Data Science in Marketing

Data science enables you to take information that has been captured, reprocess it and present it in such a way as to facilitate decision making.

Anything we do digitally gets tracked. For example, if we are reading on kindle or taking a Udemy course the server knows what we read and what we don't read. This can affect payment to the course supplier but it allows us to change the font size etc on the kindle because it is data rather than text.

We are all familiar with what can be tracked on a computer interacting with the web but mobile phones add an extra dimension because they have also had the following sensors built into them

- GPS sensor – so it knows where you are
- Accelerometer sensor – so fitness and pedometer apps work
- Gyroscope
- Proximity sensor – so that beacons work
- Ambient sensor – for temperature etc.
- NFC sensor to allow you to exchange money

All this data can be captured and managed.

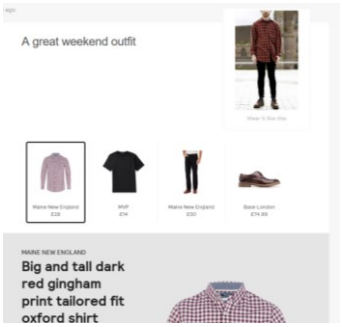
However, Data is not enough you have to engage with the customer – who they think they are, what they want to be, what your product does for their lives, dreams and fantasies. And the more you can embed what your product does or *can be made to do* into the stuff of their dreams the more likely you are to be successful.

The future of marketing is bound up with achieving this end and creating mechanisms whereby individuals feel comfortably bartering bits of their information in exchange for products and services that support their lifestyle. Nike Plus and Fitbit are well known and successful examples of this. An excellent theoretical treatment of these issues particularly as they concern the internet of things can be found in "Creating New Markets in the Digital Economy" by Irene Ng and I recommend it to you.

The other side of this equation lies in the growing perception that by 2020 interruption marketing will be dead. The work of GDPR in this direction will be completed by the sheer resistance from the customers. They will only buy from companies they approve of – unless of course there is an effective monopoly – and if expectations are not met, viral retaliation will be the order of the day.

Marketing as a separate discipline will undergo a sea change driven by this. Borek and Reinold in their book "Marketing with smart Machines" foresee a world where the Marketer works with a Creative director, a head of offers, a head of algorithms and a head of customer experience.

Some of the trends they foresee include



- Value lying in the IP of artificially intelligent algorithms
- The ability of machines to communicate and learn from each other
- Working with artificially intelligent advisers – for instance Kasia at Thread.com who suggests clothes specifically to suit me.
    -
- The 4 Ps will morph into
    - Products will include customised wraps as standard – as per Irene Ng
    - Place will be anywhere the customer is – the mobile IS the market
    - Price will vary in real time depending on the customer's situation
    - Promotions will become fully automated 1 to 1 experiences
- Customers will get contextualised personal experiences
- Next year 20% of web content will be machine authored
    - I've been using paper.LI to create a daily paper based on links tweeted by subject experts for 5 years
- Smart machines are taught and given context. Then they teach themselves or learn from their experiences
- Machines will give a statistical probability on whatever they suggest.

So, for the marketer of the future, statistics will be a core competency. Plus a working knowledge of the main machine learning tools – random forests, neural nets and the practical end of how these are used in the major tools like google analytics, Facebook etc

They will also need to decide what are sensible "key fields" on which to base the merging of disparate data set or at least how to manage the "advice" the machines might give them about this.

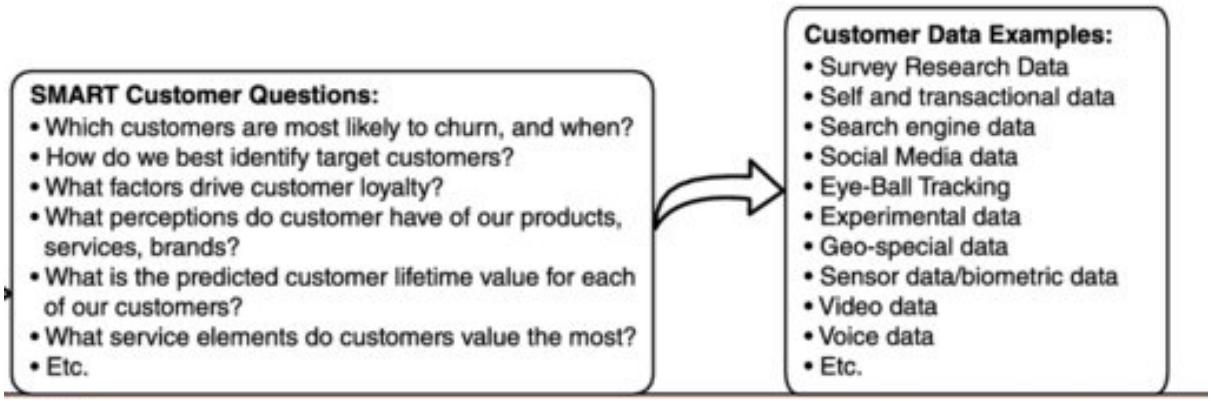
Finally they will need a working knowledge of how smart machines are trained

In short they need to think like google, amazon, Facebook etc

Types of data

Data can be internal or external to the organisation and structured, semi structured and unstructured. The datafication of electronic text means that techniques like scraping are practicable. Data can be created, provoked, or compiled. It can come from experiments, be captured, be transactional or user generated.

Here are some examples of smart customer related questions.



Data then must be analysed and presented – as charts, graphs, tables, images – in such a way as to facilitate understanding.

The tools for this are explored in detail in our main Data Science Course - details here.

In practice you have two types of data available to you

- Inferential aggregated data – anonymised and incomplete – like what you get from google analytics
- Actual data you have from your own customer / service database

Your task is to try and marry the two and create the basic evidence to act to improve the performance of the business.

Introduction to Machine Learning

What is Machine Learning?

Machine learning uses a set to tools and algorithms to make connections between individuals and their behaviours. These routines can be TRAINED to look for predictive clusters of behaviour. So here is a brief introduction to machine learning ideas.

We can infer by analysis of the data that individual A – let's call him Alfred – has sufficient correlating indicators in his behaviour that he is likely to carry on buying from us. Individual B – let's call her Barbara – displays correlations which suggest she is more likely to churn, to move to another company's offers.

Minimizing churn is a key way of maximising the long-term shareholder value of an organisation. This suggests two possible routes forward for action

1. Alter our marketing narratives and activities to attract more Alfred's.
2. Identify offers that overcome Barbara's tendency to churn

Or of course both.

Churn is one of the areas that we will be looking at in this course and we will explore how the process of CLASSIFICATION can help us here.

So, what is machine learning?

This brief introduction to machine learning covers the following points

- Customer segmentation **clusters** your customers so you can identify groups and see how similar customers behave
- Churn prediction compares your subscribers/customers to previous ones, and detects who is about to leave by **classifying** them.
- Prediction is often carried out by using **Regression** techniques which use mathematical floating-point formulas instead of Boolean operators (AND, OR etc). For example, I once created a regression model to predict steel demand in the UK economy. It was based on historical data of the 4 biggest consuming sectors (construction, motors etc) and import and export data. If you entered assumptions for the independent variables it would tell you what the demand for steel would be.
- **Rule extraction.** The search for patterns in data. A good topical example of this is the success of the Brexit and Trump campaigns which used Social Media to identify potential supporters. They were then selectively advertised to with material that appealed to their core motivations. During the course we shall explore how businesses can take advantage of such algorithmic use of big data to expand their advertising target market.

Machine Learning Applications

Typical Machine Learning Applications

Getting to grips with big data means letting the machine take the strain using the following machine learning applications.

1. Decision Trees
2. Cluster Analysis
3. Support Vector Machines
4. Facebook's ability to identify target populations

What is a decision tree?

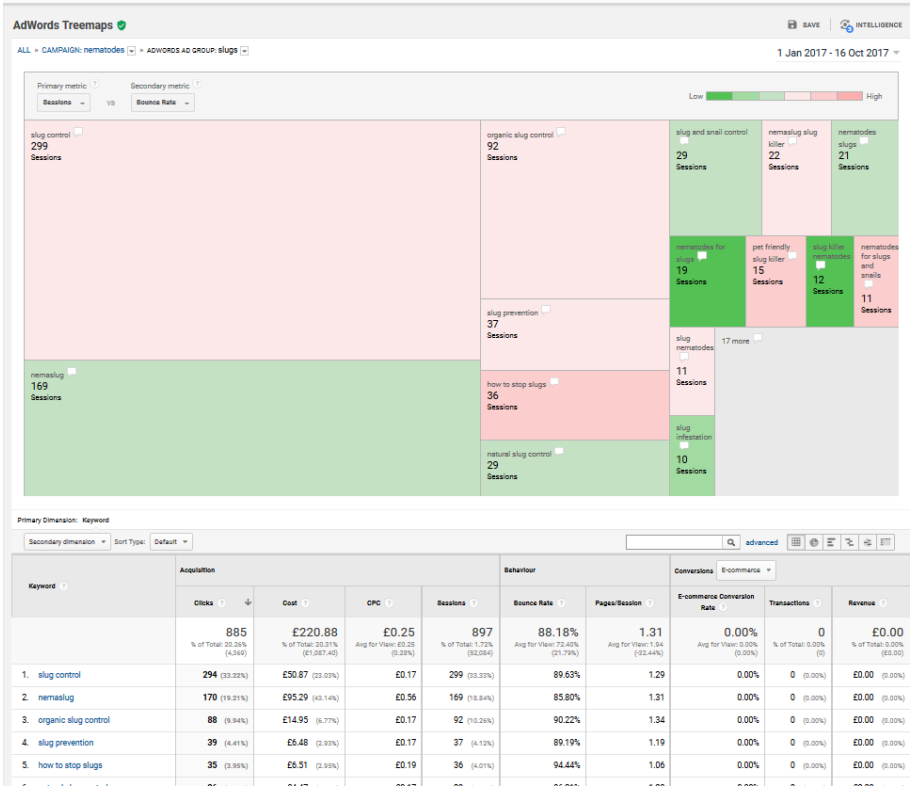
You can use this technique for classification but also for regression analysis. It effectively takes your data and splits it according to criteria that you choose. Once the algorithm is trained it will assign a new example to a category based on the previous sample. So, for example if we know that 240 out of 245 previous sign ups returned to the site, then we can predict that the next signee will also return to the site.

Decision trees are used for reporting in a couple of places in Google Analytics.

Here is an example analysing Adwords frequency to our ladybirdplantcare.co.uk site.

It's also used to help analyse the split between organic, paid and direct traffic to the site within Google Analytics.

Its capable of giving some good insights into how the customers think and talk about the products and can be used in conjunction with tools like spyfu.com to compare our activities with the competition.

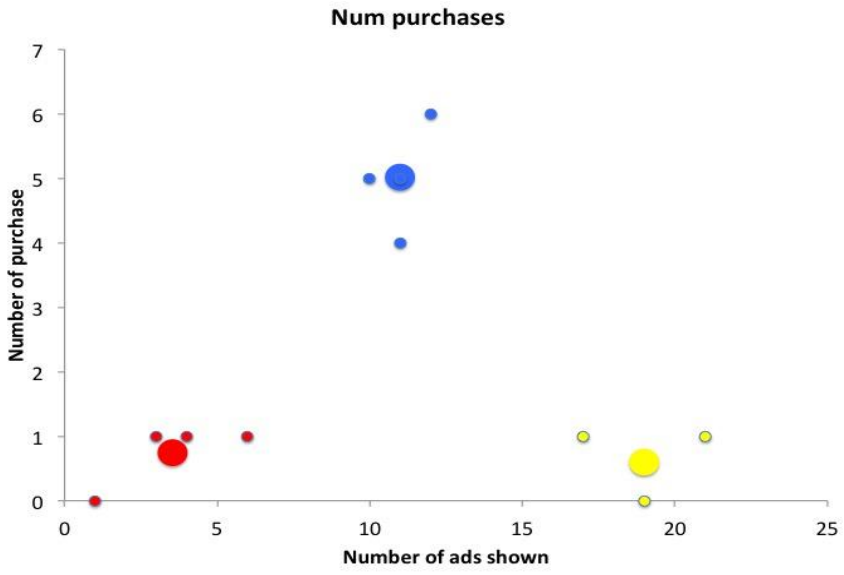


Keyword	Clicks	Cost	CPC	Sessions	Bounce Rate	Pages/Session	E-commerce Conversion Rate	Transactions	Revenue
	885	£220.88	£0.25	897	88.18%	1.31	0.00%	0	£0.00
1. slug control	294	£50.87	£0.17	299	89.63%	1.29	0.00%	0	£0.00
2. nemaslug	170	£95.29	£0.56	169	85.80%	1.31	0.00%	0	£0.00
3. organic slug control	88	£14.95	£0.17	92	90.22%	1.34	0.00%	0	£0.00
4. slug prevention	39	£6.48	£0.17	37	89.19%	1.19	0.00%	0	£0.00
5. how to stop slugs	35	£6.51	£0.19	36	94.44%	1.06	0.00%	0	£0.00

While this is still inferential it can give us some valuable pointers.

What is cluster analysis

It's a means of classifying data. K-means clustering means that you assign a certain number of preselected mean positions in the data environment and the machine builds and existing map of these in phase space and then allocates the incoming population to the appropriate cluster locus. We might for instance be measuring number of purchases against advertisement exposure.

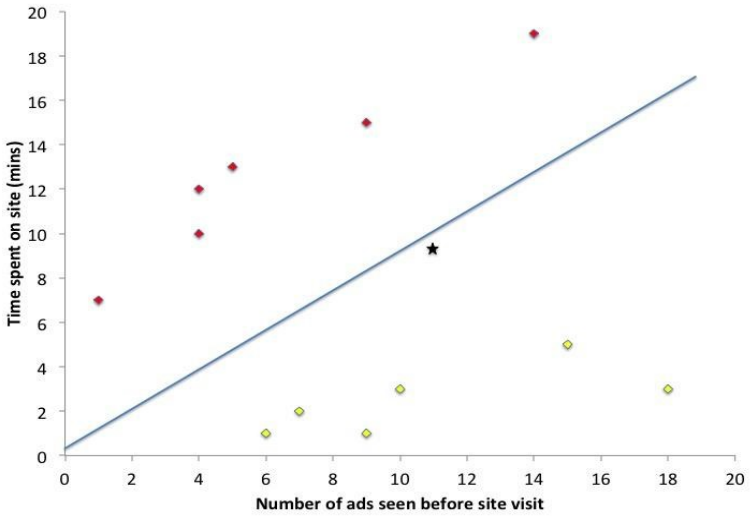


The algorithm assigns points to the nearest centroid locus and then recalculates the centroid position. It stops once the system is at rest and voila – you have three segments with different behaviours connecting the number of purchases with the the number of times you showed the ads. If you can work out what the blue group have in common, you can then target them more effectively.

What are support Vector Machines?

Again, used for classification – the Support Vector Machine is the boundary between two classes e.g. subscribers vs non-subscribers.

If we analyse purchasers vs non- purchasers based on number of ads seen and time spent on site, we calculate the line that separates the two giving the maximum differences between the line and the point. Then when a new client arrives we can see from their behaviour which side of the line they are going to fall.

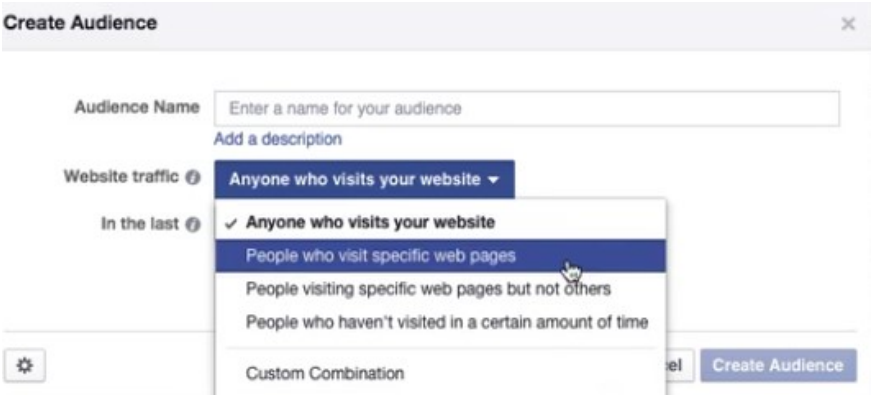


So, the red ones bought and the yellow ones didn't. The line represents the calculated boundary. We can see which side of the line the new visitor is and so can predict whether he will buy or not.

How does Facebook help you use big data?

Facebook lets you advertise to either people who have liked your page or post or to a specified group of people or characteristics. If you can supply a list of your existing customers for example or the defining characteristics in terms of interest or Facebook behaviour you can advertise to them.

You do this by creating a population that can be identified by email or mobile numbers. This could be people who've liked your page or it could be a representative sample of a market segment with which you know you have good results. Or people who have visited your site. Identified by a tracking pixel.



More importantly you can ask Facebook to identify a larger population in a given geographical area to match the characteristics of your existing population. Then you can advertise to them also.

For small organisations this is probably the best route into big data.