

New Technologies in Banking

Prof. Dr. Peter Roßbach

Frankfurt School of Finance & Management

Sonnemannstraße 9-11

60314 Frankfurt, Germany

p.rossbach@fs.de

- **Customer Profiling**
- **Predicting Customer Behavior**
- **Recommendation Engines**
- **Speech Recognition**
- **Face Detection**
- **Fraud Detection**
- **Autonomous Driving**
- **Medical Diagnosis**
- **Games Playing**
- **News Stories Writing**
- **...**

Why is Modern Analytics so Successful?

- 1. More Data for the Analysis**
- 2. More Computing Power**
- 3. New Methods and Algorithms**
- 4. New Analysis Processes**

More Data for the Analysis

From the dawn of civilization until 2003, humankind generated five exabytes of data. Now we produce five exabytes every two days...and the pace is accelerating.

Eric Schmidt,
Google



Source: Bernard Marr

12+ TBs
of tweet data
every day

? TBs of
data every day

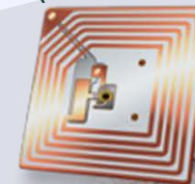


25+ TBs
of
log data
every day



Source: Ruoming Jin

30 billion RFID
tags today
(1.3B in 2005)



4.6 billion
camera
phones
world
wide



100s of millions
of GPS
enabled
devices
sold
annually



2+ billion
people
on the
Web by
end 2011

76 million smart
meters in 2009...
200M by 2014

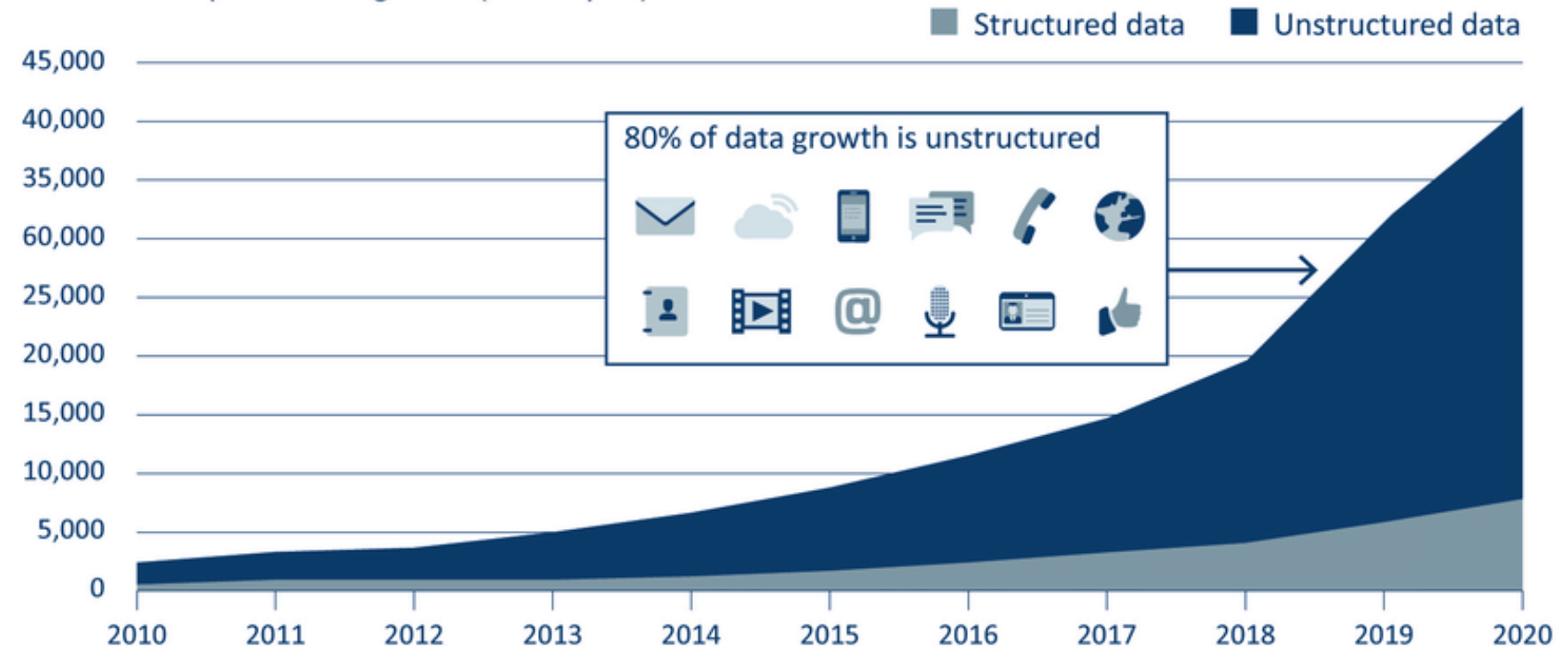


<http://www.>

Worldwide Corporate Data Growth

Massive growth in unstructured content

Worldwide corporate data growth (in exabytes)

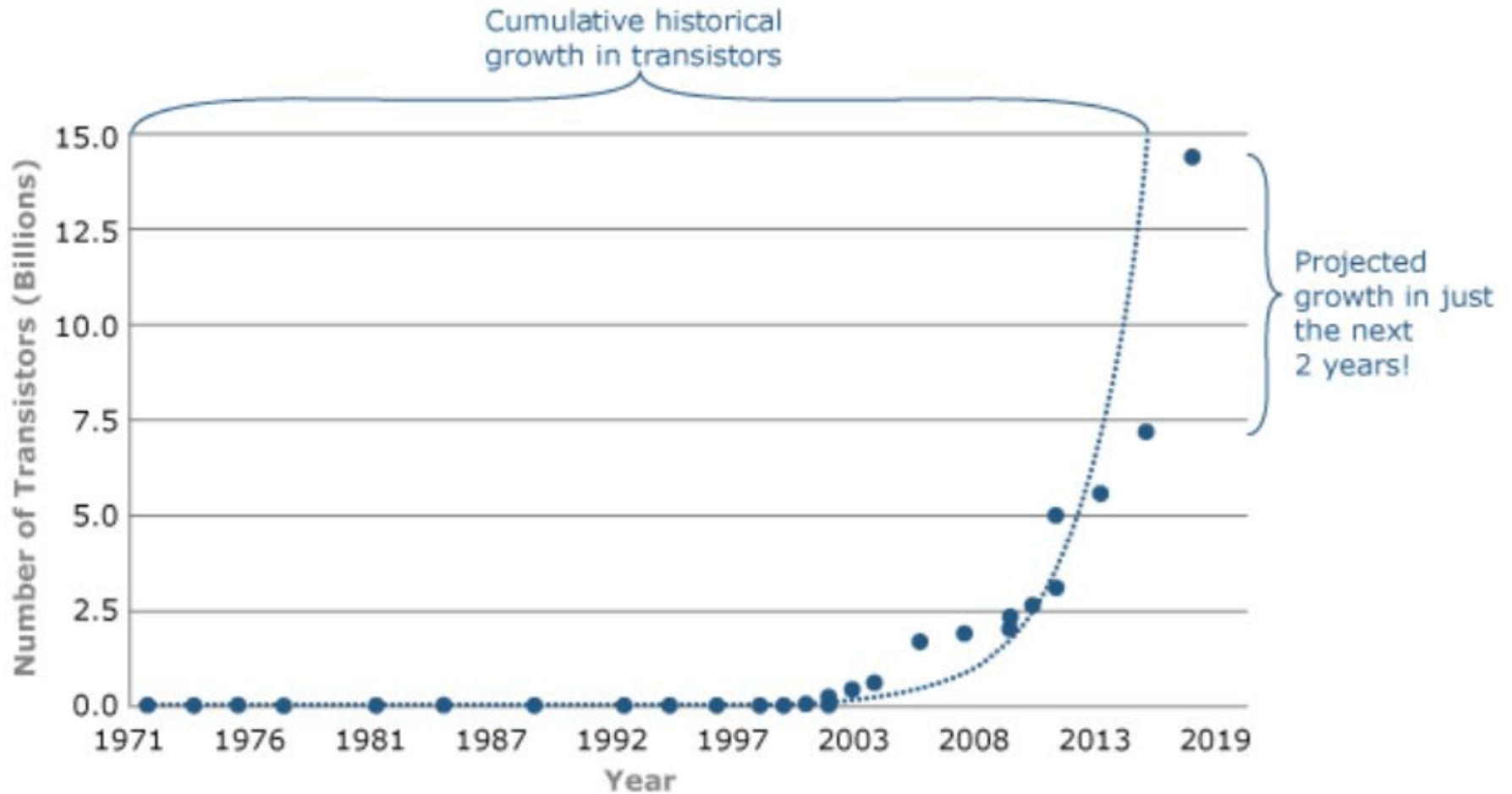


Source: The Digital Universe

Why is Modern Analytics so Successful?

1. More Data for the Analysis
2. More Computing Power
3. New Methods and Algorithms
4. New Analysis Processes

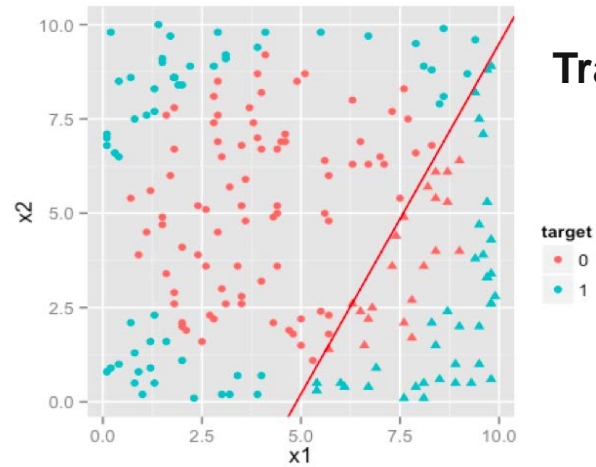
Growth of Computing Power



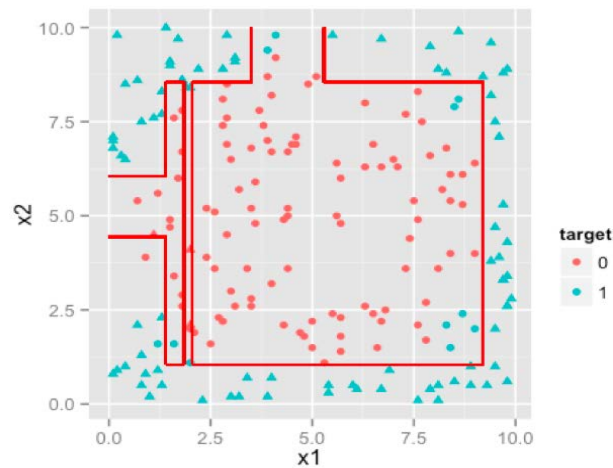
Source: Michael Kitces

Why is Modern Analytics so Successful?

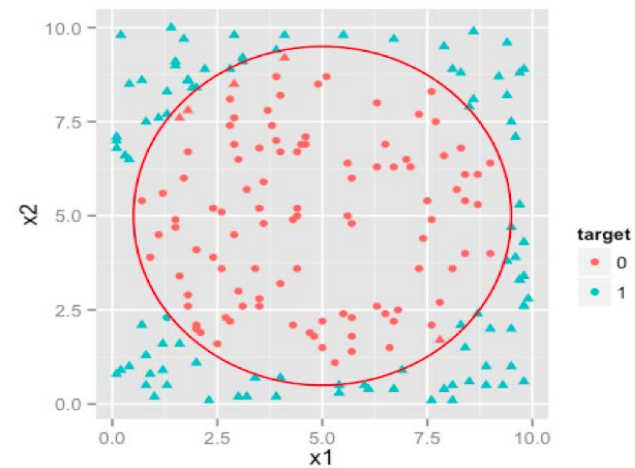
- 1. More Data for the Analysis**
- 2. More Computing Power**
- 3. New Methods and Algorithms**
- 4. New Analysis Processes**



Traditional Regression



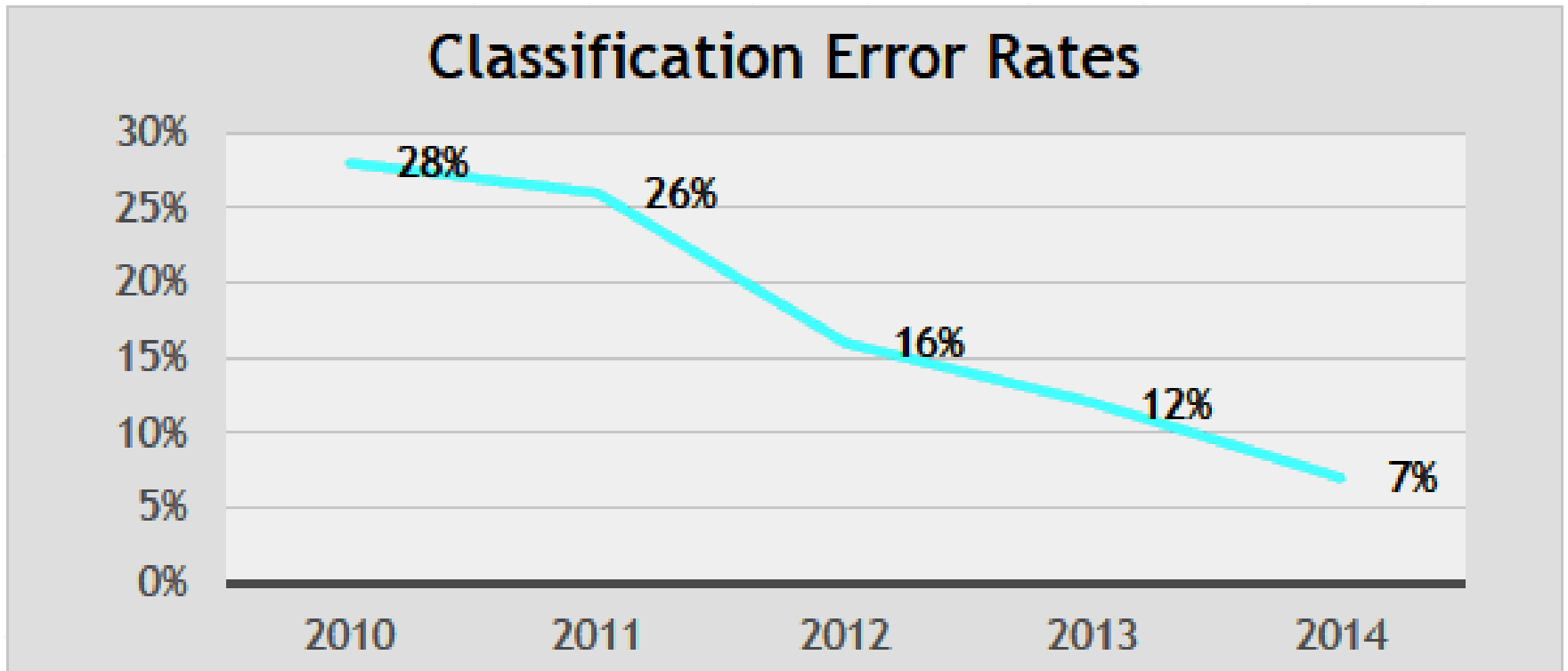
Decision Tree



Neural Network

Source: Lalit Sachan

Decrease of Error Rates



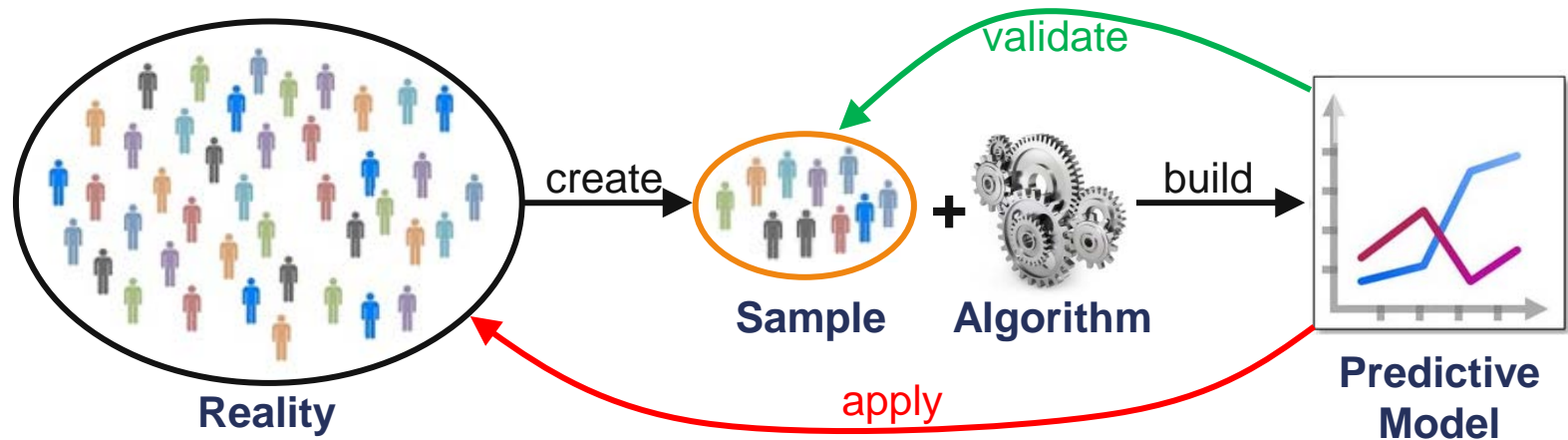
Source: Larry Brown

Why is Modern Analytics so Successful?

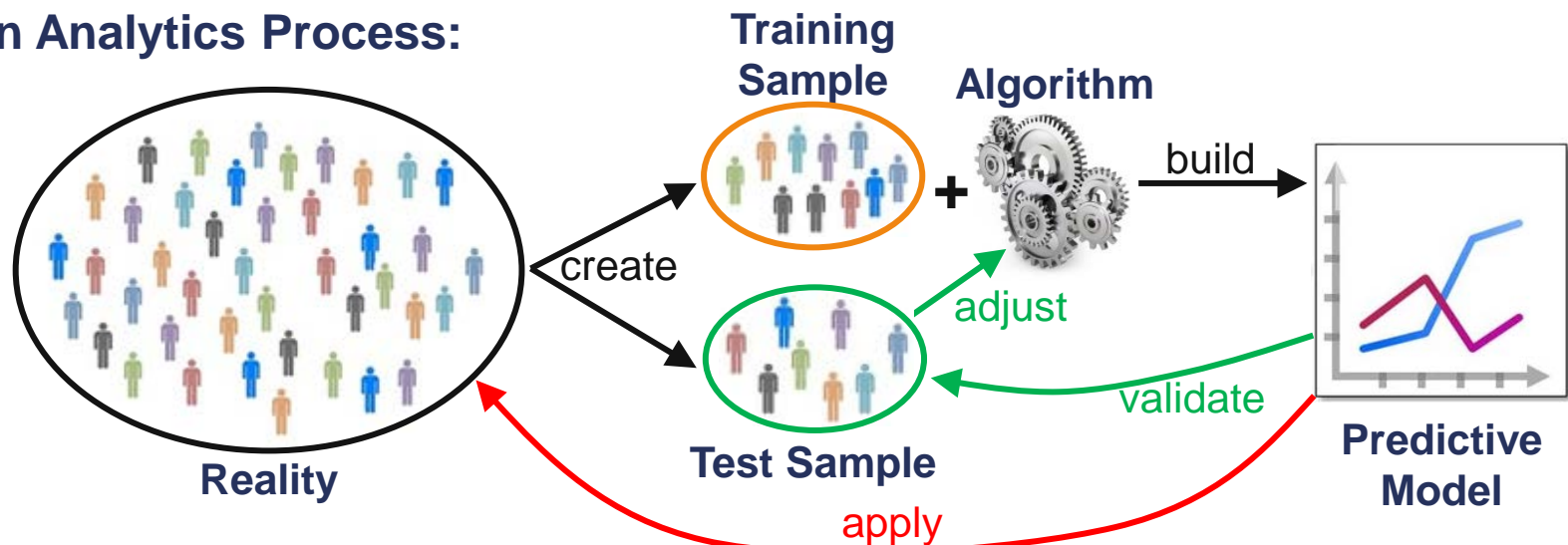
- 1. More Data for the Analysis**
- 2. More Computing Power**
- 3. New Methods and Algorithms**
- 4. New Analysis Processes**

Traditional vs. Modern Analytics Process

Traditional Analytics Process:

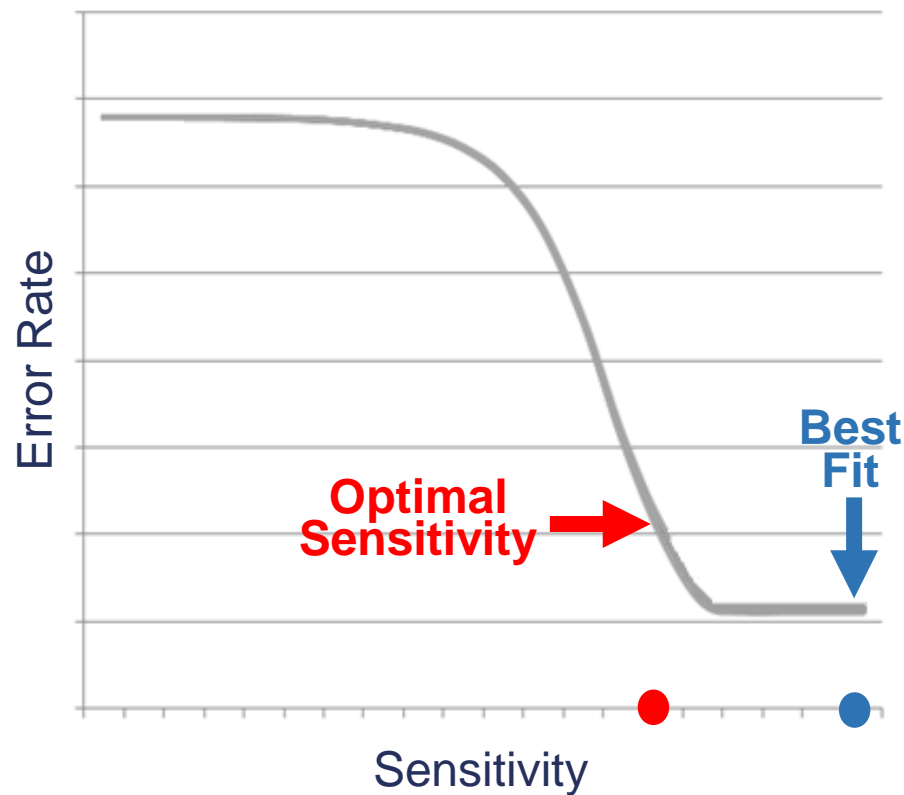


Modern Analytics Process:

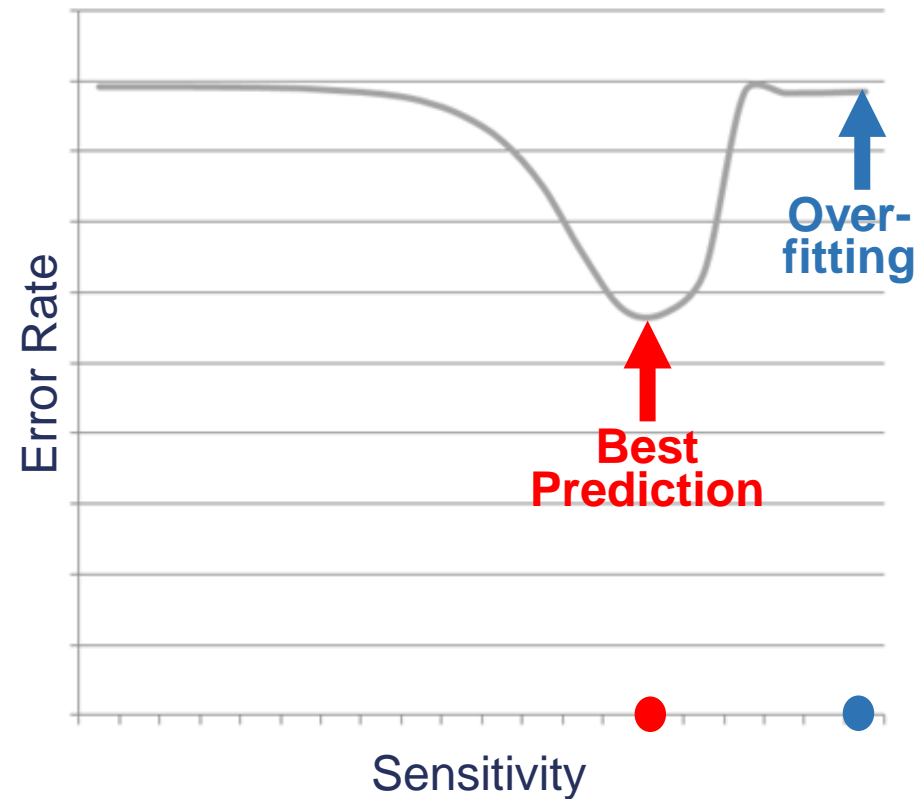


Best Fit vs. Best Prediction

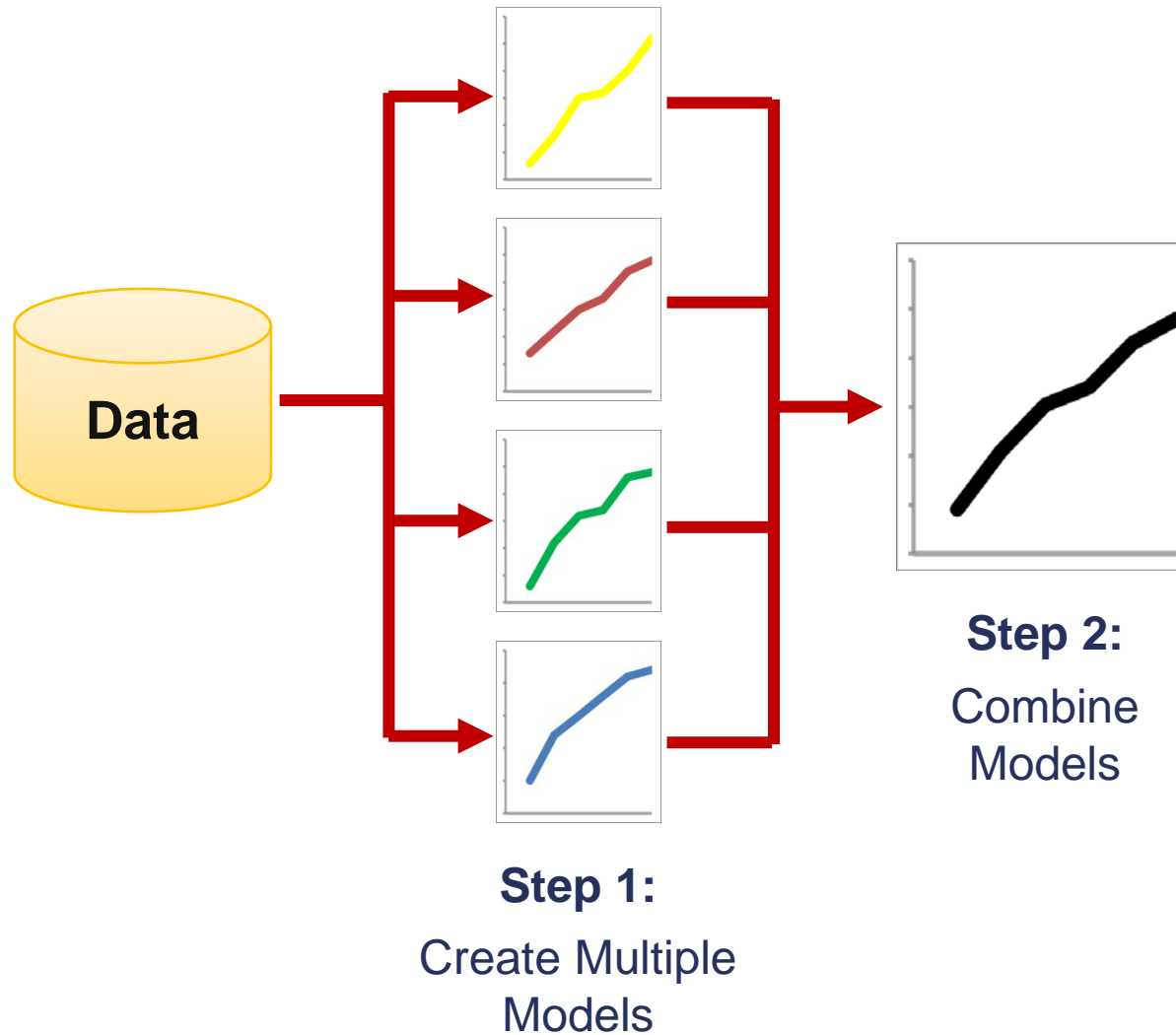
Training (Model Estimation)

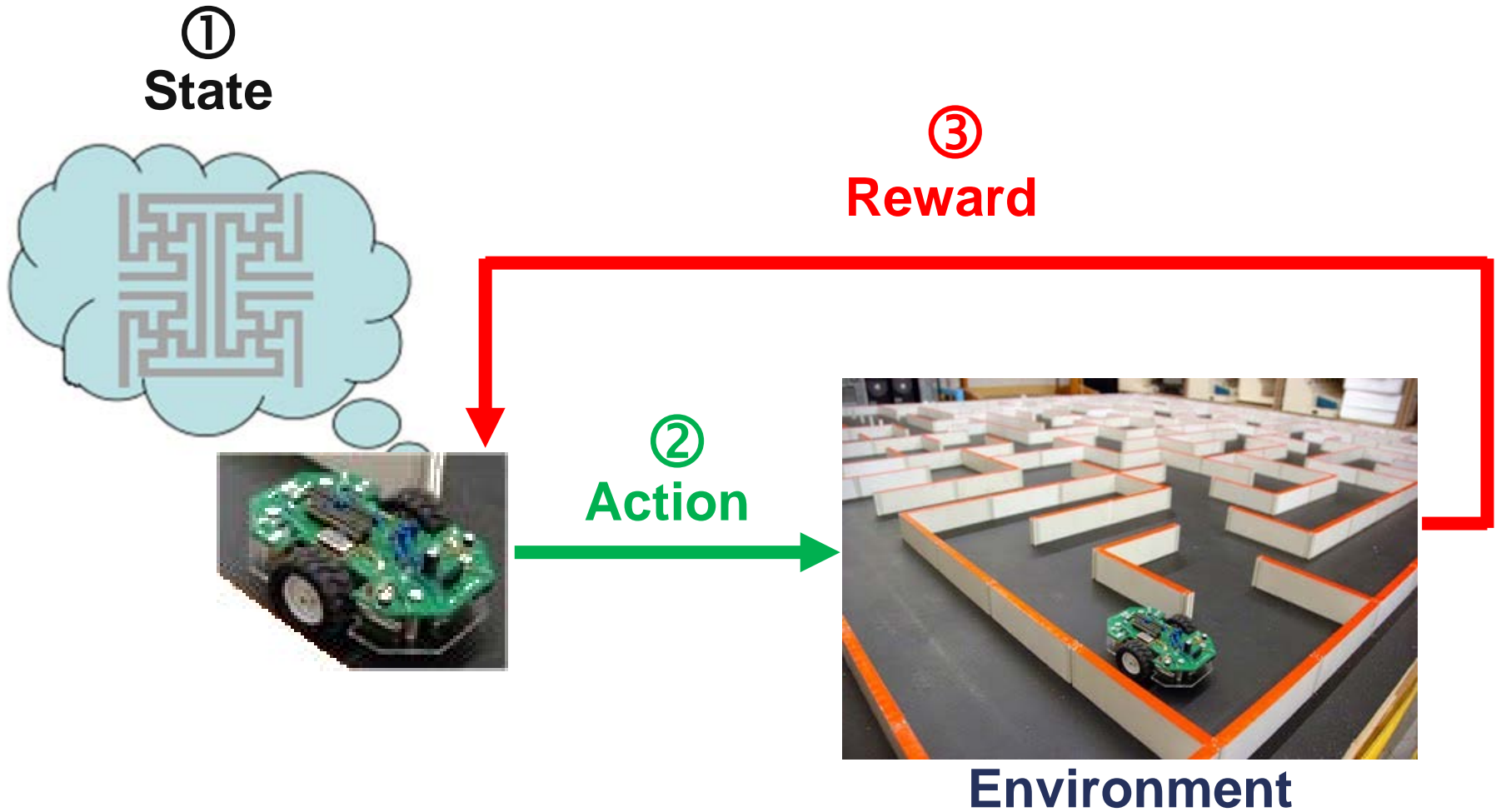


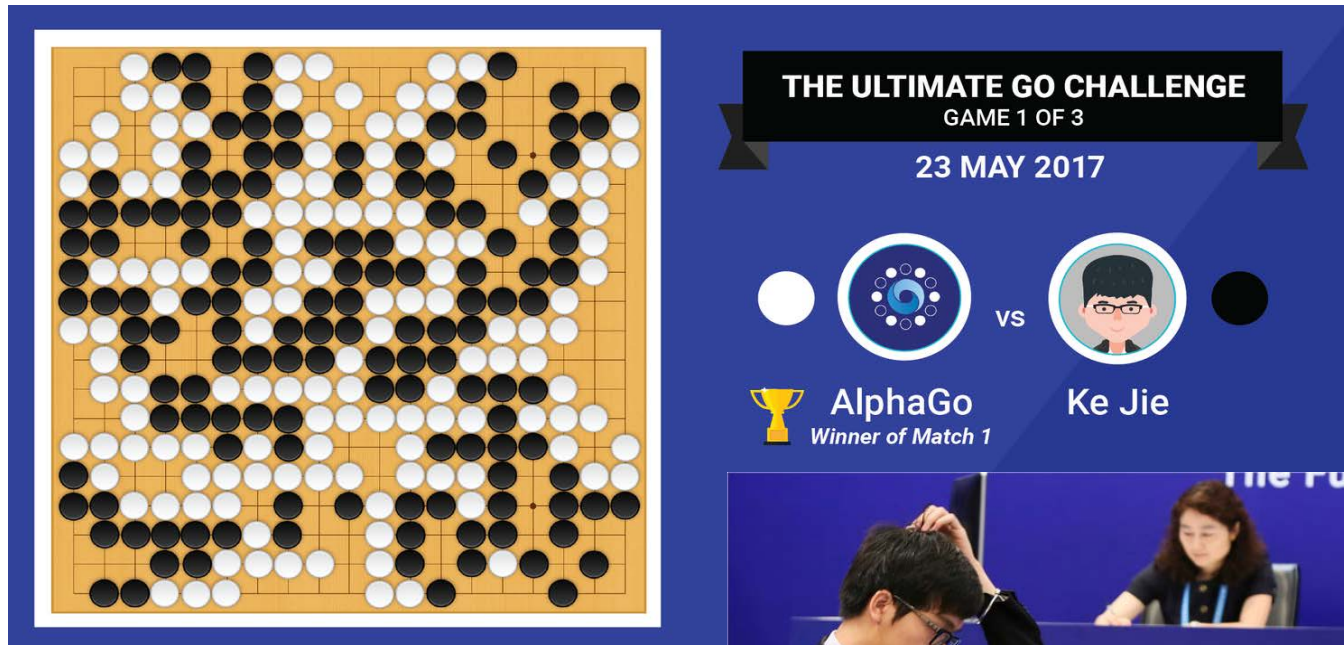
Test (Model Validation)



Source: Roßbach/Karlow







Source: The New York Times



Training:

- (1) Learned to play by using a database of around 30 mio. recorded moves
- (2) Playing millions of games against other instances of itself

Libratus has beaten four of the world's best poker players in a 20-day tournament.

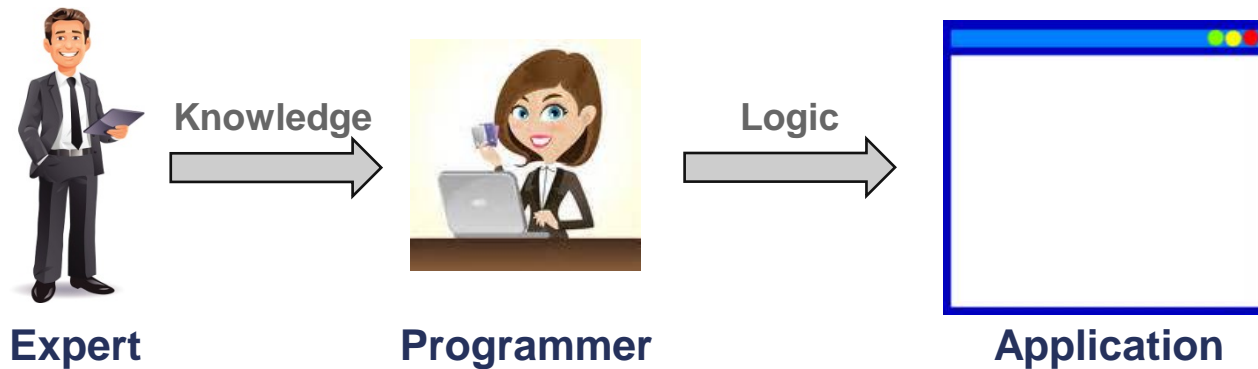


Source: Twitter

Poker is a game with imperfect information.

The AI is additionally required to bluff and correctly interpret misleading information.

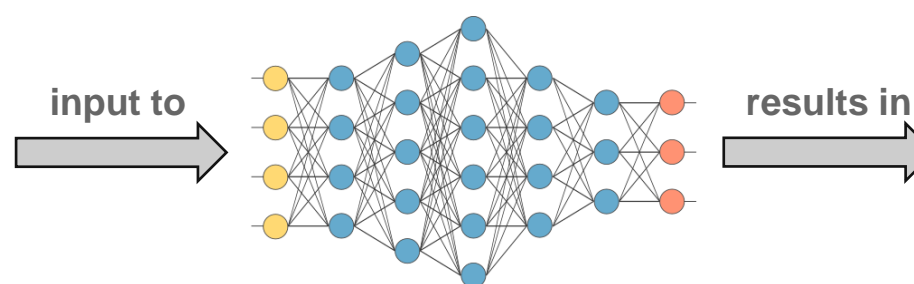
Former AI:



Self-learning AI:

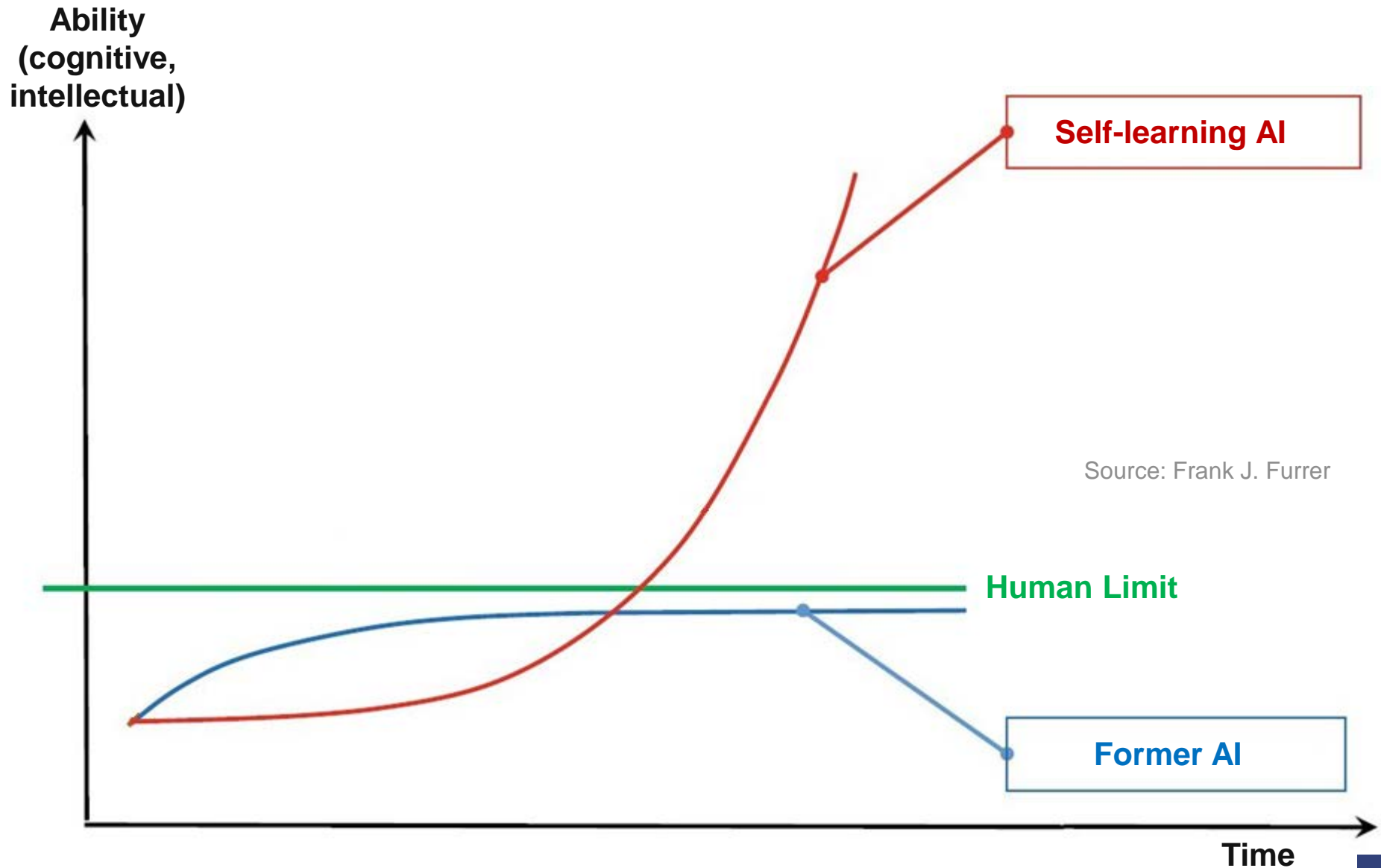
```
100100011101000000101000110111010110
100100111101110000001111100110100100
100001101101111101010011100001101001
111111010000110111001010111100001011
1100111110111111100100001110110110
010000110100110110000110000100010000
010101110011001111011001110100010111
001000010101100101000001000010011110
01110100111110010111010101010111100
100010000101100010101101010111000101
010010000100101011110011100001010000
010110000010011101010010101110110001
011011111010111100010100010100010000
011010011011011010001000101111001101
000101000001100110001100100010010110
10010101010001001110010101010111101
```

Data

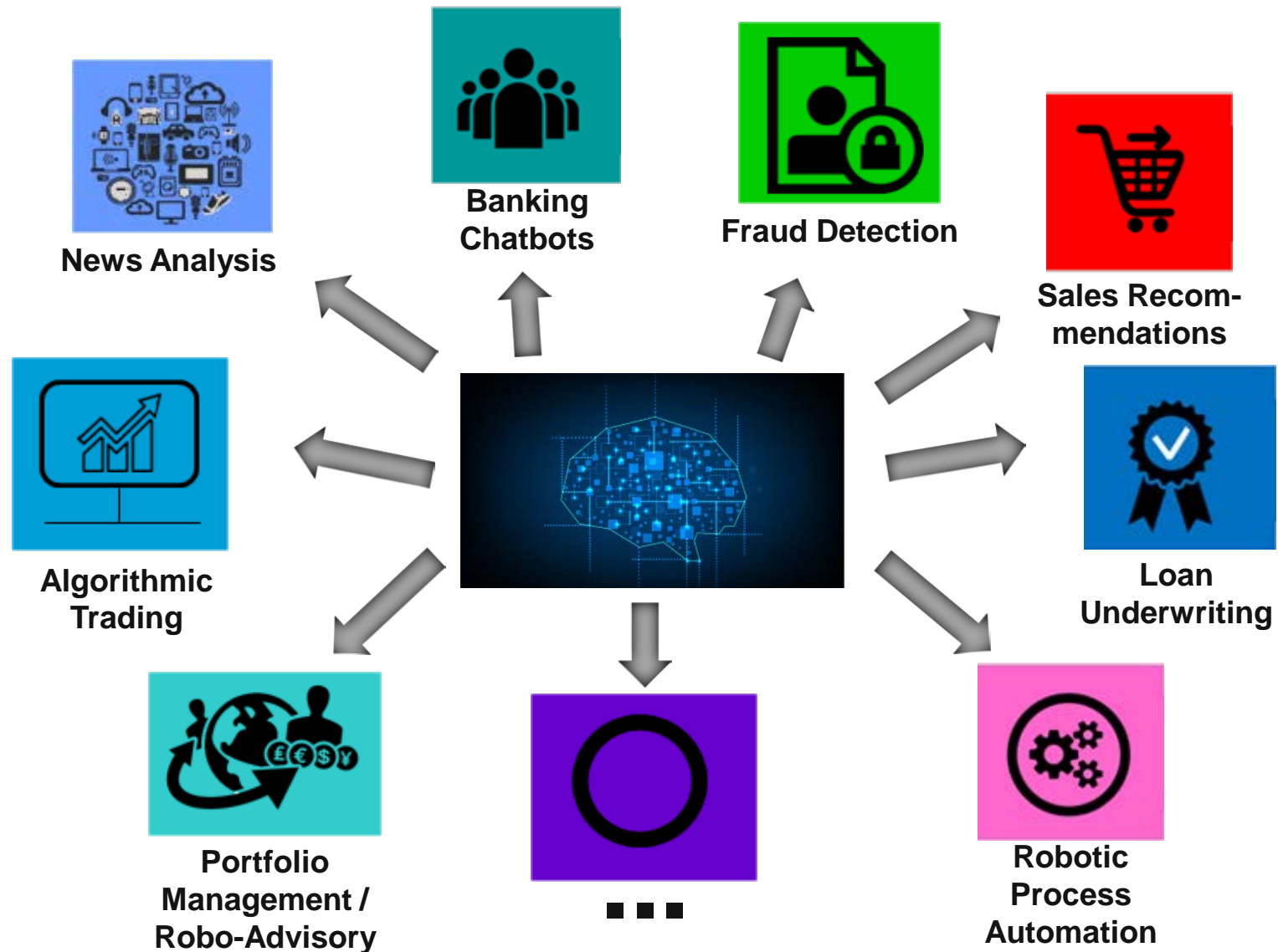


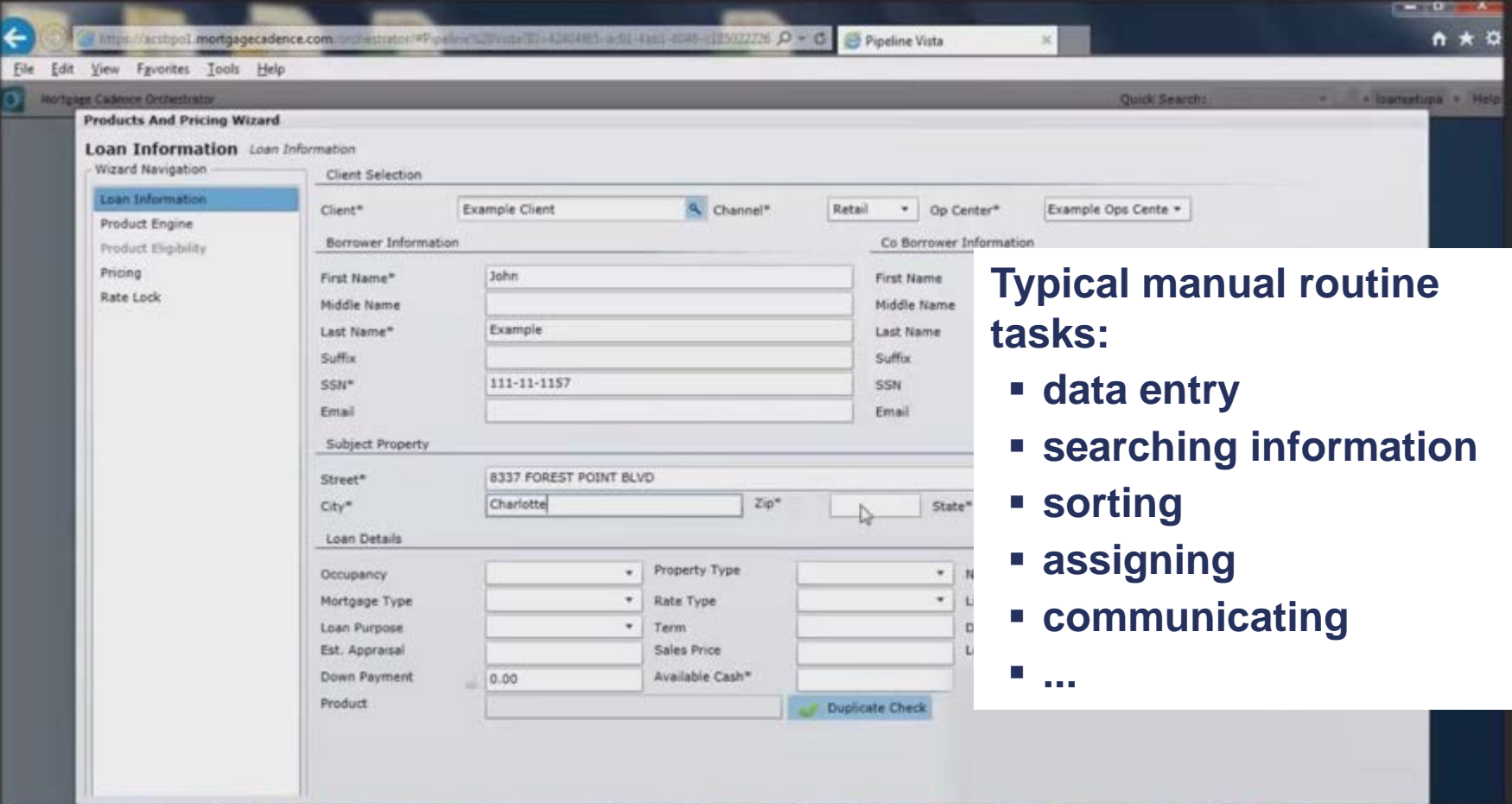
Algorithm
extracts inherent knowledge

Application



Potential Applications of AI in Banking





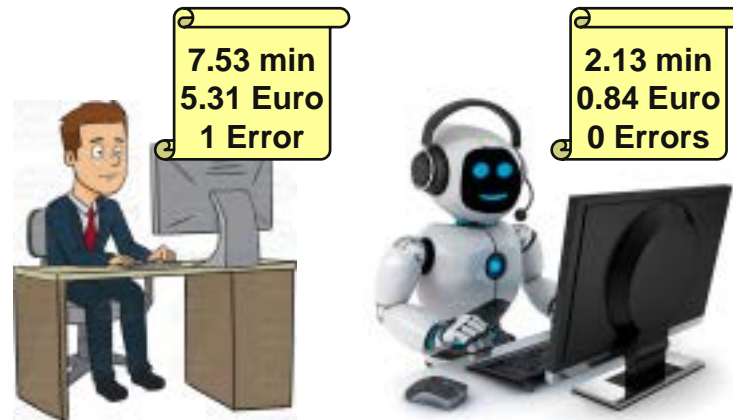
The screenshot displays a web browser window with the URL <https://acsbpo1.mortgagecadence.com/orchestrator/#Pipeline%2Froute%3D+4244463+ac51-4461-6545-1E302226>. The application is titled 'Mortgage Cadence Orchestrator' and features a 'Products And Pricing Wizard'. The 'Loan Information' tab is selected in the 'Wizard Navigation' pane. The form is divided into several sections:

- Client Selection:** Includes fields for 'Client*' (Example Client), 'Channel*' (Retail), and 'Op Center*' (Example Ops Centre).
- Borrower Information:** Includes fields for 'First Name*' (John), 'Middle Name', 'Last Name*' (Example), 'Suffix', 'SSN*' (111-11-1157), and 'Email'.
- Co-Borrower Information:** Includes fields for 'First Name', 'Middle Name', 'Last Name', 'Suffix', 'SSN', and 'Email'.
- Subject Property:** Includes fields for 'Street*' (8337 FOREST POINT BLVD), 'City*' (Charlotte), 'Zip*', and 'State*'.
- Loan Details:** Includes dropdown menus for 'Occupancy', 'Mortgage Type', and 'Loan Purpose'; text fields for 'Est. Appraisal', 'Down Payment' (0.00), and 'Product'; and dropdown menus for 'Property Type', 'Rate Type', 'Term', 'Sales Price', and 'Available Cash*'. A 'Duplicate Check' button is located at the bottom right of this section.

The Windows taskbar at the bottom shows various application icons and the system clock indicating 5:10 PM on 5/11/2016.

Typical manual routine tasks:

- data entry
- searching information
- sorting
- assigning
- communicating
- ...



- Robotic Process Automation is a technology where human employees are replaced by software robots.
- The software-robots mimic user interaction by running on the end-user computers.
- Simulating the usage of keyboard and mouse they work with the same applications as the humans do.
- Perform routine tasks such as entering data, interpreting emails, performing calculations, creating documents, ...
- AI/ML-enhanced generations are able to interpret, reason, learn, and making decisions.

Digital platforms that provide automated, algorithm-driven asset allocation of investments without human involvement.



Typical functions:

- (1) Collect customer information (goals, risk attitude, ...)**
- (2) Composition of an individual portfolio**
- (3) Automatic rebalancing**

Advantages:

- **Cheaper (usually annual flat fee of 0.2% to 0.6% of balance)**
- **Customer needs less capital (usually between \$0 and \$5,000)**
- **Available 24/7**

- **Gain better customer understanding**

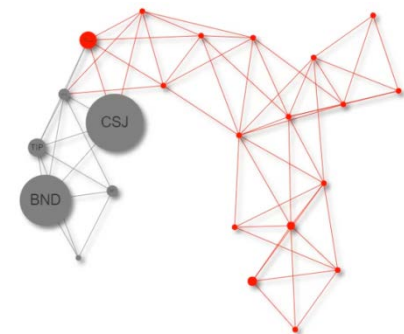
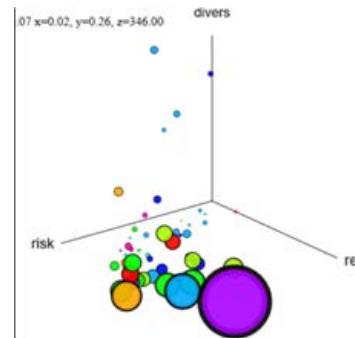
Find patterns to customize a financial plan and investment strategy using Facebook posts, spending habits, investment choices, pins on Pinterest, tweets, etc.

- **Predicting markets**

Predict market or security prices and returns, based on capital market data, news and sentiment analysis etc.

- **Constructing and rebalancing portfolios**

Application of Graph-based Machine Learning. Using nonlinear and more robust graph structures instead of linear correlations.

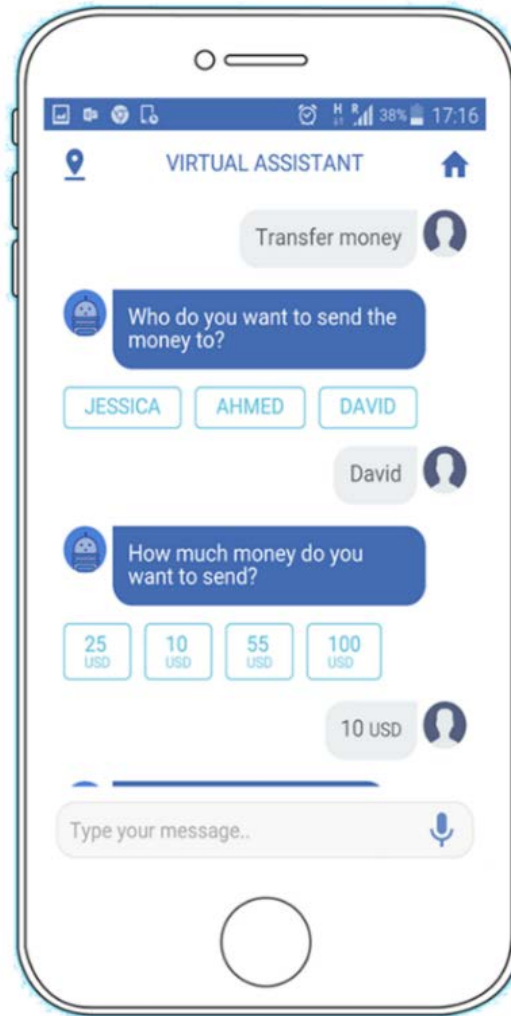
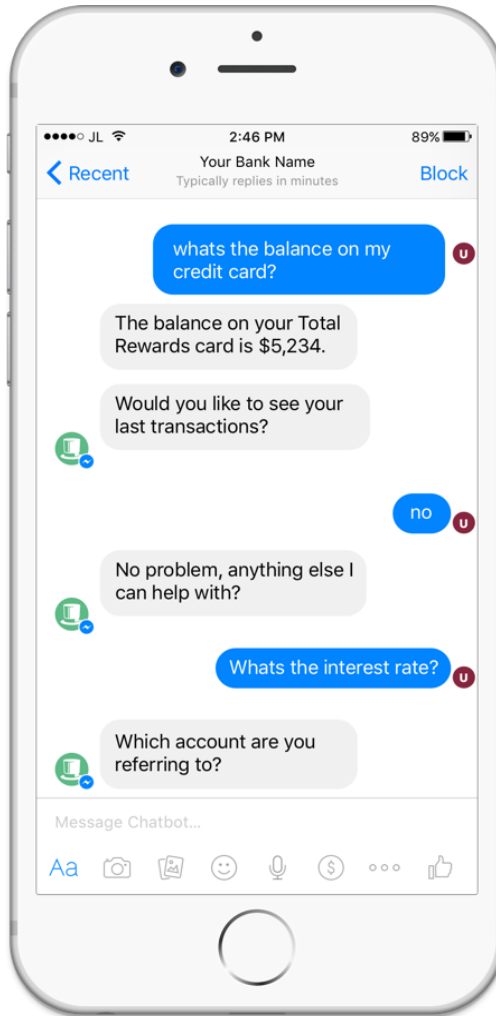


- **Interacting with the customer**

Using chatbots to communicate with the customer.

- **Chatbots are software programs that interact with a human through text or voice**
- **Can understand our free formulation in text or speech and can respond in the same way**
- **Reinvents the customer communication of a bank**
- **More convenience compared to a classical banking app**
- **Able to manage a huge amount of one-to-one conversations simultaneously**
- **Combine customer intimacy on the one and automation on the other side**

Text-based Chatbots



Source: Yello

Source: Finlabs

Voice-based Chatbot



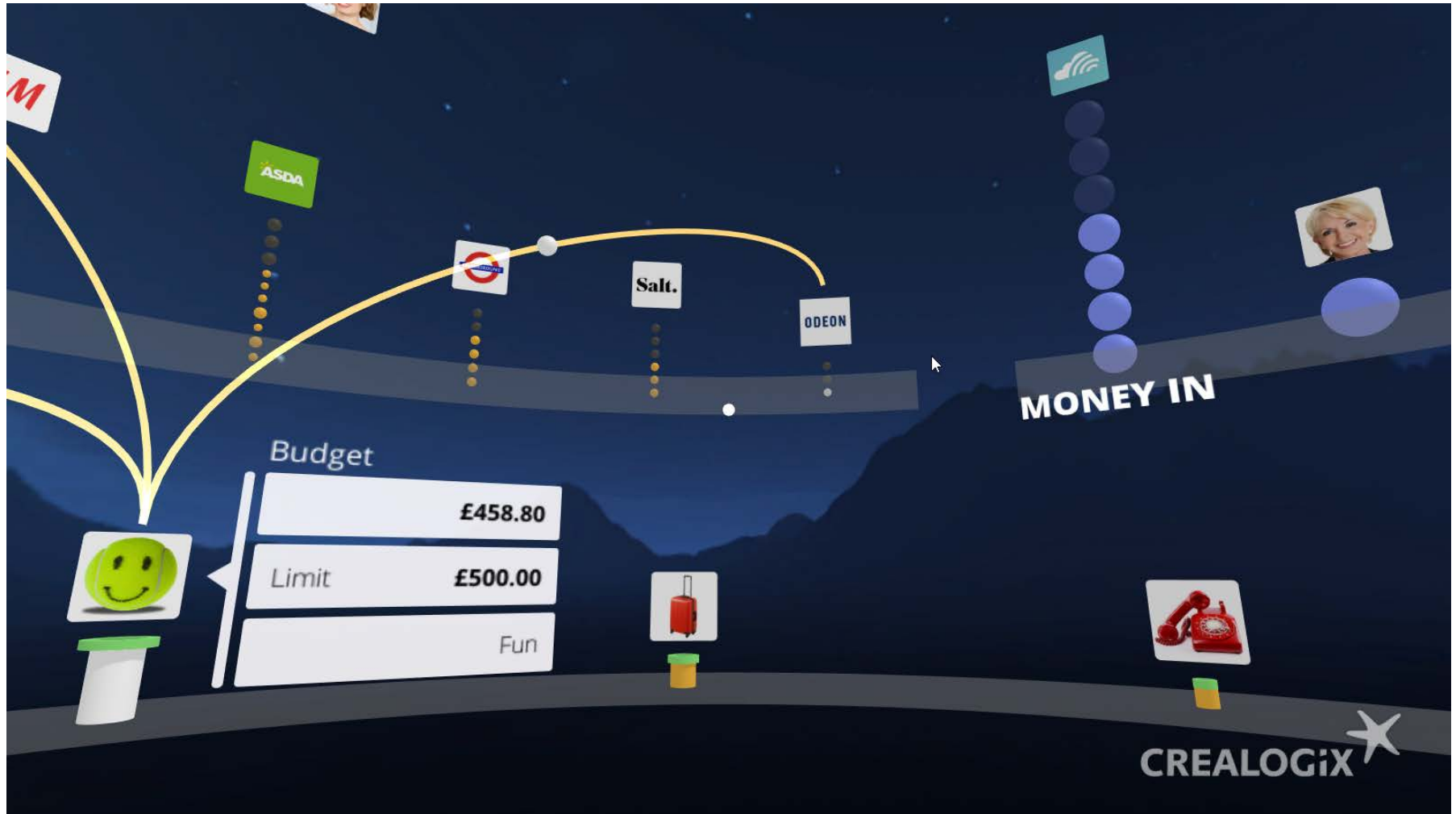
Source: Astute Solutions



Source: Impact Hub

**Computer-generated simulation
of an artificial reality**

Virtual Reality Banking App



Source: Crealogix

Virtual Reality Banking App



Source: Crealogix



Virtual Branch



Source: GTE Financial



Source: Impact Hub

**Enriches the real world with
computer-generated enhancements**

Augmented Reality at Citi Bank



Source: Citi Bank

Augmented Reality at Citi Bank



Source: Citi Bank