Future techs with near-term impacts

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- Develops actionable insight and strategy for the financial services industry at large
- Delivers keynotes nationwide
- Technology Faculty Chair for several graduate schools of finance
- Authors articles for industry trades
- Degrees in Economics and English from Duke University

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5 Machine Learning
Deep Learning

The subset of machine learning composed of algorithms that permit software to train itself to perform tasks, like speech and image recognition, by exposing multilayered neural networks to vast amounts of data.

Machine Learning

A subset of AI that includes abstruse statistical techniques that enable machines to improve at tasks with experience. The category includes deep learning.

Artificial Intelligence

Any technique that enables computers to mimic human intelligence, using logic, if-then rules, decision trees, and machine learning (including deep learning).

SOURCE: https://www.geospatialworld.net
A.I. vs. Machine Learning: Definitions & Distinctions

• **Artificial intelligence** is intelligence exhibited by machines. In computer science, an ideal "intelligent" machine is a flexible rational agent that perceives its environment and takes actions that maximize its chance of success at some goal.

• **Machine learning** is programming computers to optimize a performance objective using example data or past experience.

• **Today’s so-called A.I. systems are merely advanced machine learning software** with extensive behavioral algorithms that adapt themselves to our likes and dislikes.
Machines are better at doing math, all the time, without fail or error.
Math is neutral.
Algorithms aren’t.
“We live in the age of the algorithm. Increasingly, the decisions that affect our lives—where we go to school, whether we get a car loan, how much we pay for health insurance—are being made not by humans, but by mathematical models. In theory, this should lead to greater fairness…but the opposite is true.”

--Cathy O’Neil, Author of Weapons of Math Destruction
Your current balance is $521, but I’ve noticed your spending is higher than usual this month. This could lead to a low balance or overdraft.
Chatbots

- Chatbots are computer programs that simulate conversation with human users, especially over the Internet.
- Popularity of messaging platforms and advancements in artificial intelligence (A.I.) make chatbots viable in limited settings, but…
- …they generally aren’t ready for primetime.
- Most bots aren’t ready to handle the complexities of conversation, and they still depend on human intervention to succeed.
- The best chatbots rely on natural language processing, A.I., and machine learning, aided by thousands of iterations to drive learning…which is why it will take time for chatbots to evolve and why technologists are beginning those iterations now.

SOURCE: “Chatbots 101: Building Conversational Interfaces: Take A Progressive Approach To Building Chatbots That Aligns With Your App+ Mobile Strategy”; by Michael Facemire, Julie A. Ask, and Andrew Hogan; 12/12/16
“Alexa, ask my bank to pay my gas bill.”
What makes for a successful chatbot?

**artificial intelligence**
\[\text{ˈərdəˈfɪʃəl ɪnˈtel.ədʒəns/}\]
*noun*

Computer systems able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision making, and language translation.

**natural language processing**
\[\text{ˈnætʃ(ə)rəl ˈlæŋgwijədʒɪŋ/}\]
*noun*

Natural language processing is a form of artificial intelligence concerned with the interactions between computers and human (natural) languages.
Beware the “Uncanny Valley.”
“Anything that sounds or appears almost, but not quite, human elicits feelings of eeriness and revulsion.”
BTW, how should community banks deploy chatbots differently than BigTechs and BigBanks?
The Chatbot Continuum: Differentiation

Dedicated Human Concierge  Wealth Advisor  Robo + Advisor  Community Banks  Full Robo Advisory  BigBanks BigTech  Fully Automated AI Assistant
Why is video chat not preferable for live support at the limits of self-service?
Where do most people spend most time on mobile phones?
When chatbots work...
“Please find all transactions around four dollars in my checking.”

I couldn’t find an exact match, but I did find 5 posted transactions that are close to what you’re looking for. Here they are:

<table>
<thead>
<tr>
<th>Transaction Type</th>
<th>Date</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATM Fee</td>
<td>Tuesday December 17 2013</td>
<td>-$3.95</td>
</tr>
<tr>
<td>ATM Fee</td>
<td>Monday December 9 2013</td>
<td>-$3.95</td>
</tr>
<tr>
<td>ATM Fee</td>
<td>Tuesday December 3 2013</td>
<td>-$3.95</td>
</tr>
<tr>
<td>ATM Fee</td>
<td>Monday November 2 2013</td>
<td>-$3.95</td>
</tr>
</tbody>
</table>
How much did I pay Jake Zamrak last month?

Nothing came up.

Please pay Jake Zamrak $150 for guitar lesson

Let’s confirm. You’d like to send Jake Zamrak $150, right?
Personetics
White-label banking chatbot

- Includes functionality such as standard banking features (check balances, move money, etc.). However, also includes a machine-learning component that leverages predictive messaging and behavioral insights.
- The system can recognize input errors and even out-of-context inputs.
- Currently working with 4 of the top 10 FIs in North America.
Meet Penny, your personal finance coach.

Good things happen when you chat with Penny: spend smarter, save more, live happier.

A chat-based personal finance coach.
Know everything about your money with Penny.

Penny sends you beautiful tailored charts and insights to help you know how you’re spending in real time. Avoid overdrafts and “where did my money go?” damage control.

“Here’s how your July is looking…”
Data Rich, Insight Poor
GOOD NEWS:
Banks have the best data
BAD NEWS:
Banks don’t have enough data.
Dynamic Segmentation
Dynamic Segmentation: Data Analytics Trends

- Persistent vigilance for life-cycle transitions
  - Checking account transactions (e.g., tuition check)
  - Debit card transactions (e.g., marital license fee)
  - Credit card transactions (e.g., baby furniture purchase)
  - Social media updates (e.g., new jobs, relationships, moves, etc.)
- END GOAL: humanize digital interactions
  - Anticipate needs

SOURCE: Celent's “CHANGING THE LANDSCAPE OF CUSTOMER EXPERIENCE WITH ADVANCED ANALYTICS APPLICATIONS IN BANKING, WEALTH MANAGEMENT, AND INSURANCE”; Karlyn Carnahan, Dan Latimore, & William Trout; October 17, 2016
Data Analytics Trends

• Delivering relevant levels of communications and engagement at scale means **activating pertinent customer insights in real time**

• Requires gathering, managing, and analyzing massive amounts of data.
  • Machine learning
  • Artificial intelligence

• Happily, the financial services industry is awash with data; few industries are so fortunate.

SOURCE: Celent’s “CHANGING THE LANDSCAPE OF CUSTOMER EXPERIENCE WITH ADVANCED ANALYTICS APPLICATIONS IN BANKING, WEALTH MANAGEMENT, AND INSURANCE”; Karlyn Carnahan, Dan Latimore, & William Trout; October 17, 2016
Platforms
Platforms that offer the ability to engage with different financial institutions from a single channel will become the dominant model for the delivery of financial services.

<table>
<thead>
<tr>
<th>B2C Product Distribution Platforms</th>
<th>Segment Platforms</th>
<th>Data Aggregation Platforms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platforms become the dominant model for delivery of financial services.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Example: Tencent’s WeBank platform acts as a storefront, allowing retail customers to purchase products from multiple competing vendors of credit and asset management services.

Example: Wave’s accounting, invoicing and reporting platform for small businesses offers key financial services such as payments or lending directly, as well as through partners like ADP and RBC.

Example: The United Kingdom is developing a “pensions dashboard”, aggregating information from insurers and asset managers to allow customers to view and manage all their savings in one location.

SOURCE: “Beyond Fintech: A Pragmatic Assessment of Disruptive Potential in Financial Services”; World Economic Forum; August 2017
The “Platformification” of Banking (Ron Shevlin)

• Platform
  • “A plug-and-play business model that allows multiple participants (producers and consumers) to connect to it, interact with each other, and create and exchange value.”

• Successful platforms attract both producers and consumers, match producers with consumers, and provide seamless integration among participants.

• Platform Service Providers (PSPs)
So why are platforms a threat to U.S. financial institutions?
Platforms control distribution, UX, marketing and data.
Amazon has partnered with Bank of America for its lending program:...

Amazon has partnered with Bank of America Merrill Lynch for its lending program, but its loan growth has slowed for the time being.
In the US, Amazon has already developed key beachheads into financial services...

<table>
<thead>
<tr>
<th>Payments</th>
<th>Small Business Loans</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>amazon payments</strong></td>
<td><strong>amazon lending</strong></td>
</tr>
<tr>
<td><em>33M</em> users of Amazon Payments</td>
<td><em>$3B</em> lent to small businesses on Amazon since 2011</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cash Deposits</th>
<th>Member Rewards</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>amazon cash</strong></td>
<td><strong>reload</strong></td>
</tr>
</tbody>
</table>
Amazon reportedly looks to offer checking accounts for customers via JP Morgan, other banks

- The e-commerce giant is in early talks with financial institutions including J. P. Morgan Chase to help launch accounts aimed at younger customers, The Wall Street Journal reports.
- Sources tell the Journal that while a final product could include an Amazon-branded account, it would not involve Amazon becoming a bank.
- According to a recent survey, roughly 45 percent were open to using Amazon as their primary banking account.
NOW
PANIC
AND
FREAK OUT
“Once a P2P payment is sent, the cash balance will be stored on the Apple Pay virtual card in the Wallet App. That means users have instant access to the cash instead of waiting for it to clear in a traditional bank account.” – www.pymnts.com
The Washington Post
On eve of deadline, Pentagon delays plan to allow new transgender recruits by six more months

Yo, get the Cash Card before anyone else

The Wall Street Journal
Did you ever suspect that your parents had a favorite child? You were probably right

Cash Card is a free debit card that allows you to spend your cash anywhere!

By continuing, you agree to the Terms & Privacy Policy
The BigTech Threat Vector

- P2P
- Stored Value
- Deposit Accounts
Deposit Displacement

- P2P stored value
  - Venmo ($2B)
  - Square ($2B?)
  - ApplePay ($1B?)
- Retail mobile apps
  - Starbucks ($2B)
- HSAs ($45B)
- Robo-advisory ($1.1T)

Total deposits of all commercial banks in the U.S (in trillions of dollars)
3 Digital Personas
“...we trained everyone to use passwords that were hard for humans to remember but easy for computers to guess.”

--Randall Munroe
What’s the biggest fraud trend in retail?
“External shrinkage” is industry speak for self-checkout shoplifting.
Most Common Types of Fraud Loss for Banks

Q. What are the top 3 types of losses being incurred in digital channels? (N=19)

- ATO: 89%
- Application fraud/ID theft/synthetics: 42%
- mRDC: 32%
- First-party fraud/scams: 32%
- CNP fraud: 21%
- Money movement: 16%
- ACH: 5%
- ATM cashout: 5%

Majority of attacks causing FI losses now target consumer accounts.

Source: Aite Group interviews with 28 fraud executives from 19 large North American FIs, July to September 2017
Solutions: **Device Fingerprinting**

- Associating specific devices with particular customers
- Has customer used device previously for undisputed transaction?
- 85% of big banks using/implementing device fingerprinting…
- …but few have linked device fingerprints to customer’s identity to create **digital personas** for authentication across channels

SOURCE: "Digital Channel Fraud Mitigation: Evolving to Mobile-First"; Aite Group; November 2017
Sensor Fusion
The Internet of Things Moves In


### SMART HOME

- **Home Control**: Lights, heating and burglary alarms controlled by smartphone (47%)
- **Home Monitoring**: In-home camera footage viewed and controlled by smartphone (40%)
- **Entertainment**: Entertainment systems display social media postings (20%)
- **Appliance Control**: Sensors in appliances send notifications to smartphone (18%)
- **Landscape Control**: Landscape systems measure plant moisture, watering only when necessary (9%)

**Younger Generations (18-24)**
- 17%: Compared to other consumers surveyed, the youngest generation valued landscape control the most. Do they not want to do their chores?
- 16%: Surprisingly, the youngest generation is also the age group most interested in self-driving cars. Would they rather test than get behind the wheel?

### CONNECTED CAR

- **Traffic/Weather**: Real-time traffic and weather updates displayed on in-car screens (40%)
- **Navigation**: Mapping and route optimization (39%)
- **Maintenance**: Automated diagnosis and tracking of vehicle’s systems (28%)
- **Access**: Remotely lock and track vehicle via Internet-connected device (23%)
- **Entertainment**: Music streaming to in-car entertainment system (18%)
- **Automation**: Driverless operation (10%)
- **Fuel Tracking**: Fuel efficiency tracking (18%)

**Would find value in connected CAR solutions**
- **Smartphone owners**: 72%
- **All consumers**: 63%
- **Consumers willing to pay for connected car solutions**: 60%
Global Connected Devices

Global Connected Devices Forecast (in billions), 2015 to e2021

<table>
<thead>
<tr>
<th>Year</th>
<th>IoT (in billions)</th>
<th>PC/laptop/tablet (in billions)</th>
<th>Mobile phones (in billions)</th>
<th>Fixed phones (in billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>4.60</td>
<td>1.7</td>
<td>7.1</td>
<td>1.3</td>
</tr>
<tr>
<td>2016</td>
<td>5.64</td>
<td>1.72</td>
<td>7.33</td>
<td>1.32</td>
</tr>
<tr>
<td>2017</td>
<td>6.93</td>
<td>1.73</td>
<td>7.57</td>
<td>1.33</td>
</tr>
<tr>
<td>e2018</td>
<td>8.50</td>
<td>1.75</td>
<td>7.81</td>
<td>1.35</td>
</tr>
<tr>
<td>e2019</td>
<td>10.43</td>
<td>1.77</td>
<td>8.07</td>
<td>1.37</td>
</tr>
<tr>
<td>e2020</td>
<td>12.79</td>
<td>1.78</td>
<td>8.33</td>
<td>1.38</td>
</tr>
<tr>
<td>e2021</td>
<td>15.70</td>
<td>1.8</td>
<td>8.6</td>
<td>1.4</td>
</tr>
</tbody>
</table>

SOURCE: Ericsson Mobility Report 2016, Aite Group analysis

SOURCE: Aite Group; “The Internet of Things: An Information Explosion”; May 2017
Internet Data Volumes Grow 21% Annually

Global IP Data Growth, 2015 to 2020 (In exabytes)

SOURCE: Cisco Visual Networking Index

SOURCE: Aite Group; “The Internet of Things: An Information Explosion”; May 2017
Sensors: Costs Go Down; Deployments Go Up

Average Cost per IOT Sensor ($US)

Source: Goldman Sachs, BI Intelligence

SOURCE: Aite Group; “The Internet of Things: An Information Explosion”; May 2017
Amazon Go store leverages sensors, machine learning, and AI to allow customers to walk in and walk out without going through a checkout line.
Internet of Things (IoT), Data, Analytics & Decisioning

sensors  data  analysis  decision
IoT Impacts on Payments and Security

• More payments for lower amounts
  • Shift from periodic (monthly) to real-time, on-demand, a la carte payments…will challenge authorization capacity
  • Machine-to-Machine (M2M) payments between machine-based accounts or value stores?

• Unsecured IoT devices amplify power/scale of botnets

• As payments automate, “top of wallet” card becomes defacto “only card” in wallet
1

Emotion A.I.
:) Affectiva
Affectiva monitors your face to track your feelings.
NOW PANIC AND FREAK OUT
WHAT YOU CAN DO

COLLECT INSIGHT INTO UNFILTERED CONSUMER EMOTIONAL RESPONSES. MAKE APPS AND DIGITAL EXPERIENCES EMOTION-AWARE.
HOW IT WORKS

WE DETECT COMPLEX AND NUANCED HUMAN EMOTIONS AND COGNITIVE STATES FROM FACE AND VOICE

LEARN MORE
UI → UX
The totality of emotions evoked in a customer when he/she connects with the bank—and not just the interface.
UI → UX → engagement → trust
Negative Emotions of Money

- Doubt
- Anxiety
- Guilt
- Inferiority
- Incompetence
- Addiction
- Helplessness
- Despair
- Rage
Positive Emotions of Money

Trust, Control, Confidence, Empowerment, Competence, Security, Safety, Peace
KEEP CALM AND DON'T FREAK OUT