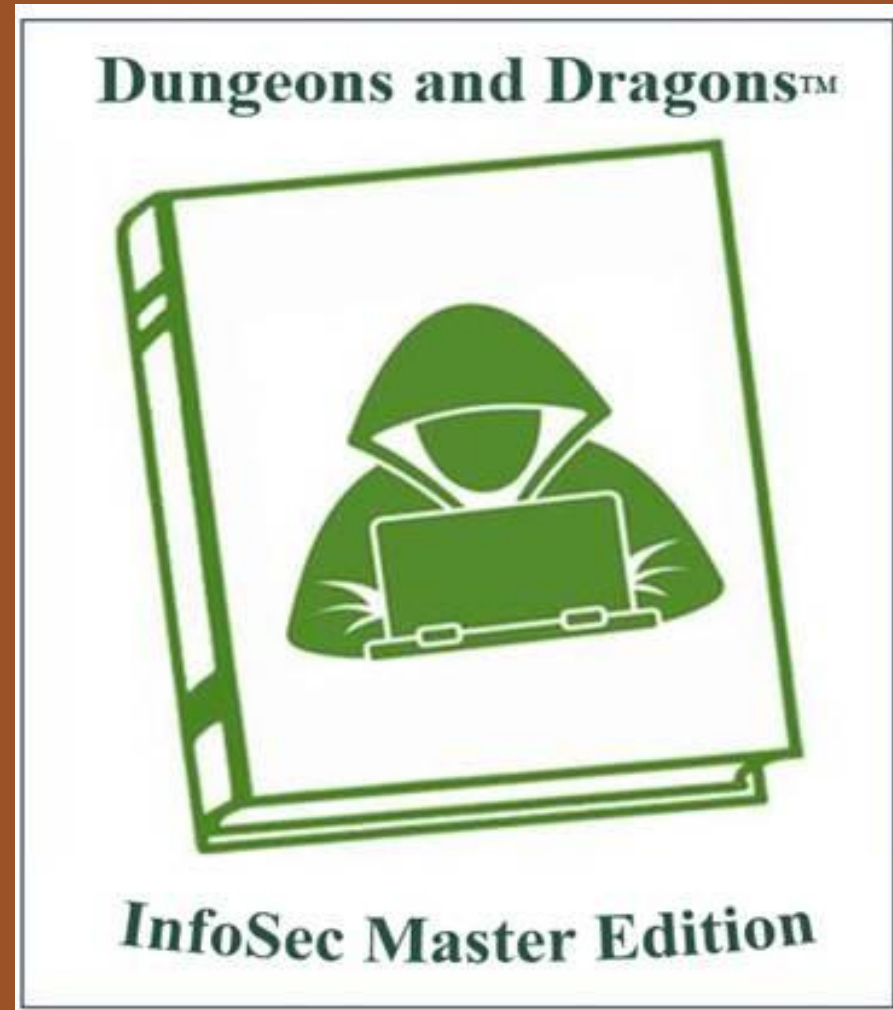


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About Charles



1995-2002: Forward Deployed US Navy Hornet Avionics Tech

2002-2005 US Naval Postgraduate School Network Security
Group Division Officer
sk3wl Of r00t team member



InfoWorld **2003-2008:** InfoWorld Test Center
Contributing Product Reviewer – Network and Information
Security

2005-2012 DoD Security, Data & Workflow Consultant



CISCO **2012-2016:** Consulting Security Architect for Lancope then
Cisco Systems

2016 CTO & co-founder at WitFoo

witfoo



Disclaimer

Information in this presentation is intended to protect against illegal or harmful social engineering and human manipulation or to be used in benevolent endeavors.

Please do good and obey the law.



Old School Social Engineering

- Based on “Confidence Games” (Cons)
- Target a “mark” to achieve inappropriate action
- Requires understanding of “mark” (agent)
- Manipulates existing human vulnerability



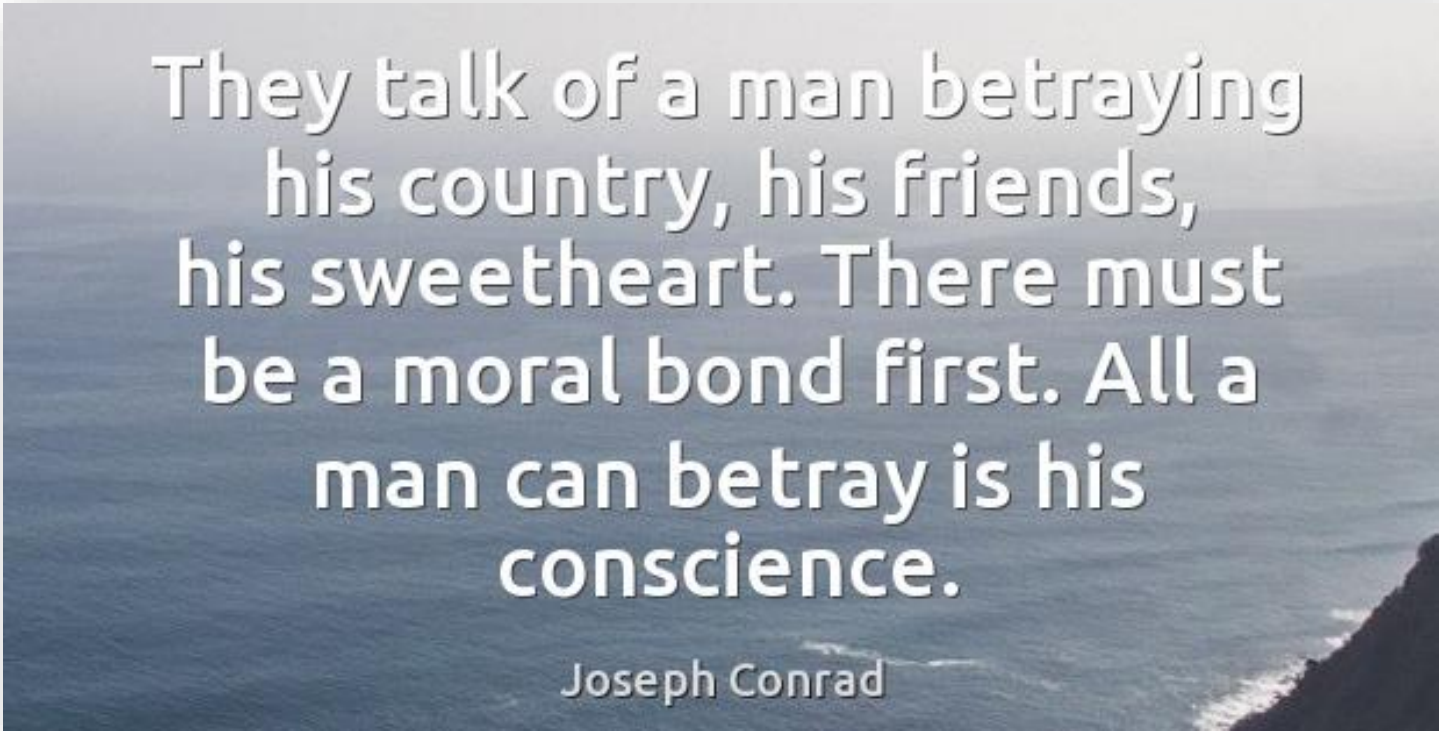
Second Generation Social Engineering

- Bulk, mass attacks
- Phishing
- Robocalls



Social Engineering with ML

- Need the Cohort (not a specific agent) to take action
- Long term training will transform agent values (create vulnerability)

The background of the quote is a photograph of a vast blue sea meeting a dark, rocky cliff on the right side. The sky is a pale, hazy blue. The text is centered and has a subtle drop shadow.

They talk of a man betraying
his country, his friends,
his sweetheart. There must
be a moral bond first. All a
man can betray is his
conscience.

Joseph Conrad

Relentless Manipulation

- *“We’ve created a world in which online connection has become primary. Especially for younger generations. And yet, in that world, anytime two people connect, the only way it’s financed is through a sneaky third person who’s paying to manipulate those two people. So, we’ve created an entire global generation of people who were raised within a context with the very meaning of communication, the very meaning of culture, is manipulation.”* – Jaron Lainer in *The Social Dilemma*

Machine Learning Basics

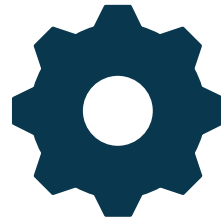
Supervised Learning

Input

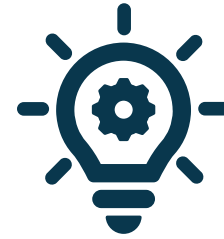


Age: 3

Model



Output



Height: 29"

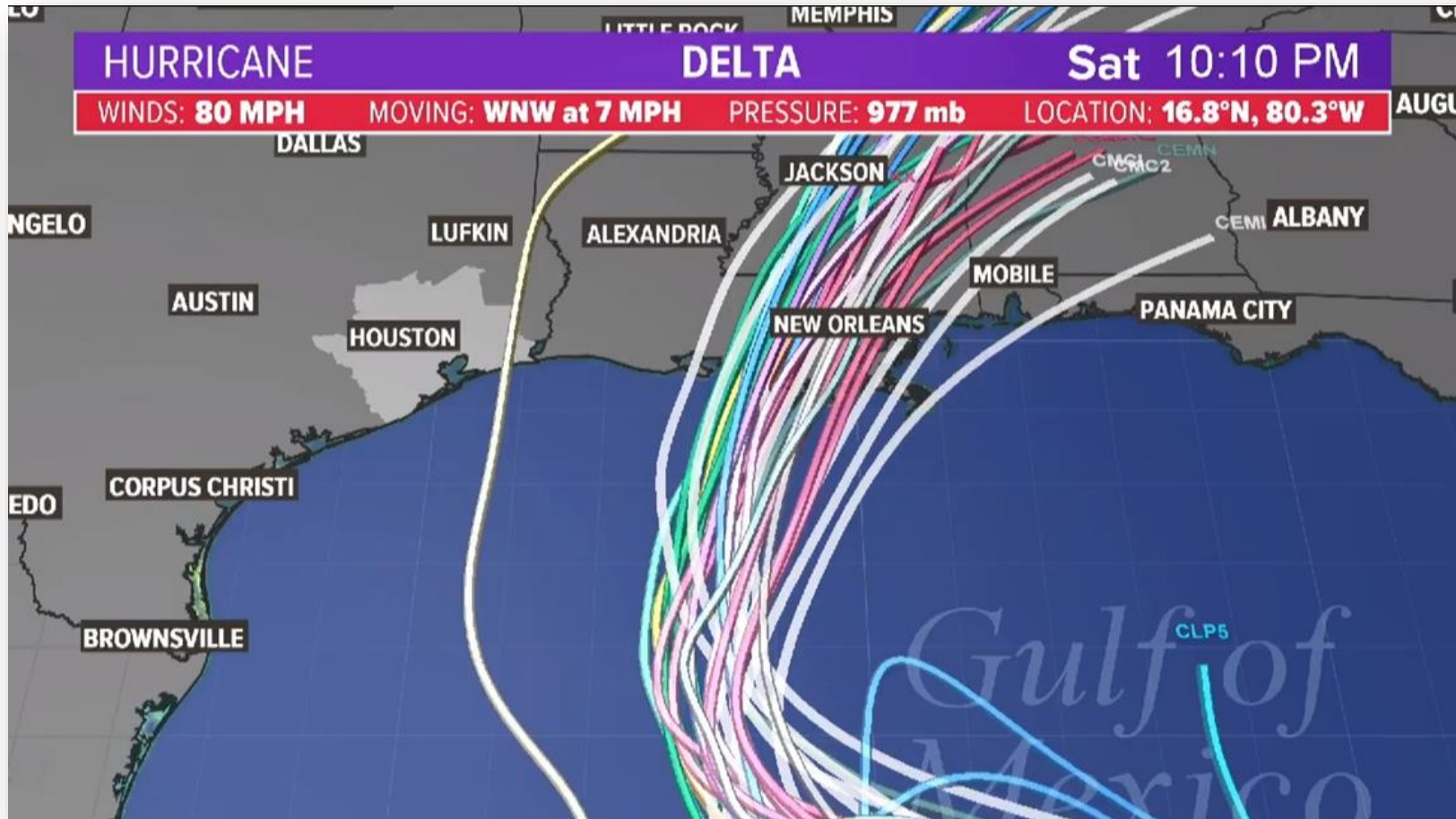
Data

Age	Height
1	20"
5	38"
20	72"
50	72"



Confirmation /
Action

Data and Models



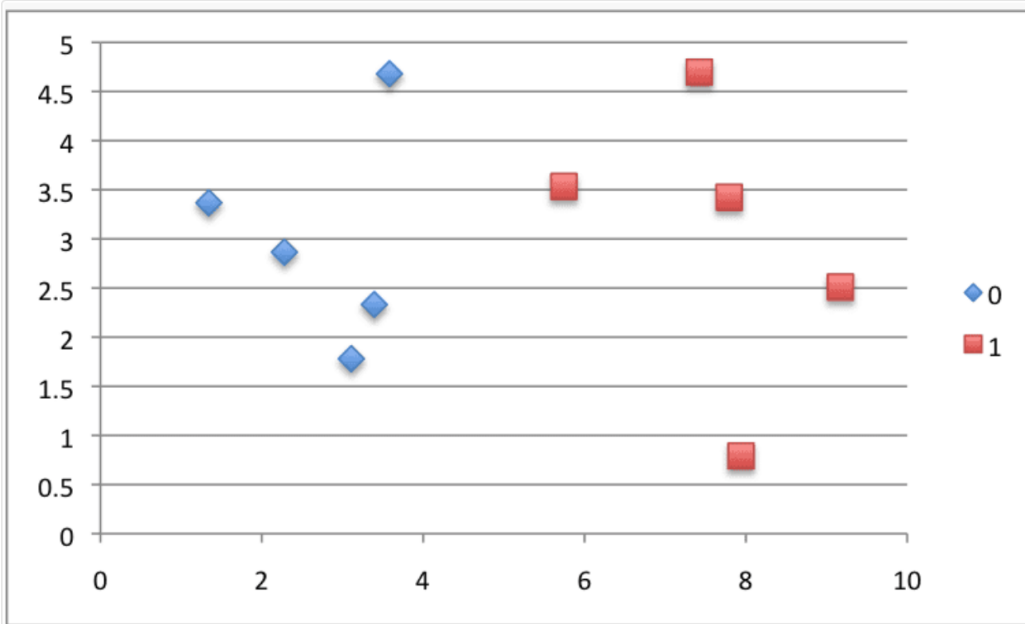
Common Models

- ***Naive Bayes***
- Nearest Neighbor
- Decision Trees
- Linear Regression
- Support Vector Machines (SVM)
- Neural Networks

<https://towardsdatascience.com/types-of-machine-learning-algorithms-you-should-know-953a08248861>

Naïve Bayesian Python

- <https://machinelearningmastery.com/naive-bayesian-classifier-in-python/>



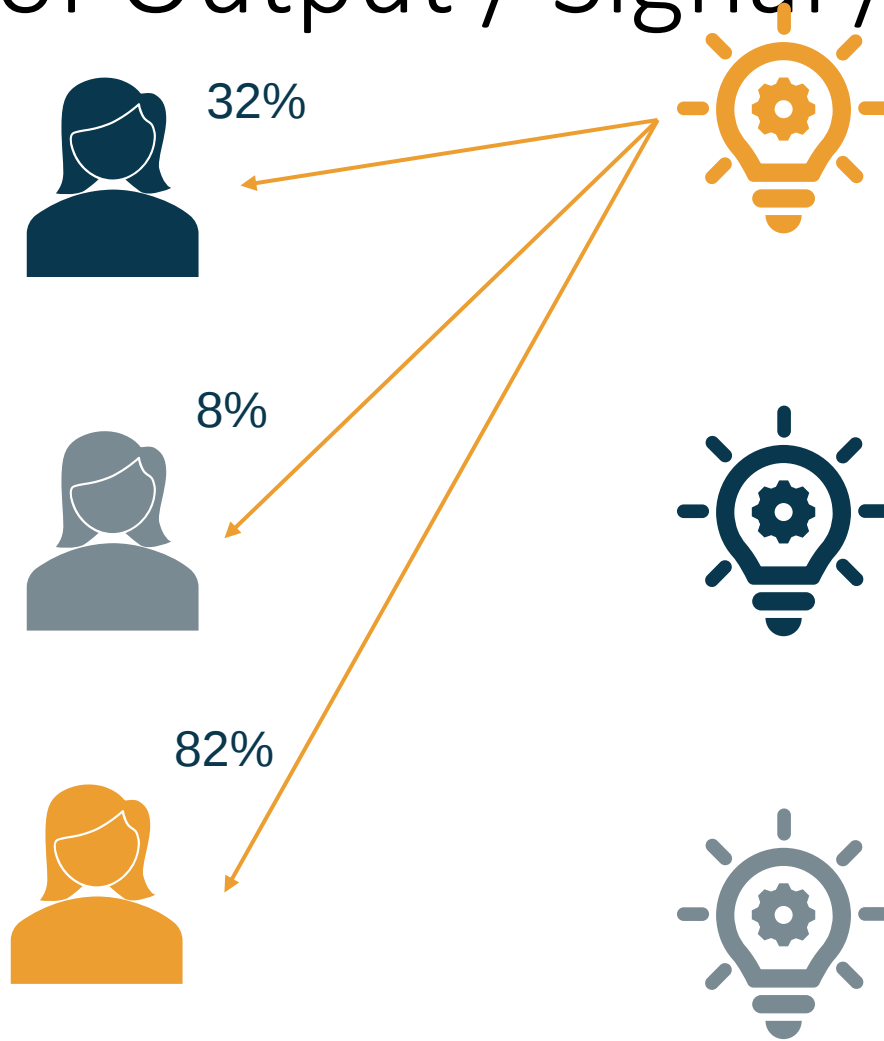
Scatter Plot of Small Contrived Dataset for Testing the Naive Bayes Algorithm

```
1 # Example of separating data by class value
2
3 # Split the dataset by class values, returns a dictionary
4 def separate_by_class(dataset):
5     separated = dict()
6     for i in range(len(dataset)):
7         vector = dataset[i]
8         class_value = vector[-1]
9         if (class_value not in separated):
10             separated[class_value] = list()
11         separated[class_value].append(vector)
12     return separated
13
14 # Test separating data by class
15 dataset = [[3.393533211,2.331273381,0],
16            [3.110073483,1.781539638,0],
17            [1.343808831,3.368360954,0],
18            [3.582294042,4.67917911,0],
19            [2.280362439,2.866990263,0],
20            [7.423436942,4.696522875,1],
21            [5.745051997,3.533989803,1],
22            [9.172168622,2.511101045,1],
23            [7.792783481,3.424088941,1],
24            [7.939820817,0.791637231,1]]
25 separated = separate_by_class(dataset)
26 for label in separated:
27     print(label)
28     for row in separated[label]:
29         print(row)
```

Reinforcement Learning



A/B Testing of Output / Signal / Content



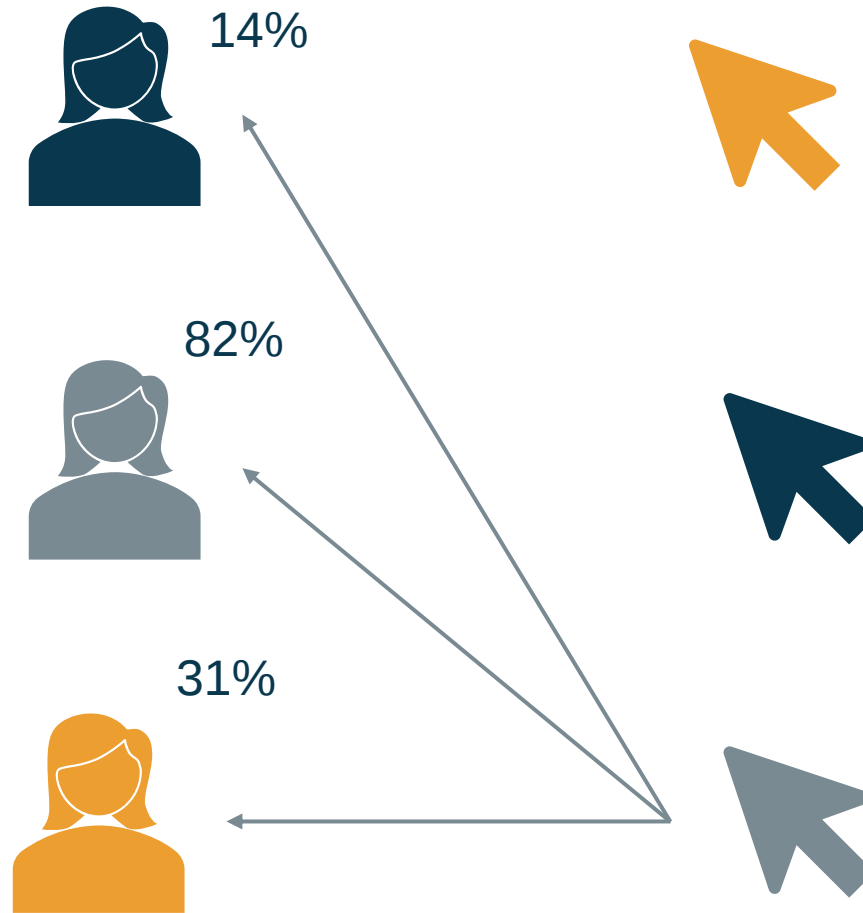
Types of Content

- Text Ad
- Video Ad
- Promoted Pages
- Email
- Snail Mail
- Images

Message Considerations

- Alignment with Values
- Suspicion Triggers
- Language & Dialect Use
- Use of Nostalgia
- Trauma Triggers (Crossing a line)
- Bias Reinforcement
- Trusted Corroboration
- Social Corroboration
- Pain vs. Reward

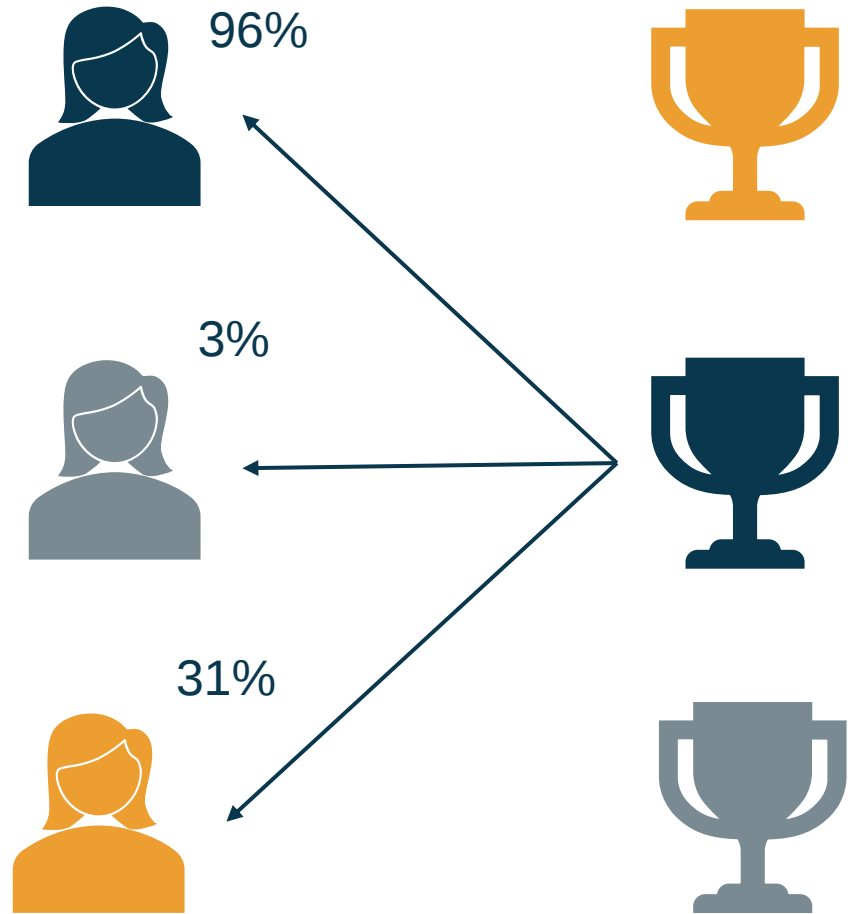
A/B Testing of Action



Types of Actions

- Click to Page
- Watch Video
- Play Game
- Fill out Form
- Join a Group
- Install an Application
- Comment / Engage

A/B Testing of Reward



Types of Reward

- Public Praise – like, retweet, comment
- Artificial Prize - badge, points
- Physical Prize - cash, gift card, prize, beer, meal
- Education Credit – CEU, certification
- Celebrity Interaction – virtual or physical
- Promise of job
- Romantic Relationship or Encounter
- Confirmation Reinforcement

Cohort Targeting

Common Cohort Dimensions

- Gender
- Age
- Ethnicity
- Religious Belief
- Income
- Location
- Family Status
- Job Type
- Employer Type
- Education Level
- Affiliations
- Relationships
- Entertainment
- Credit Rating
- Net Worth
- Political Association

Facebook Audiences

Create Audience

Locations

United States

United States

Search Locations

Detailed Targeting

Include people who match ⓘ

Behaviors > Politics (US)

Likely engagement with US political content (conservative)

Demographics > Education > Education Level

College grad

Interests > Additional Interests

Grand Rapids, Michigan

The Hacking Universe

Interests > Entertainment > Music

Add demographics, interests or behaviors

Suggestions Browse

Your audience selection is **fairly broad**.

Potential Audience Size: 140,000,000 people ⓘ

Specific Broad

Cancel Save

Income

Household income: top 10% of ZIP codes (US) ☐

Household income: top 10%-25% of ZIP codes (US) ☐

Household income: top 25%-50% of ZIP codes (US) ☐

Household income: top 5% of ZIP codes (US) ☐

Work

Employers

Industries

Job Titles

Soccer

Friends of Soccer fans ☐

Soccer fans (high content engagement) ☐

Soccer fans (moderate content engagement) ☐

LinkedIn Audience

Who is your target audience?

Include people who have **ANY** of the following attributes:



Member Interests

Open Source Software

AND also have **ANY** of the following attributes:



Job Titles (Current)

Software Engineer

AND also have **ANY** of the following attributes:



Company (Current Jobs)

Steelcase

Narrow audience further

Exclude people by audience attributes and Matched Audiences

LinkedIn tools may not be used to discriminate based on personal characteristics like gender, age, or actual or perceived race/ethnicity. [Learn more](#)

Search		Learn more about targeting criteria
 Audiences Use your data to retarget website visitors or reach known contacts and accounts	Company	
	Demographics	
	Education	
	Job Experience	
 Audience attributes Add targeting criteria like job title, industry, or skills	Interests and Traits	

Useable on Bing Search

Google Audience

People: who you want to reach
Define your **Audiences**, **Demographic**, or both

Demographics

Select your demographic targeting ?

Gender	Age	Parental status	Household income
☒ Female	☒ 18 - 24	☒ Not a parent	☒ Top 10%
☒ Male	☒ 25 - 34	☒ Parent	☒ 11 - 20%
☒ Unknown ?	☒ 35 - 44	☒ Unknown ?	☒ 21 - 30%
	☒ 45 - 54		☒ 31 - 40%
	☒ 55 - 64		☒ 41 - 50%
	☒ 65+		☒ Lower 50%
	☒ Unknown ?		☒ Unknown ?

 Note: Household income targeting is only available in select countries. [Learn more](#)

Audiences

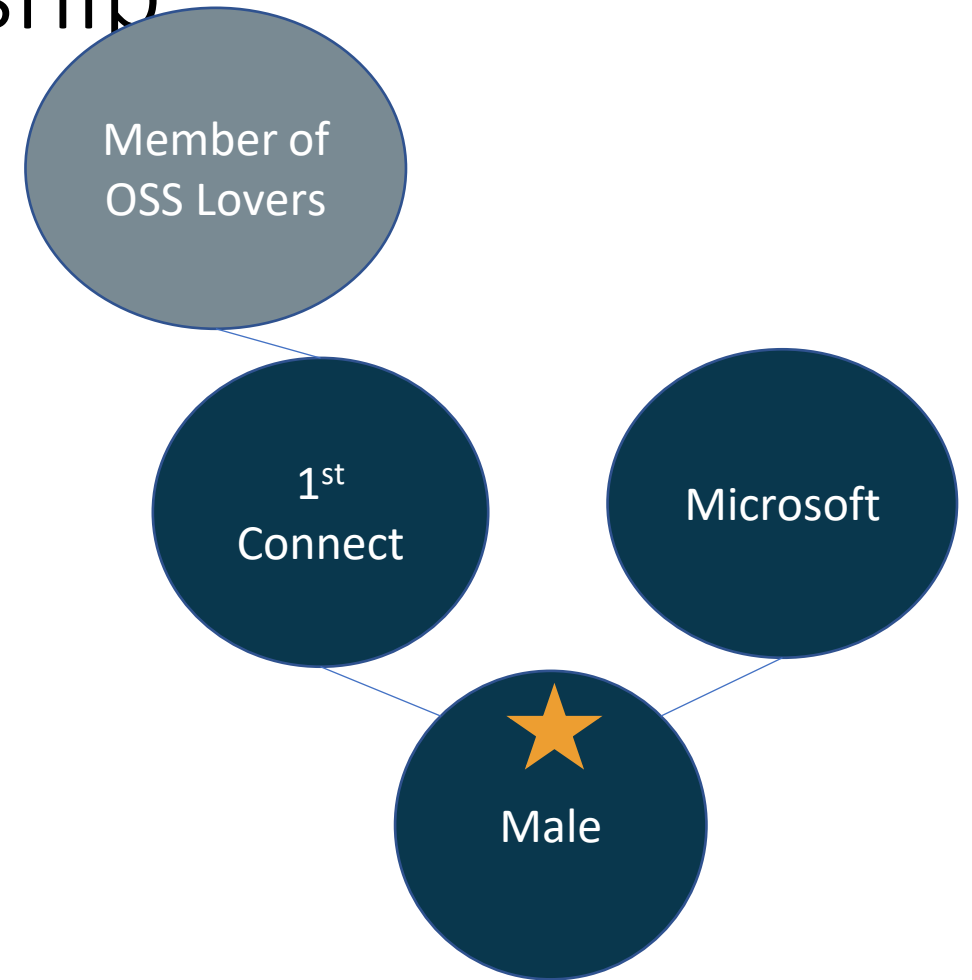
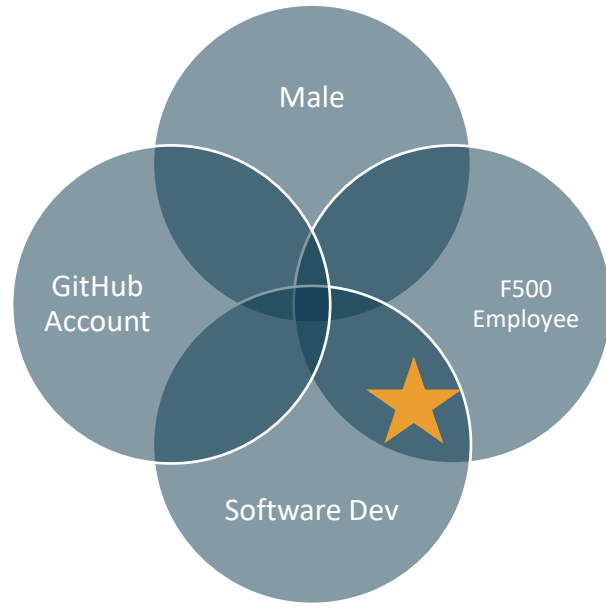
Select audiences to define who should see your ads. You can create new audiences in [Audience Manager](#). ?

SEARCH	BROWSE	7 selected	CLEAR ALL
Who they are (Detailed demographics)	>	Detailed demographics	
What their interests and habits are (Affinity)	>	Employment > Company Size Very Large Employer (10k+ Employees)	
What they are actively researching or planning (In-market and life events)	>	Employment > Industry Manufacturing Industry	
How they have interacted with your business (Remarketing and similar audiences)	>	Parental Status > Parents Parents of Preschoolers (4-5 years)	
Your combined audiences (Combined audiences)	>	Marital Status Single	
Your custom audiences (Custom audiences)	>	Homeownership Status Homeowners	
		Education > Highest Level of Educational Attainment Bachelor's Degree	
		Affinity audiences	

Other Sources of Information

- Breach Data (Cambridge Analytica, etc)
- Intellius
- Scraping Social Media Sites
- Public Records

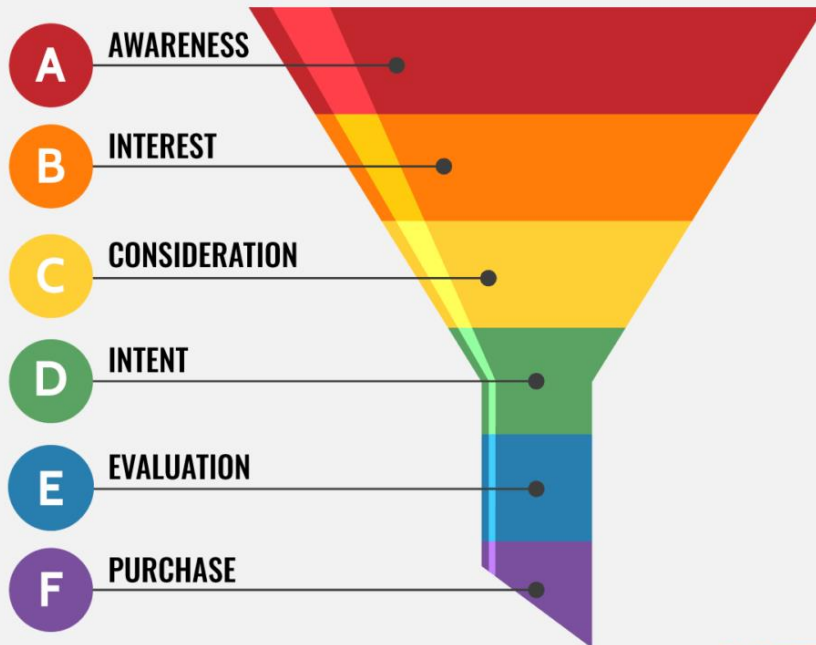
Cohort Collision vs Relationship



Launching Campaigns

Humans Move Slowly

THE TRADITIONAL SALES FUNNEL



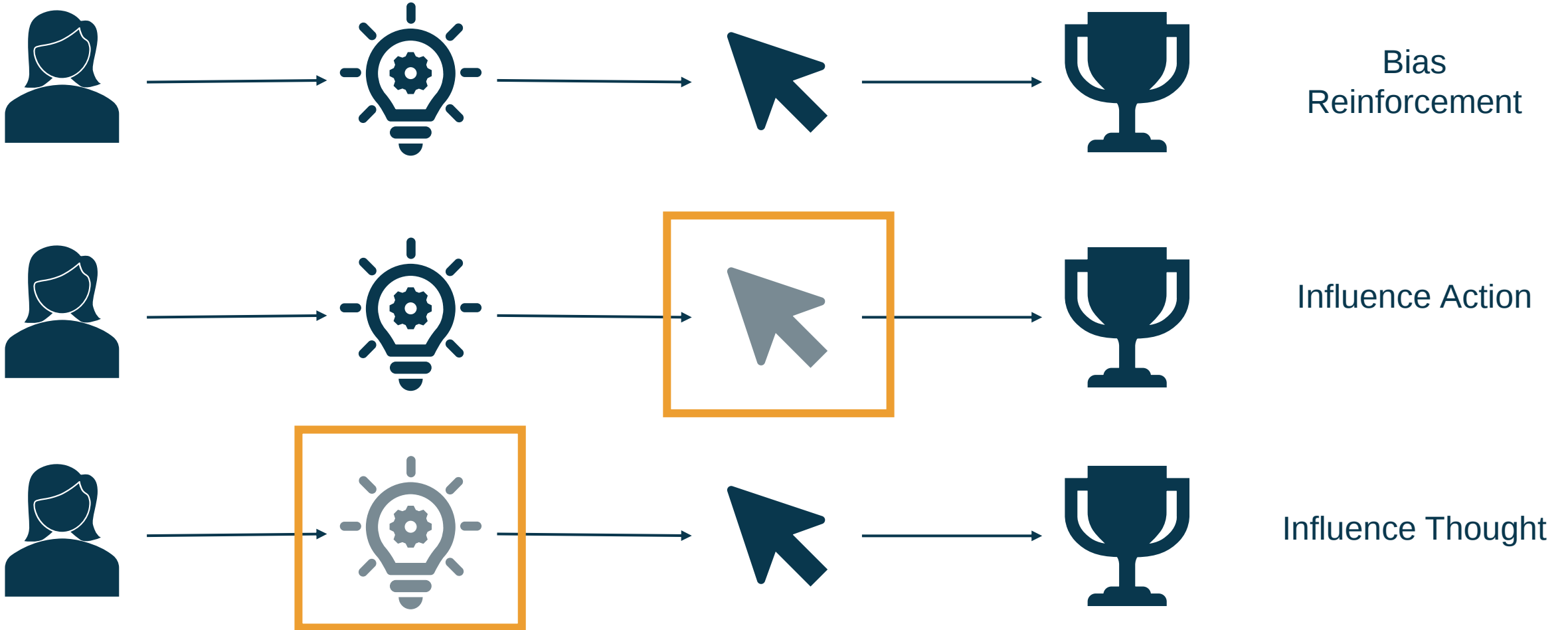
@2021 DK New Media, LLC. All Rights Reserved.



Sales cycles as detailed here can take months or years to complete as agents progress through the process.

Successful progressions will have small, incremental steps requiring the lowest amount of agent change per stage.

Agent Transformation



Key Tracking Metrics

- Agent ID (Preferred) or Cohort ID
- Content ID
- Action ID
- Action State
- Proposed Reward ID

ID	Cohort	CID	AID	AS	RID
1000	1	3	2	0	1
1002	2	3	2	1	1
1000	1	4	2	1	2
1001	2	3	2	1	1

https://test.com/page.php?agent_id=1001&content_id=3&action_id=2&state=fail&reward_id=4

Behavior Flow Analysis



Improving Cohort Definitions

- What characteristics are shared among funnel exits?
- Are those characteristics missing in continuations?
- Tracking interaction counts to conversion

ID	Age	Politics	Income	Role	Music
1003	57	Near Left	\$120k	PM	EDM
1198	45	Far Left	\$200k	Exec	EDM
2876	33	Near Right	\$85k	Dev	EDM

Multi-stage Cultivation

Obtain Followership

Level 1 Exposure

1st Action

Level 2 Exposure



Maintaining a Campaign

- Data Mining for Cohort Definition
- Large, diverse, effective content
- Ability to maintain audience (Groups, followers, mail lists, games)
- A/B testing of action delivery
- Reward types
- Decent Model (Naive Bayes)
- Growing Dataset for Model
- Detection Avoidance



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