**Marketing Sciences Analytics Test**

Updated: March 2018

# Challenge # 1: Statistical Modeling

# OBJECTIVE

The purpose of this test is to assess candidates’ analytical and modeling skills via a typical dataset we are dealing with in Marketing Science team. Based on the below dataset, please answer the following questions:

* Which media channel(s) are contributing to the growth of KPI?
* What is the cost efficiency for each media channel?
* What is the strategy to optimize media allocation for a given budget based on learnings from the model?

Please send back your model code (e.g. in R and/or Python etc.) and a report (could be pdf/word document/html) less than 6 pages.

**TIPS**

* Build a statistical model to fit KPI as a function of marketing input variables.
* Please be mindful that advertising is known to have lag effects (e.g. today’s advertising may influence tomorrow’s KPI).
* You should inspect your data set and conduct preliminary analysis for your inputs.
* You may decide to use spend and/or impression as explanatory variables.
* You may add additional publicly available explanatory variables.
* Conduct model diagnostics.
* Report parameter estimates and significant levels.

# DATA DESCRIPTION

Attached is a data set (data.csv) containing daily KPI and daily marketing spend/impressions in a variety of media channels. Data Descriptions are tabulated in the following figure. There is also an Appendix available at the end for a more thoroughly description of media channels.

|  |  |
| --- | --- |
| **Variables** | **Description** |
| date | Date Variable |
| KPI | Key Performance Indicator |
| GDN\_Spend | Google Display Spend |
| GDN\_IMP | Google Display Impression  Facebook Spend |
| FB\_Spend |
| FB\_IMP | Facebook Impression |
| Google\_nonbrand\_Spend | Google Non Branded Search Spend  Google Non Branded Search Impression |
| Google\_nonbrand\_IMP |
| Google\_nonbrand\_e\_Spend | Google Non Branded Search Extra Spend |
| Google\_nonbrand\_e\_IMP | Google Non Branded Search Extra Impression |
| Google\_brand\_spend | Google Branded Search Spend |
| Google\_brand\_imp | Google Branded Search Impression |
| YT\_Spend | YouTube Spend |
| YT\_IMP | YouTube Impression |
| radio\_spend | Radio Spend  Radio Impression  TV 60s Impression |
| radio\_imp |
| tv60\_imp |
| tv30\_imp | TV 30s Impression  TV 15s Impression  TV 60s Impression |
| tv15\_imp |
| tv60\_spend |
| tv30\_spend | TV 30s Impression |
| tv15\_spend | TV 15s Impression |

Note:

Impressions = the total number of persons exposed to your ad, typically expressed in (000)s.

Each media type has a unique role in communicating a brand’s message and should be considered based on providing optimal support of a brand’s marketing objectives. Certain types of media are more effective than others in communicating a brand’s message (see Appendix section).

# Challenge # 2: Arithmetic

# OBJECTIVE

The purpose of this challenge is to test candidates’ basic knowledge of Bayesian statistics and arithmetic skills. Using the data set provided, please write your own Bayesian algorithm to categorize map\_publisher to channel for the given dataset.

Please send back your R code and a brief description (less than 100 word) of your method.

# DATA DESCRIPTION

Attached (publisher\_channel\_mapping.csv) is a synthetic data set. Data Descriptions are tabulated in the following figure.

|  |  |
| --- | --- |
| **Variables** | **Description** |
| Map\_publisher | Actual meida publisher |
| Channel | Channel that a pulisher is mapped to |

# APPENDIX

Media Channel Introduction

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Medium** | **Description** | **Strengths** | | |  | **Weaknesses** | | |
| National  Television | Effectively communicates brand’s product message through sight/sound/motion | * Efficient CPM * High impact/reach   relative to other media   * Equitable DMA coverage * Standard :30s unit but can purchase :15s or :60s | | |  | * High out-of-pocket cost * Limited targeting due to mass reach * Local Cable does not include   satellite homes   * High production   costs | | |
| Radio | Offers localized support to nationalized efforts; can be purchased nationally, locally, or via satellite | * Reaches consumers outside the home * Builds frequency   efficiently   * Longer :60s unit * Synergistic with TV * Target by radio format/ station * Low production costs | | |  | * No visual, audio only * Cluttered; Low message recall;   less responsive medium | | |
| Digital | Extends brand exposure to the core target | | • •  • | Pull vs. Push  Provides unique opportunities for  brand engagement Creative can be  display, video, or  custom | | | •  • | Difficult to build reach; inverse relationship to TV Cluttered; shares page with other ads |
| Out-of-  Home | Reaches consumers “on-thego”; typically used to extend reach in local market | | • •  • | Geo-targeted  Builds awareness inmarket Various venues/creative units can be used to create impact | | | •  •  • | Long production lead times Short exposure; minimum onemonth  High out-of-pocket cost |
|  |  | |  |  | | | • | Limited measurability |
| Magazine | Ability to align brand message in relevant contextual environment | | • •  • | Targeted Reaches light TV viewers  Added value opportunities | | | •  • | Long shelf life; slow reach build Long creative lead times |
| Newspaper | Delivers immediate reach; can be purchased nationally or locally | | •  • | Long copy  Immediacy | | | •  • | Limited audience  selection Declining readership |