PROPOSITION FOR LEAD SCORING SYSTEM AND BUSINESS GROWTH

- CASE STUDY FOR A FICTITOUS ONLINES COURSE COMPANY

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1.1 PROJECT OBJECTIVE

This fictious company aims to

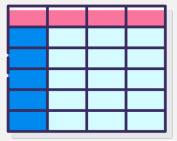
1. Prioritize sales resources
2. Improve conversion rates
3. Shorten sales cycle

by building a lead scoring system.

1.2 PROJECT OVERVIEW - LEAD SCORING DESIGN

A PROCESS OF ASSIGNING SCORES TO PROSPECTS BASED ON PREDICTION OF CONVERSION PROBABILITY DATA IN ORDER TO PRIORITIZE LEADS.

Raw Data → **Data Exploration** → **Data Modeling** → **Lead Scoring Design**



Variables

	Variables
1	Variables
2	Prospect ID
3	Lead Number
4	Lead Origin
5	Lead Source
6	Do Not Email
7	Do Not Call
8	Converted
9	TotalVisits
10	Total Time Spent on Website
11	Page Views Per Visit
12	Last Activity
13	Country
14	Specialization
15	How did you hear about Data
16	What is your current occupation
17	What matters most to you in choosing this course

Profile Data

Customer Profile = FIT

- Specialization/Current Occupation
- Country/city
- What matters most to you in choosing this course
- .....

Behavior Data

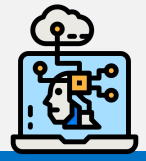
Customer behavior = PAIN

Product Engagement

- Total Visits
- Page Views Per Visit
- Last Notable Activity
- .....

Non-Product Engagement

- Receive More Updates About Our Courses
- Update me on DS Content
- Free copy
- .....



Classification

Predict the probability of conversion

- CatBoost
- Random Forest
- XGBoost
- Logistic Regression

Lead Buckets

Use numerical values to assign a score to each lead and then categorize leads into four lead buckets according to their score.

HOT	77-100
WARM	51-76
COOL	25-50
COLD	below 25

SDR: Sales Development Representative

2.1 CURRENT SITUATION - OVERVIEW

Total Leads: 9,240

5679 (61.5%) non-converted	3561 (38.5%) converted

Website Analytics

Average Total Visits	Average Total Time	Average Pages Per Visit
3.2	479 =8 min	2.3

Lead Origin/Source/Quality

Lead Origin	No	Yes
Landing Page Submit	3,118	1,768
API	2,465	1,115
Lead Add Form	54	664

Lead Source	No	Yes
Google	1,726	1,147
Direct Traffic	1,725	818
Olark Chat	1,307	448
Organic Search	718	436

Lead Quality	No	Yes
Others	3,743	1,024
Might be	381	1,179
Not Sure	826	266
High in Relevance	34	603
Worst	589	12

Tags

Tags	No	Yes
Will revert after reading email	65	2,007
Ringing	1,169	34
Current Student ⇨	566	13
Insterested	506	20
No Response	347	112
Closed by Horizzon	2	356
Lost	11	171
invalid number or not provided	156	1
Not doing further education ⇨	144	1
Interested in full time MBA ⇨	114	3
Diploma holder (Not Eligible) ⇨	62	1
Have Question	11	3

**Yes: number of converted leads. No: number of unconverted leads.*
Tables are descending by the total number of leads.

Findings:

1. Generally, the company has decent conversion rates, and the website has high levels of user engagement.
2. Most leads filled up the form through Landing Page submission and API.
3. Google Ads was the strongest lead source, but more leads came from Direct Traffic, Olark Chat, and Organic search (combined).
4. Overall, the leads reacted positively to selling pitches. Almost all leads contacted by email were converted – indicating email may be an effective channel.
5. Especially, a lot of leads tagged with diploma information (see red arrow) are not converted. Based on educated guess, the reason of tagging that information can be this company not only sells data science courses (low cost) but also offer diploma-related program (high cost), just like Coursera does.
   => important assumption for further analysis

2.2 CURRENT SITUATION - CUSTOMER PROFILE

Occupation

	No	Yes
Unemployed	3,159	2,441
Working Professional	59	647
Student	132	78
Housewife		10
Businessman	3	5

Specialization

	No	Yes
Finance Management	540	436
HR Management	460	388
Marketing Management	430	408
Operations Management	265	238
Business Administration	224	179
IT Projects Management	226	140
Supply Chain Managem..	198	151
Banking, Investment An..	171	167
Media and Advertising	118	85
Travel and Tourism	131	72
International Business	114	64

Findings:

1. More than half of the leads were unemployed. It is possible that leads' motivation to study is to land a job.

2. Almost all working professionals were converted. Since working professionals tend to have higher purchasing powers, we may need to involve more working professional customers.

3. Most specializations were related to business/management. It is possible that leads want to study DS courses associated with business.

Location

TOP 1
Country: India
Count of City: 4,374

TOP 2
Country: United States
Count of City: 45

TOP 3
Country: United Arab Emirates
Count of City: 25

City	
Mumbai	3,222
Thane & Outskirts	752
Cities of Maharashtra	457
Metro Cities	380
Tier II Cities	74

Findings:

1. Nearly half of the leads located in India while the rest were scattered around the world.

2. In India, 74% leads were from Mumbai. To better market the service in India, it is necessary to examine what are the factors that contributed to Mumbai's dominant market share.

2.2 CURRENT SITUATION - CUSTOMER PROFILE

Likes & Contact

What matters?	How did you hear about DS course?
Better Career Prospect 6,528 (99.97% chosen)	*TOP 1* Online Search - 808 *TOP 2* Word of Mouth - 348 *TOP3* Student of School - 310
Free copy of case study?	**Phone/Email Permission**
YES - 2,888 (35.7% converted) *NO* - 6,352 (39.8% converted)	*YES Phone* - 8,506 (35.7% converted) *YES Email* - 9,238(29% converted)

Update content/Payment Method

- No update on DS/DM content/course
- Do not agree to pay through check or credit card.

Findings:

1. Almost all leads attributed better career prospect as the reason for choosing the course. It is highly possible that career development is the main motivation for prospects to convert.

2. Most of the leads heard this company from online search while others from classmates and word-of-mouth. But we don't know the exact type of online search (organic, paid, etc.). Considering much fewer people heard the DM course from social media and advertisement, it is rather safe to say that this company needs to improve their communication strategies.

3. About 90% leads opted in phone and email communication and eventually 30% of them were converted. We need to further utilize phone and email to communicate with leads.

2.3 WHERE WE ARE – CUSTOMER BEHAVIOR

Last Activity

	No	Yes
Email Opened	2,184	1,253
SMS Sent	1,018	1,727
Olark Chat Conversation	889	84
Page Visited on Website	489	151
Converted to Lead	374	54
Email Bounced	300	26
Email Link Clicked	194	73
Form Submitted on Websi..	88	28

# of leads saw ad

DS Forums	1.00
Digital Advertisement	4.00
Magazine	0.00
Newspaper	1.00
Newspaper Article	2.00
Search	14.00

Findings:

1. As for last activity, most of the leads opened/clicked the email, sent SMS, initiated Olark chart conversation, or visited the website. We need to later examine which last activity(s) is significantly associated with conversion in order to optimize communication strategy.

2. Very few customers claimed they have seen the ad on search (result), magazine, newspaper article, data science online forums, or digital advertisement. The number of leads who saw the ad from "search" (14 leads) was much smaller than the number of leads who had Google Ads as lead source (>3000 leads). This discrepancy calls for further investigation

Lead Source	No	Yes
Google	1,726	1,147

Contradicts

KEY TAKEAWAYS

- The company offers data science courses (low cost) and diploma-related program (high cost).
- Key motivation to study online courses is landing a job/career development. It is possible that working professionals have the strongest purchase power.
- Except for Google Ads, the overall advertising performed poorly.
- Email and phone call are effective communication tools to nurture leads.
- Main business market is in India and Mumbai.
- Last activity seems to be highly correlated with conversion.

3.1 MODEL SELECTION STRATEGY

HOW TO SELECT MODELS AND MAKE STRATEGY TO MEET THE CURRENT BUSINESS NEEDS?

PERFORMANCE VS INTERPRETABILITY

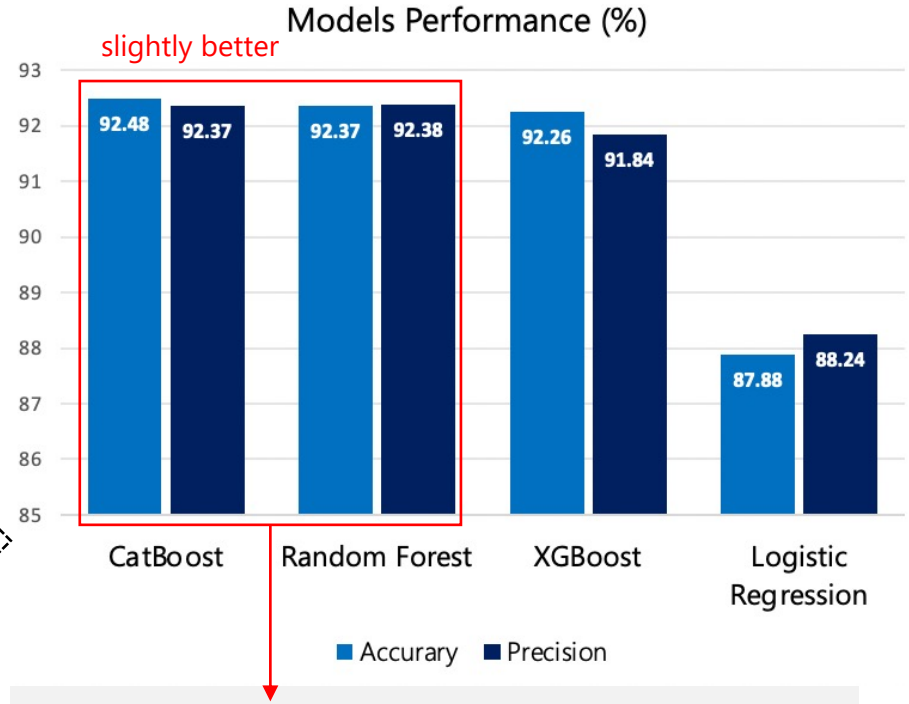
Generally, more complex models like XGBoost tend to have **better performance but less interpretability** while the relatively simple models, like logistics regression, are the other way around.

⊕

CURRENT SALES OBJECTIVE

- Diploma-related program √
  - Price: high cost
  - How to convert: sales involved
- Data science course – *not current objective**
  - Price: Low cost
  - How to convert: drip emails

- Find a balance between performance and interpretability.
- To not waste any sales resources, we prefer a classifier that rejects many good leads (relatively low recall) but keeps only the true hot leads (high precision). In this sense, we prefer use accuracy and precision as main metrics to evaluate model performance.



After Applying K-fold Cross Validation

CatBoost:
Accuracy: 92.98 %, Standard Deviation: 0.84 %

Random Forest:
Accuracy: 92.59 %, Standard Deviation: 0.85 %

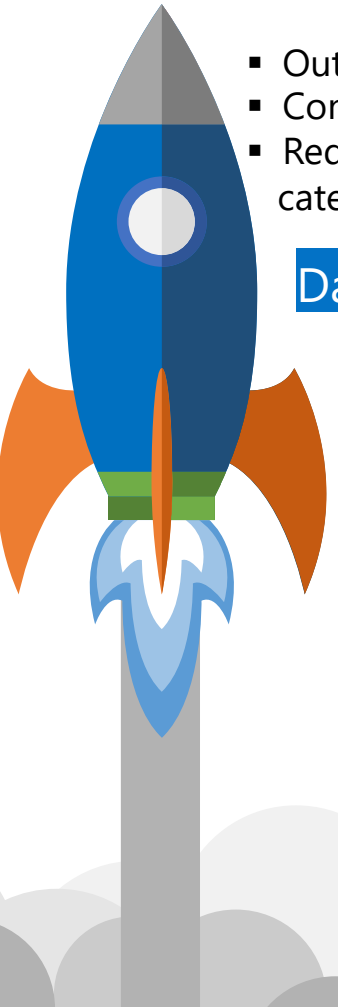
CatBoost Wins!

** This is an assumption that I made. In real business situation, I will confirm with the marketing/sales team.*

3.2 BEST MODEL - CATBOOST

Data Cleaning

- NA value/Select -> mean value/"Others"
- Put new label with few results
  => avoid shift between train and test data
- Outliers ->95% quantile value
- Convert variable to factor
- Reduce redundancy by merging similar categories



Data Processing

- One-Hot Encoding
- Data Splitting
- Feature Scaling

Data Modeling

- Grid Search
  =>Find the best parameters
  No need for CatBoost
- Model Building
- K-Fold Validation

multiplied by 100

	Converted	Prediction Class	Conversion Probability	Lead Score	Lead Buckets
1828	0	0	0.04	4	Cold
1829	0	0	0.01	1	Cold
1830	0	0	0.01	1	Cold
1831	0	0	0.00	0	Cold
1832	1	1	0.94	94	Hot
1833	0	0	0.18	18	Cold
1834	0	0	0.01	1	Cold
1835	0	0	0.07	7	Cold
1836	0	0	0.01	1	Cold
1837	1	1	0.72	72	Warm
1838	1	1	0.98	98	Hot

CatBoost Advantages

- Great quality without parameter tuning
- Reduce overfitting

Performance

- Accuracy = 92.4784%
- Precision = 92.3685%, Recall = 91.6803%
- F1 = 91.9975%

Confusion Matrix

True Label \ Predicted Label	0	1
0	**1081**	84
1	55	**628**

3.2 MODEL IMPLICATION - LOGISTIC REGRESSION

```
logit(p) = +3.76*Tags_Lost
           +3.53*Tags_Will revert after reading the email
           +2.41*Last Activity_SMS Sent
           +1.96*CurrentOccupation_Working Professional
           +1.21*Last Activity_Email Opened
           +0.97*Last Activity_Email Link Clicked
           +0.92*TotalTime
           +0.83*Lead Quality_Low in Relevance
           +0.64*Last Activity_Page Visited on Website
           -0.31*TotalVisits
           -0.34*Lead Source_Google
           -0.78*Tags_No Response
           -2.13*Tags_Current Student
           -2.51*Tags_Insterested
           -2.91*Lead Quality_Worst
           -3.23*Tags_Interested in full time MBA
           -3.50*Tags_Ringing
           -19.64
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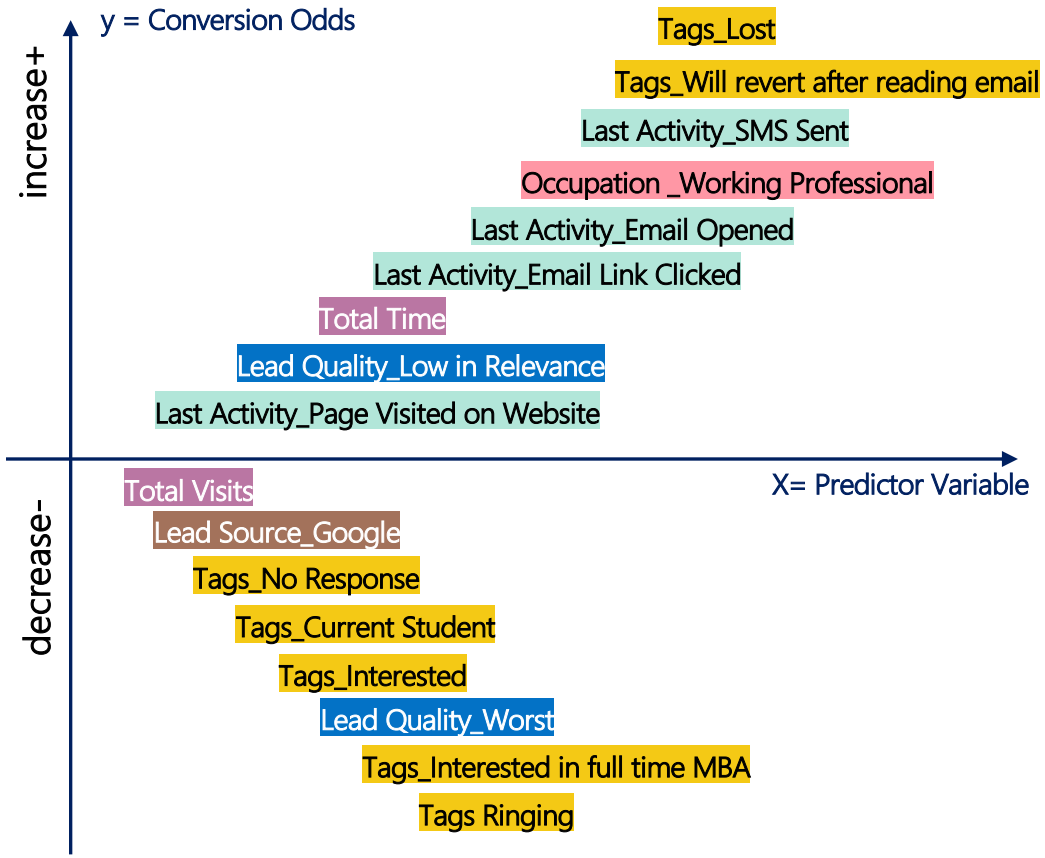
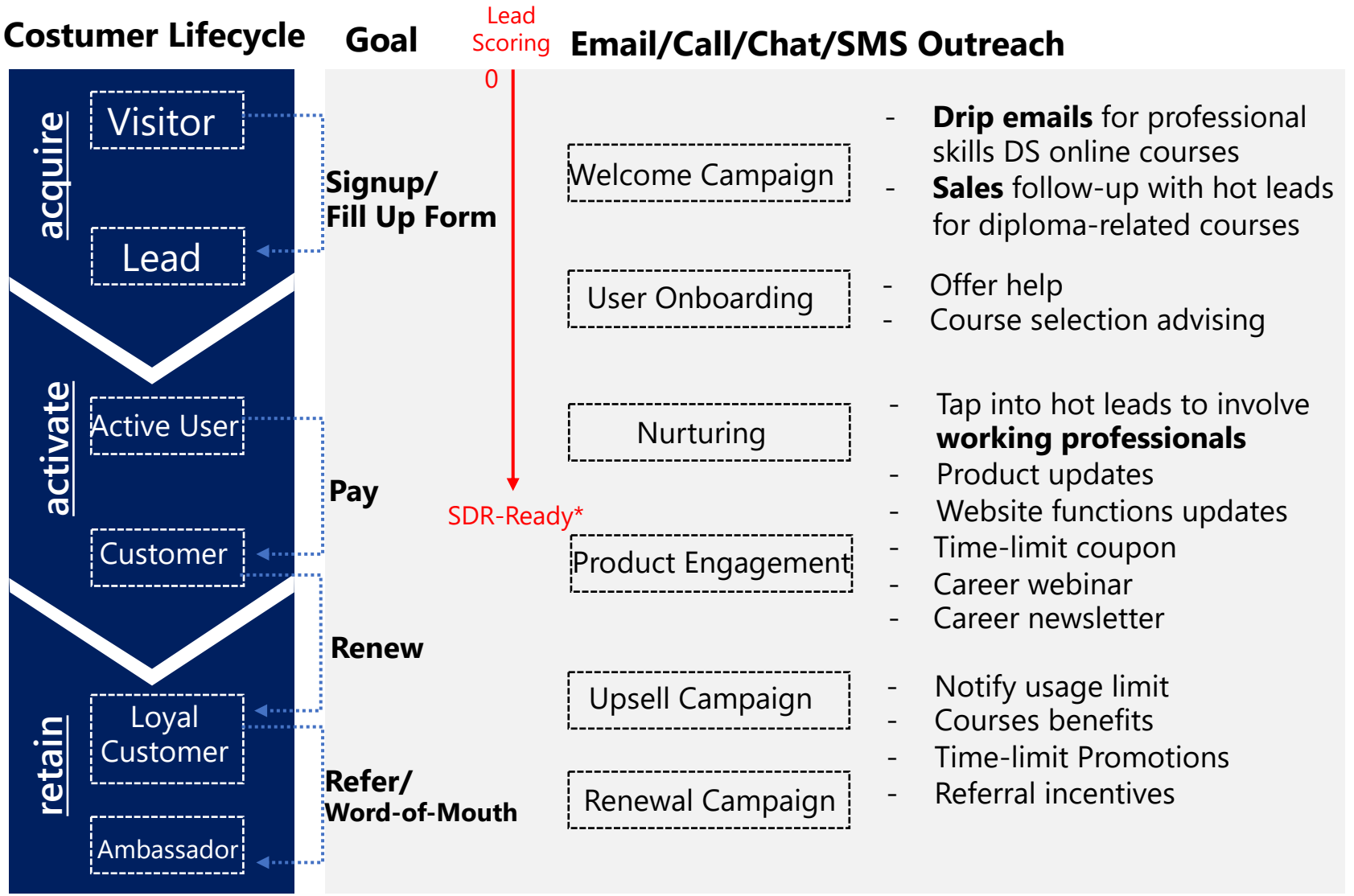


The coefficients show the change in log(odds) in conversion, for a unit change in the predictor variable, holding all other predictor variables constant.

- Roughly speaking, for occupation, working professional is positively associated with conversion.
- For last activity, leads who sent SMS, opened/clicked Email, or visited website pages are positively related with conversion.
- Tags with education info are all negatively related with conversion. It implies that **Diploma-related program didn't sell well.**
- Lead quality label correctly reflects conversion.
- Leads tend to convert when they spend more time on website while total visits are not necessarily the case.

4.1 MARKETING/SALES STRATEGIES



Communication

#Career-oriented
- Skills obtained from courses
- Course curriculum
- Payment plan
- Free trial courses

#Working skills for Next Job
- Skills obtained from courses
- Service information
- Mock interview courses

#How to survive in a changing Job Market
- Educate the importance to learn in a changing job market
- Referral promotion info

** Make sure that SDR team can effectively follow up with every lead that has reached an SDR-ready score within 48 hours.*

4.2 NEXT STEP: FOLLOW-UP WITH MARKETING/SALES TEAM

Hypothesis 1: Except for Google ads, other advertising methods did not work.

To be done:

- Figure out whether it is because the survey "How many lead had seen the ads" did not reflect the real situation or advertising outlet selection fails.
  - Check Google analytics/campaign report.
  - Check if the target audience of advertising media matches product users.

Hypothesis 2: Career development is the biggest motivation for users to purchase online courses.

To be done:

- Conduct A/B test to see how leads react to the courses with career information/or not.
- Conduct survey to collect users' needs for career related courses.

Hypothesis 3: Leads prefer low-priced professional skills online courses than diploma-related courses.

To be done:

- Figure out the reason why leads don't like diploma-related courses. Is it because of sales strategies, product design, or users' preference?

Hypothesis 4: Increase Email/SMS/Call communication frequency can enhance conversion rates.

To be done:

- Conduct A/B tests with different communication frequency to see if conversion rates differ.

FINAL THOUGHTS

- To keep the model simple and efficient, **current lead scoring system is static** based on past data on customer profile, action, and other features. **We can make lead scoring dynamic** by constantly scoring leads with new data and improve its accuracy.

- We should always keep in mind that the **main goal of building a lead scoring system is to prioritize sales resources** and therefore sales can allocate their capacity effectively to convert leads.
  - If the course price is not high enough to warrant in-person sales pitches, **email could be a better cost-effective communication channel.**
  - This company's business model decides how much efforts we should put into improving accuracy and timeliness for the lead scoring system and therefore making it cost-efficient.

THANK YOU. MERCI. GRACIAS. VIELEN DANK. 谢谢!

“A STORYTELLER WITH INTELLECTUAL CURIOSITY ABOUT DATA AND CONSUMER BEHAVIOR.”

-HUAN DENG