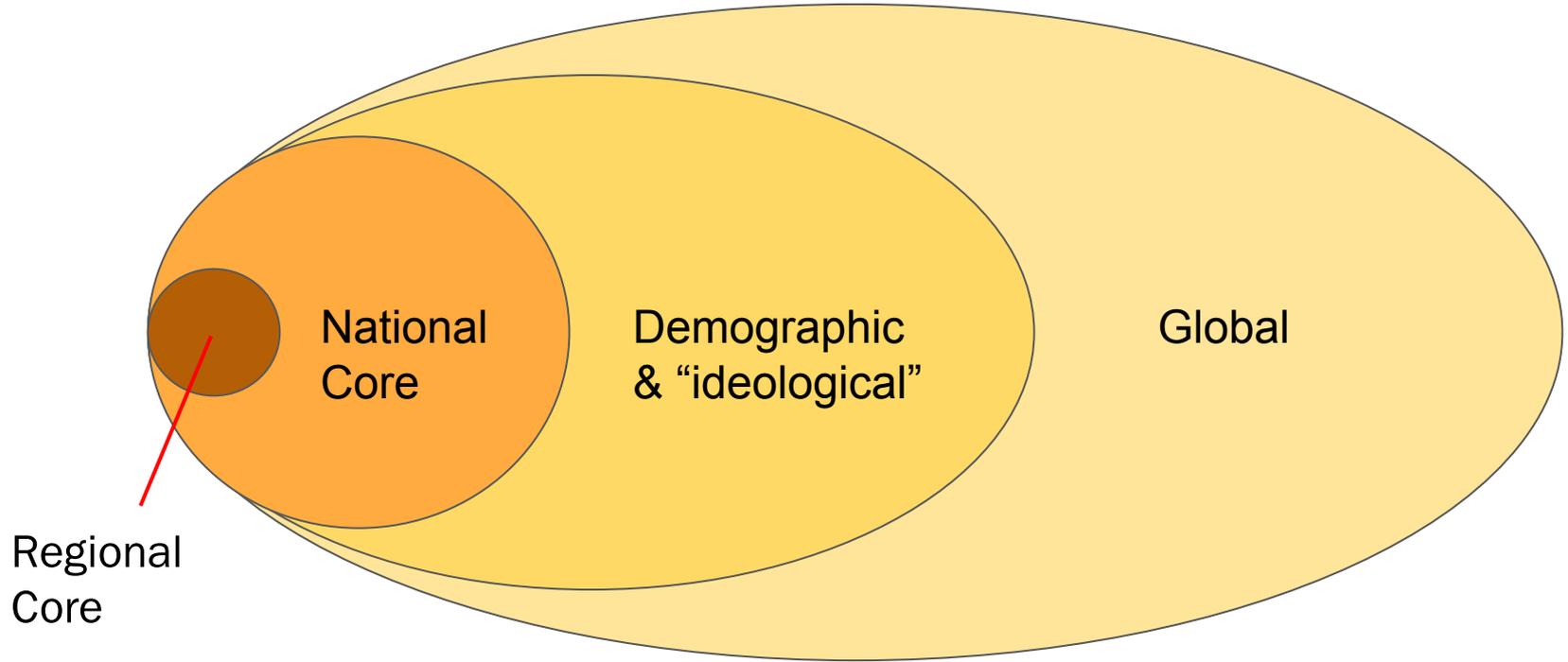
→ A mobile-first world powered by platforms, apps, and proven digital subscription models.

→ A subscriber-first business driven by digital.

Customer Journey Evolution



Where the Growth Is



1:45 📶 🔋

☰ **The New York Times** 📄

Updated: Thursday, March 21, 2019 at 1:45 PM

BOEING CRASHES



Ruth Fremson/The New York Times

Doomed Jets Lacked 2 Safety Features That Boeing Sold as Extras

- The planes that crashed in Ethiopia and Indonesia weren't equipped with optional safety features that could, in part, have helped the pilots detect erroneous readings.
- Now the company is making one of those features standard.

5m ago 🔖 📤

Lion Air Crash Families Say They Were Pressured to Sign No-Suit Deal

Different times, Different Times.

- Mobile Native First means Home Page is a feed: much easier to rank.
- Subscription First means need for demonstrable, personal value.
- Global First means being relevant to each reader: “meeting the beholder halfway.”

**What Do Our
Readers Think?**

Why people pay for The New York Times

- We support their goal of “learning about the world”.
- They trust us the most.
- We deliver substance in a world full of fluff.
- Our coverage is in-depth, thorough, expert.
- We complement social media: Facebook is about the personal world, NYT about the real world.



*“It’s the **anti-Twitter**. I get such a good education. If you read The NYT for seven years it’s like getting a college education” –*

Rachel, RA, NYC



*“Each morning I sift through what’s happening in my very personal friends’ world of Facebook and **the world at large** through The New York Times.” --*

Alexander, EM, San Francisco

Personalization Solves FOMO... Until it Doesn't

“There’s so much.
What am I missing?”

?



“I’m only seeing what I am
interested in. What am I missing?”

No personalization

Too much personalization



*“I like that you (NPR One) don’t know me too well, so I don’t feel boxed in by your recommendations or control over my listening...(Improvements?) Maybe slightly more tailored news stories (**whoops, just contradicted myself.**)” -- Maeve, EM, NYC*

“Personalized” Means Many Things

“Adapted”

Personal

...my stuff
...my history
...my connections

e.g., my bank account, my pictures on FB

Optimized

...my settings
...my location
...my frequency

What I want, how I want it

Predicted

...your content suggestions

Based on my, or my cohorts', past behavior

Mixed Feelings on News and Personalization

Many of the subscribers did not want a personalized news content experience from The Times (or any news source).



*“I value that about the NYT: it’s not customized to me. I don’t think an **unbiased news source** should be.”* – **Maia, RA, Chicago**



*“**Top stories** should stay away from being too personalized.”*
– **Maeve, EM, NYC**

What Personalized Experiences do Readers Want From The Times?

Subscribers and non-subscribers wanted an **idealized news home screen** to have breaking news and summaries first.

After that, they wanted **variety**, which could include favorite columnists or writers followed by lifestyle content based on their **interests, time of day, or location**.



“I want them to notice that I read certain sections a lot. When I get to the bottom of an article they could say ‘catch up on our food page.’”

– **Alexander, EM, San Francisco**

What We Are Making

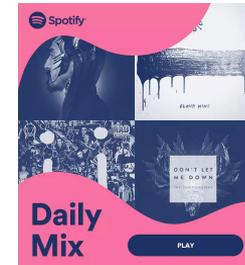
Goal: Drive Engagement

- **Frequency:** more readers engage with us more often.
- **Habit:** readers have multiple moments, and multiple reasons to engage with us each day.
- **Relevance:** each session reveals something of importance to each reader.
- **Discovery:** readers are often surprised and delighted by what we present to them.

Recreate the serendipity of the physical paper...

Recommendation Products

- **Strategic:** understand the role each feature plays in the customer journey.
- **Clear Goals:** know what your metrics are and which you are optimizing for.
- **Actual Products:** not just bolting on personalization. Think like Spotify:



SCIENCE >



Desenfoque Producciones

DNA Clues to an Ancient Canary Islands Voyage

The islands' pioneers likely arrived centuries before European conquest, as part of a large-scale movement of people from North Africa.

13m ago



ART & DESIGN >



Your Feed / For You

- **Second** tab in the native apps, algorithmically programmed from explicit and implicit signals.
- User need is discovery, relevance, second reason to come back.
- Metric is sessions with/without engagement.
- Role is to build engagement of activated users (app downloaders).

YWE v2 / Push

- “Your Weekly Edition” v2: driven by Your Feed.
- Personalized Push Notifications.
- User need is discovery, immediacy, relevance.
- Role is to re-engage activated users and initiate sessions.

Your Weekly Edition

Discover the best stories you might have missed in this newsletter, curated by Times editors and personalized for you with machine learning.

Best of The Times Signature journalism of the last week

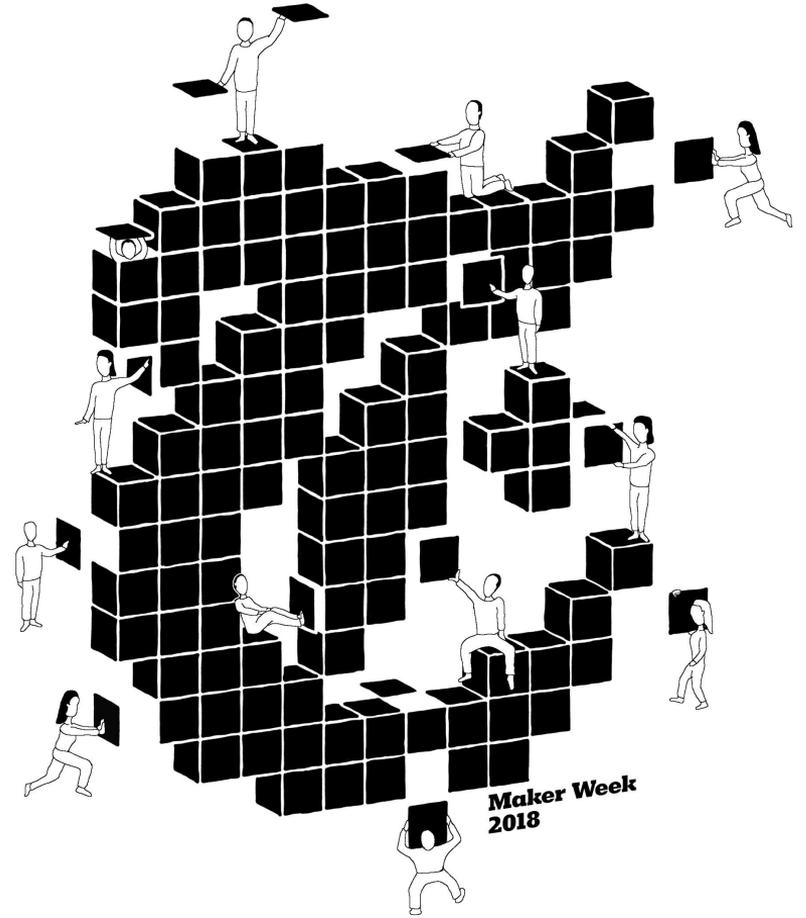


Gene J. Puskar/Associated Press

Bigger, Saltier, Heavier: Fast Food Since 1986 in 3 Simple Charts

Times 3.0

These features may seem small, but carry weight in a simple product, and lay the groundwork for a mobile, global, subscription first, personally relevant Times.



Our Values: Curiosity

- **Independence**
- **Integrity**
- **Curiosity**
- **Respect**
- **Collaboration**
- **Excellence**



“

Open-minded inquiry is at the heart of our mission. In all our work, we believe in continually asking questions, seeking out different perspectives and searching for better ways of doing things. ”

**Recommendation
is Hard**

How Recommenders Work, pt. 1

A recommender is a system that takes various inputs (consumption history, etc.) and predicts which of a set of items (article, video, etc.) a given user is most likely to engage with.

- **Reinforcement learning** is commonly used in recommender problems.
- In reinforcement learning, the desired outcome produces the **reward**.
- The delta between the optimal and the observed outcome is called **regret**.
- A **multi-armed bandit** is an architecture used to rapidly **explore** a solution space.
- A **contextual bandit** is a multi-armed bandit that takes contextual state - such as a reader's history - into account.

How Recommenders Work, pt. 2

A common approach is to use a contextual bandit to **explore/exploit** the solution space bounded by a set of contexts, a set of content and a set of strategies. Two common strategies include:

- **Content Based Filtering** techniques that directly compare articles' similarity. Bayesian classifiers, cluster analysis, or neural network classifiers are techniques used to classify and compare articles.
- **Collaborative Filtering** techniques that identify articles read by readers with a similar history, often using matrix factorization. Collaborative Filtering approaches suffer from the “**cold start**” problem when dealing with new content.

Machine Learning is Hard, pt. 1

This is a diagram of a typical content recommender systems architecture.

- It's complicated.
- It's highly specific.
- Each of these boxes contains more complexity.

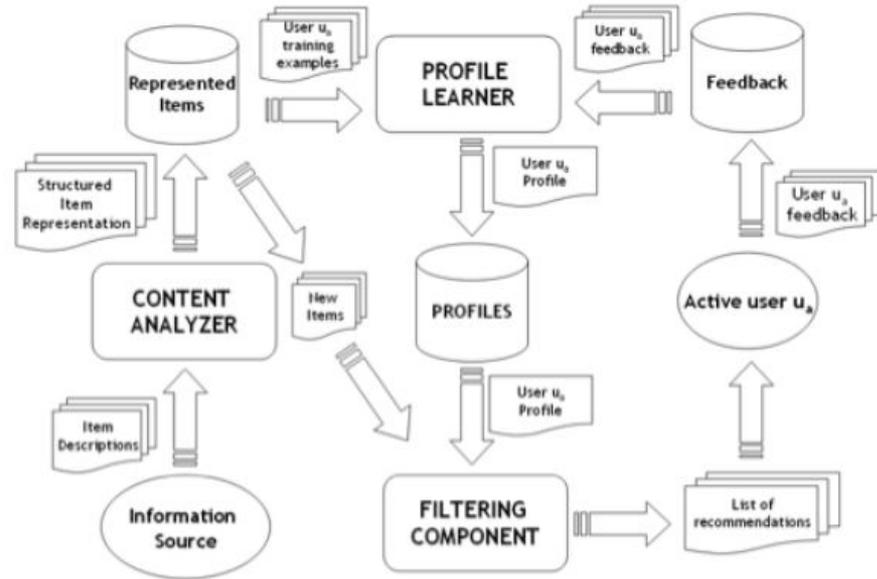


Fig. 3.1: High level architecture of a Content-based Recommender

Diagram from Carlos Pinela, "Content-Based Recommender Systems".

Machine Learning is Hard, pt. 2

- Machine learning solutions are highly problem-specific.
- The “uncanny valley” means that results must be very, very good before being acceptable.
- Lead time to acceptable results is often measured in years (cf. Netflix, according to Carlos Uribe.)
- Success requires sustained effort by PhD level, research capable experts.

Recommendation is a Dance

- The Tyranny of Preference: do we want similarity or discovery?
- Relevant Garbage: how to drain the Internet swamp
- The Filter Bubble: what are our expectations?



"I value that about the NYT: it's not customized to me. I don't think an unbiased news source should be."

-- Maia, RA, Chicago

Our Advantage

- Recommendation is a supplement: we will always curate the news and tell you what you need to know.
- Breadth and volume: we produce 250 articles a day across a wide range of topics, so we can truly drive discovery and value for readers.
- Quality: our journalistic and editorial standards underlie every article in the pool.
- Business Model: subscription means we serve only one master: the reader.

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- **Our mission keeps us honest.**

The Real Goal

“We seek the truth and help people understand the world.

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Our Values: Respect

- Independence
- Integrity
- Curiosity
- **Respect**
- Collaboration
- Excellence



“

We help a global audience understand a vast and diverse world. To do that fully and fairly, we treat our subjects, our readers and each other with empathy and respect. ”

Let's use recommendation to reward curiosity, to show respect, and to build trust.

- Can we meet each reader “half way”? In the world, in their journey, in each moment?
- Can we use the machinery of engagement to build a virtuous habit, a habit of curiosity?
- Could that habit condition and generate trust?
- And could that curiosity and that trust in turn help, in a small way, to engender a more compassionate and just world?



Thank You.

