Digital marketing attribution modelling

IN R

Code examples: https://goo.gl/M567GT

Slides: https://goo.gl/oGpAqd

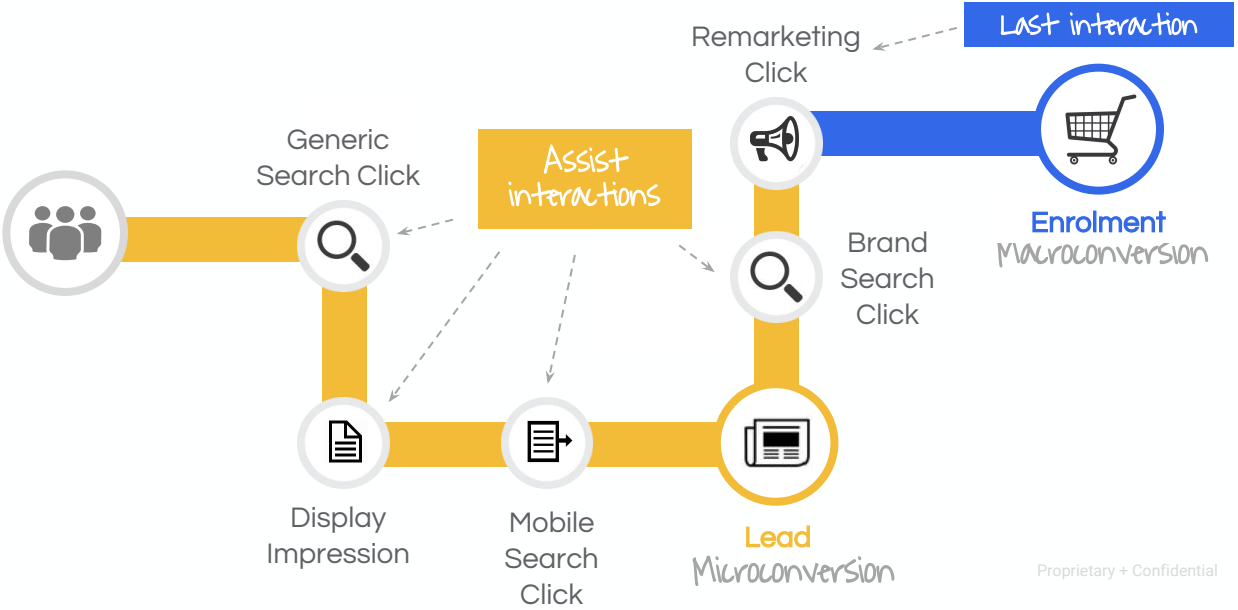
Hello!

I am Dan Booth

You can contact me at
https://www.linkedin.com/in/**danielbooth1**/

First, what is Attribution?

- In a marketing context, Attribution involves identifying **the set of user actions** ("events" or "touchpoints") that contribute in some manner to a **desired outcome**



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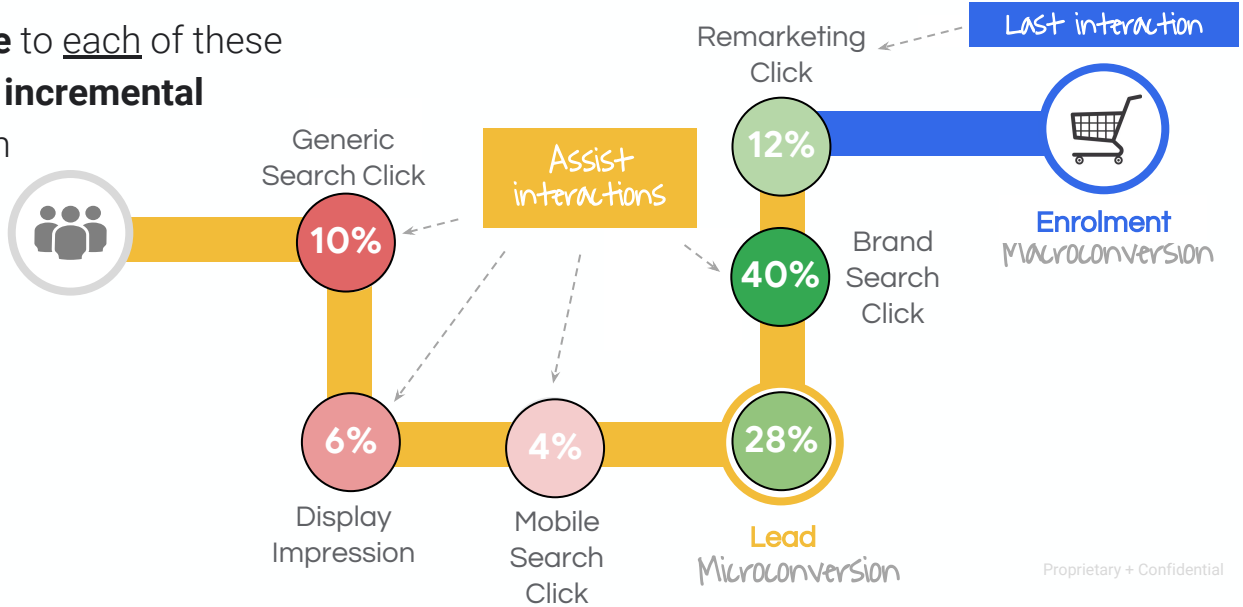
First, what is Attribution?

- In a marketing context, Attribution involves identifying **the set of user actions** ("events" or "touchpoints") that contribute in some manner to a **desired outcome**
- Our goal is to **assign a value** to <u>each</u> of these touchpoints that reflects its **incremental contribution** to a conversion



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How attribution is used?

- Then we **aggregate the attributed value** across **all the customers** to get a high-level channel report like this:

Attribution Report				
channel	**DDA Attribution**	**DDA Attributed Revenue**	**Actual Spend (Ads, etc)**	**ROAS**
Direct	40,451	$2,948,878	N/A	N/A
Paid Search - Generic	28,852	$2,103,311	$1,237,242	1.70
Paid Search - Brand	10,785	$597,732	$711,585	0.84
Organic Search	25,033	$1,291,828	N/A	N/A
Email	807	$41,645	$44,303	0.94
Referral	19,803	$1,021,934	$811,059	1.26
...				

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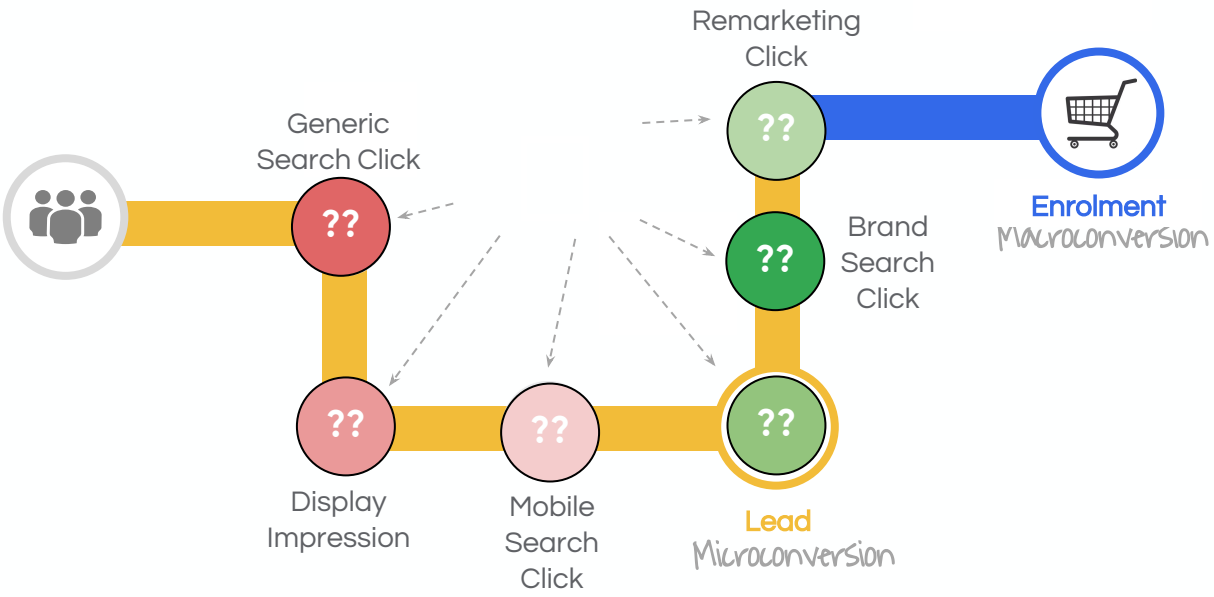
But...

How do we calculate the fractional contribution?



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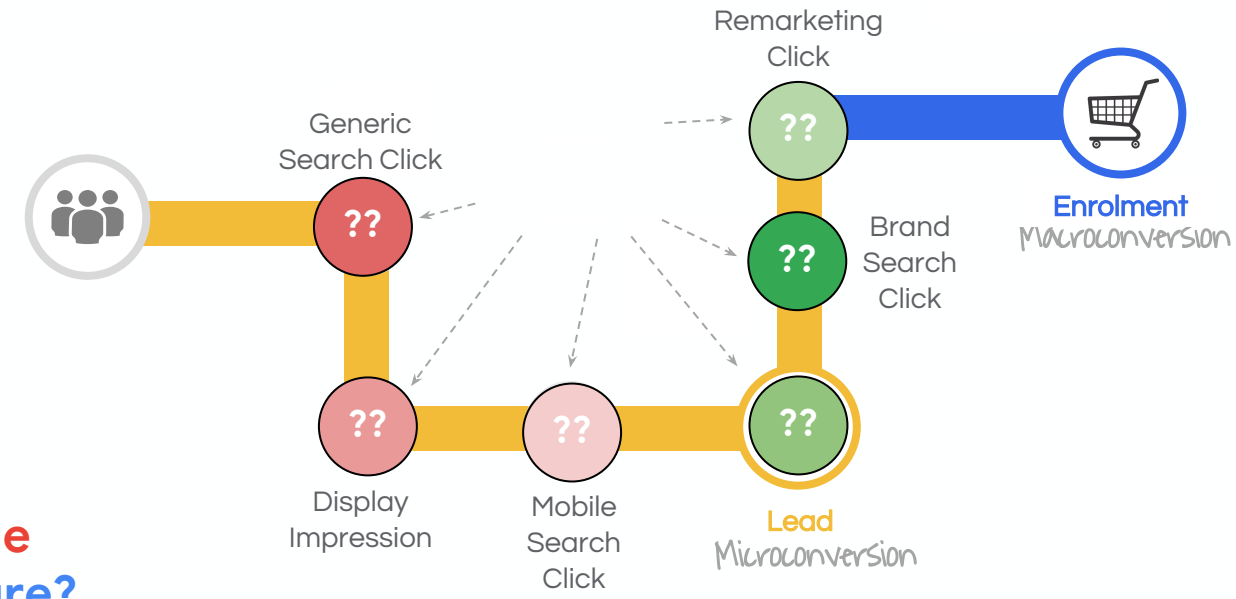
But...

How do we calculate the fractional contribution?

Where does revenue come into the picture?



Attribution Report				
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...				

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How to calculate the fractional contribution?

Rule based

- Last interaction / Last touch
- Last non-direct touch
- First interaction / First touch
- Linear
- Time decay
- Position based

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Algorithm based

- Logistic regression
- Conditional probabilistic methods
- Causal analysis
- Shapley value / Game theoretical approaches
- Survival modelling
- Hidden markov model
- Bayesian inference

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Really nice comparison paper: **Attributing Conversion Credit in an Online Environment: An Analysis and Classification** (C. H. W. Jayawardane; S. K. Halgamuge; U. Kayande | University of Melbourne).

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How to calculate the fractional contribution?

Rule based

- Last interaction / Last touch
- Last non-direct touch
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Today's focus

Algorithm based

- Logistic regression
- Conditional probabilistic methods
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How to calculate revenue?

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Most marketers are familiar with **Last touch attribution** (and other rule based approaches).

Attribution Report	
channel	**Last touch attribution**
Direct	40,951
Paid Search - Generic	20,852
Paid Search - Brand	9,785
Organic Search	26,533
Email	2807
Referral	25,803
...	

Demonstration data. Not real.

We can use a **data-driven attribution** approach to improve this.

Attribution Report		
channel	**Last touch attribution**	**DDA attribution**
Direct	40,951	40,451
Paid Search - Generic	20,852	28,852
Paid Search - Brand	9,785	10,785
Organic Search	26,533	25,033
Email	2807	807
Referral	25,803	19,803
...		

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You can assign a default conversion value to these conversions to help you **calculate revenue**.

Attribution Report			
channel	**Last touch attribution**	**DDA attribution**	**Attributed Revenue**
Direct	40,951	40,451	$2,588,864
Paid Search - Generic	20,852	28,852	$1,846,528
Paid Search - Brand	9,785	10,785	$690,240
Organic Search	26,533	25,033	$1,602,112
Email	2807	807	$51,648
Referral	25,803	19,803	$1,267,392
...			

Conversion Value: $64

40,451 × $64 = $2,588,864

807 × $64 = $51,648

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We take this one step further. Where everything is user-level.

Attribution Report				
channel	DDA Attribution	DDA Attributed Revenue	Actual Spend (Ads, etc)	ROAS
Direct	40,451	$2,948,878	N/A	N/A
Paid Search - Generic	28,852	$2,103,311	$1,237,242	1.70
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Email	807	$41,645	$44,303	0.94
Referral	19,803	$1,021,934	$811,059	1.26
...				

$2,103,311
$1,237,242

= sum(direct) = 0.459 + 0.784 + 0.573 + ...

= sum(direct revenue) = $45.90 + $223.62 + $13.77 + $8.31 + ...

path	direct
Direct > Paid Search - Generic > Paid Search - Brand	0.459
Direct > Paid Search - Generic	0.784
Direct > Paid Search - Brand	0.573
...	

direct revenue
$45.90
$223.62
$13.77
$8.31
...

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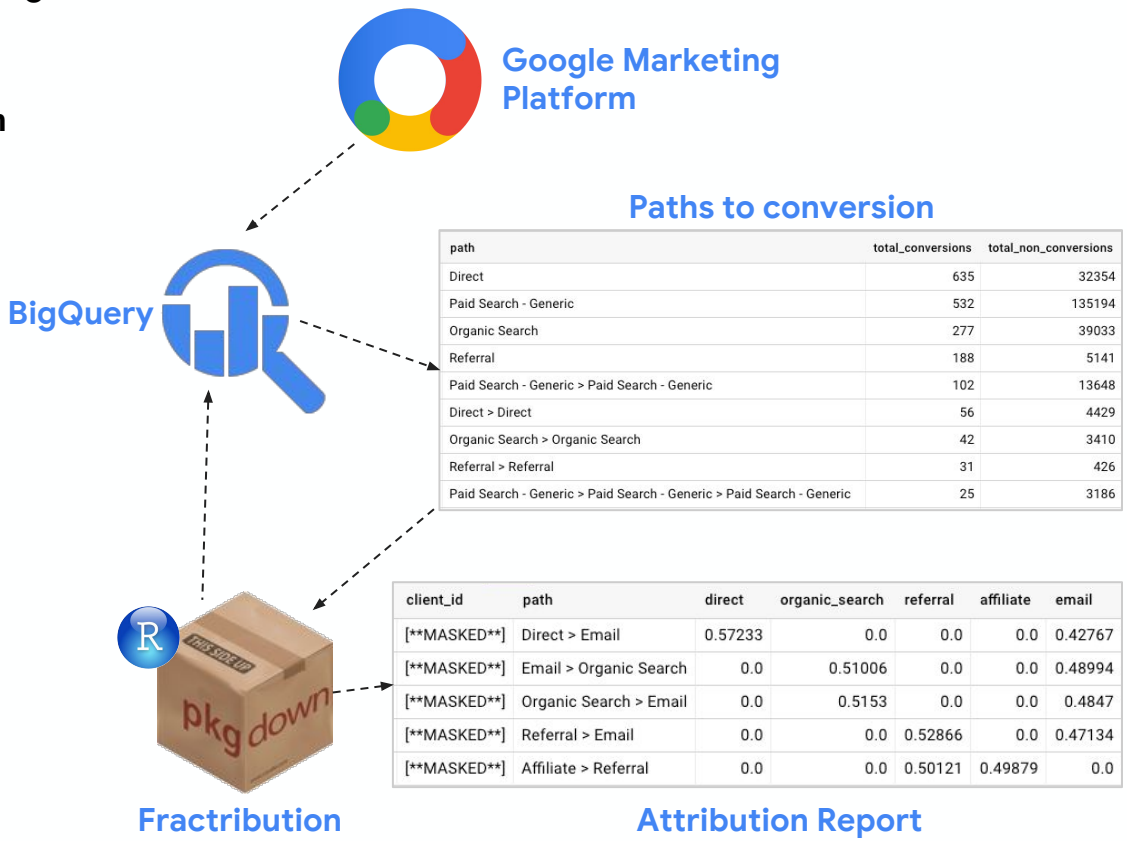
This methodology is available as an R package: Fractribution.

- An **R package** that drives an automated end-to-end **user-level fractional attribution model**.
- A **generalisable** process that can run on any **custom event log** (currently supporting GA360 sessions).
- The attribution algorithm uses a simplified **Shapley Value method**.
- It is an ideal solution for clients who find that the Data-Driven Attribution solutions built into GA360/DV360 are suboptimal for their specific use cases. E.g. regulation or data policy prevents ecommerce/revenue events being shared with GMP.



path	total_conversions	total_non_conversions
Direct	635	32354
Paid Search - Generic	532	135194
Organic Search	277	39033
Referral	188	5141
Paid Search - Generic > Paid Search - Generic	102	13648
Direct > Direct	56	4429
Organic Search > Organic Search	42	3410
Referral > Referral	31	426
Paid Search - Generic > Paid Search - Generic > Paid Search - Generic	25	3186

client_id	path	direct	organic_search	referral	affiliate	email
[**MASKED**]	Direct > Email	0.57233	0.0	0.0	0.0	0.42767
[**MASKED**]	Email > Organic Search	0.0	0.51006	0.0	0.0	0.48994
[**MASKED**]	Organic Search > Email	0.0	0.5153	0.0	0.0	0.4847
[**MASKED**]	Referral > Email	0.0	0.0	0.52866	0.0	0.47134
[**MASKED**]	Affiliate > Referral	0.0	0.0	0.50121	0.49879	0.0

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How Fractribution works?

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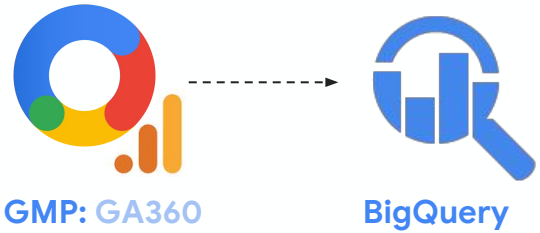
First, we need some data.

- The **BigQuery export** for Analytics 360, gives clients access to their **GA sessions data in BigQuery**. (See here for configuration details and schema).
- This dataset is super valuable for Data Science, as you are able to quickly query *all* of your Google Analytics data.



- Google have released a **sample BigQuery dataset** which contains Google Analytics 360 data from the Google Merchandise Store, a real ecommerce store. (See here for setup).
- You can explore yourself at: `bigquery-public-data.google_analytics_sample.ga_sessions_*` or visually in this data studio dashboard.

fullVisitorId	visitStartTime_utc	source	medium	device_os	geo_country	hits.hitNumber	hits.pagePath
6631067223324142886	2017-08-02 05:21:09	youtube.com	referral	Windows	Netherlands	1	/google+redesign/shop+by+brand/youtube
						2	/google+redesign/shop+by+brand/youtube
						3	/google+redesign/shop+by+brand/youtube/quickview
0045120268929000634	2017-08-01 08:13:07	youtube.com	referral	Windows	United States	1	/google+redesign/shop+by+brand/youtube
						2	/google+redesign/apparel/womens/womens+outerwear
						3	/google+redesign/apparel/womens+performance+wear
1989451073741192712	2017-08-01 19:29:03	youtube.com	referral	Windows	Russia	1	/google+redesign/shop+by+brand/youtube
						2	/google+redesign/apparel/mens
						3	/google+redesign/accessories/fun
1957458976293878100	2017-08-01 18:58:05	dfa	cpm	Windows	United States	1	/home
						2	/home
						3	/asearch.html

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fullVisitorId	visitStartTime_aest	channel
1321955548994962358	2018-03-22 21:21:41	Referral
1464282128005036096	2018-03-21 08:08:16	Paid Search - Generic
1464282128005036096	2018-03-21 08:42:47	Paid Search - Generic
1464282128005036096	2018-03-30 00:36:26	Paid Search - Generic
1464282128005036096	2018-03-30 03:51:05	Paid Search - Generic
1464282128005036096	2018-03-30 03:51:54	Referral
1464282128005036096	2018-03-30 03:56:45	Display - Prospecting
1464282128005036096	2018-03-30 11:51:41	Paid Search - Generic
1464282128005036096	2018-03-31 03:24:13	Paid Search - Generic
1464282128005036096	2018-03-31 03:55:59	Organic Search
1464282128005036096	2018-03-31 08:59:13	Unmatched Channel
1506295747200511732	2018-02-25 00:58:35	Paid Search - Generic
1506295747200511732	2018-03-02 11:57:42	Paid Search - Brand
1506295747200511732	2018-03-02 12:37:17	Paid Search - Brand
1506295747200511732	2018-03-03 07:30:29	Display - Retargeting
1506295747200511732	2018-03-03 08:09:15	Display - Retargeting
1506295747200511732	2018-03-03 12:10:07	Display - Retargeting
1632881112157734750	2018-03-04 12:09:49	Direct
1632881112157734750	2018-03-04 12:54:49	Paid Search - Generic
1632881112157734750	2018-03-04 13:05:36	Paid Search - Brand

1 Session event log

Demonstration data. Not real.

1 Session event log

fullVisitorId	visitStartTime_aest	channel
1321955548994962358	2018-03-22 21:21:41	Referral
1464282128005036096	2018-03-21 08:08:16	Paid Search - Generic
1464282128005036096	2018-03-21 08:42:47	Paid Search - Generic
1464282128005036096	2018-03-30 00:36:26	Paid Search - Generic
1464282128005036096	2018-03-30 03:51:05	Paid Search - Generic
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1506295747200511732	2018-03-03 12:10:07	Display - Retargeting
1632881112157734750	2018-03-04 12:09:49	Direct
1632881112157734750	2018-03-04 12:54:49	Paid Search - Generic
1632881112157734750	2018-03-04 13:05:36	Paid Search - Brand

We see each visitor's sequence of events during some defined reporting window (here it's 22 Feb to 31 Mar 2018)

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1 Session event log

fullVisitorId	visitStartTime_aest	channel
1321955548994962358	2018-03-22 21:21:41	Referral
1464282128005036096	2018-03-21 08:08:16	Paid Search - Generic
1464282128005036096	2018-03-21 08:42:47	Paid Search - Generic
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1632881112157734750	2018-03-04 12:54:49	Paid Search - Generic
1632881112157734750	2018-03-04 13:05:36	Paid Search - Brand

2 Target endpoints

fullVisitorId	registration_time_aest
1464282128005036096	2018-03-31 04:05:27
1506295747200511732	2018-03-03 07:34:01
1632881112157734750	2018-03-04 13:33:46

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1 Session event log

fullVisitorId	visitStartTime_aest	channel
1321955548994962358	2018-03-22 21:21:41	Referral
1464282128005036096	2018-03-21 08:08:16	Paid Search - Generic
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1632881112157734750	2018-03-04 12:54:49	Paid Search - Generic
1632881112157734750	2018-03-04 13:05:36	Paid Search - Brand

3 Join to find each endpoint position

2 Target endpoints

fullVisitorId	registration_time_aest
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1506295747200511732	2018-03-03 07:34:01
1632881112157734750	2018-03-04 13:33:46

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4 Collect events within a lookback window

1 Session event log

full[illegible]Id		
132[illegible]54		
146428212[illegible]	[illegible]	[illegible] - Generic
1464282128005036096	2018-03-21 08:42:47	Paid Search - Generic
1464282128005036096	2018-03-30 00:36:26	Paid Search - Generic
1464282128005036096	2018-03-30 03:51:05	Paid Search - Generic
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7 days

7 days

7 days

3 Join to find each endpoint position

2 Target endpoints

fullVisitorId	registration_time_aest
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1506295747200511732	2018-03-03 07:34:01
1632881112157734750	2018-03-04 13:33:46

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4

Collect events within a lookback window

1464282128005036096	2018-03-21 08:42:47	Paid Search - Generic
1464282128005036096	2018-03-30 00:36:26	Paid Search - Generic
1464282128005036096	2018-03-30 03:51:05	Paid Search - Generic
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1632881112157734750	2018-03-04 13:05:36	Paid Search - Brand

7 days

7 days

7 days

These are now your **paths to conversion**

Paid Search - Generic > Paid Search - Generic > Referral > Display - Prospecting > Paid Search - Generic > Paid Search - Generic > Organic Search

Paid Search - Generic > Paid Search - Brand > Paid Search - Brand > Display - Retargeting

Direct > Paid Search - Generic > Paid Search - Brand

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fullVisitorId	visitStartTime_aest	channel
1321955548994962358	2018-03-22 21:21:41	Referral

[redacted]

5 Filter the session event log to just non-converting visitors

fullVisitorId	visitStartTime_aest	channel
1321955548994962358	2018-03-22 21:21:41	Referral
1464282128005036096	2018-03-21 08:08:16	Paid Search - Generic
1464282128005036096	2018-03-21 08:42:47	Paid Search - Generic
1464282128005036096	2018-03-30 00:36:26	Paid Search - Generic
1464282128005036096	2018-03-30 03:51:05	Paid Search - Generic
1464282128005036096	2018-03-30 03:51:54	Referral
1464282128005036096	2018-03-30 03:56:45	Display - Prospecting
1464282128005036096	2018-03-30 11:51:41	Paid Search - Generic
1464282128005036096	2018-03-31 03:24:13	Paid Search - Generic
1464282128005036096	2018-03-31 03:55:59	Organic Search
1464282128005036096	2018-03-31 08:59:13	Unmatched Channel
1506295747200511732	2018-02-25 00:58:35	Paid Search - Generic
1506295747200511732	2018-03-02 11:57:42	Paid Search - Brand
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1632881112157734750	2018-03-04 12:09:49	Direct
1632881112157734750	2018-03-04 12:54:49	Paid Search - Generic
1632881112157734750	2018-03-04 13:05:36	Paid Search - Brand

Additional non-converting visitors

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6 Construct your non-converting paths

fullVisitorId	visitStartTime_aest	channel
1321955548994962358	2018-03-22 21:21:41	Referral
1000616322209632382	2018-02-27 10:48:58	Paid Search - Brand
1000616322209632382	2018-02-27 10:49:16	Organic Search
1000598485220432643	2018-02-27 03:44:33	Paid Search - Brand
1000598485220432643	2018-03-09 07:55:53	Paid Search - Brand
1000598485220432643	2018-03-11 02:01:28	Paid Search - Brand
1000598485220432643	2018-03-12 08:08:42	Paid Search - Brand
1000598485220432643	2018-03-30 04:12:18	Paid Search - Brand
1000408875265680585	2018-02-26 21:10:24	Paid Search - Brand
1000408875265680585	2018-02-27 11:37:29	Paid Search - Brand
1000408875265680585	2018-02-28 16:37:25	Paid Search - Brand
1000408875265680585	2018-03-22 04:09:48	Paid Search - Brand
1000408875265680585	2018-03-22 07:04:10	Paid Search - Brand
1000408875265680585	2018-03-27 04:06:06	Paid Search - Brand
1000408875265680585	2018-03-29 20:52:43	Paid Search - Brand
1000201269471321813	2018-03-29 00:55:34	Email
1000201269471321813	2018-03-30 23:07:55	Email
1000185760342848879	2018-03-10 21:37:34	Referral
1000152126453468655	2018-03-05 06:50:09	Paid Search - Generic
1000088225928354082	2018-03-07 10:26:43	Organic Search

7 days

7 days

7 days

7 days

7 days

Referral

Paid Search - Brand > Organic Search

Paid Search - Brand

Paid Search - Brand > Paid Search - Brand

Email > Email

Referral

Paid Search - Generic

Organic Search

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path	total_conversions	total_non_conversions
Direct	2236	89137
Organic Search	1296	137741
Referral	1051	16372
Paid Search - Generic	863	118292
Display - Prospecting	732	129677
Paid Search - Brand	691	8537
Direct > Direct	233	10353
Organic Search > Organic Search	223	12362
Paid Search - Generic > Paid Search - Generic	147	12670
Paid Search - Brand > Paid Search - Brand	132	1397
Affiliate	123	2017
Referral > Referral	116	1146
Display - Prospecting > Display - Prospecting	74	10764
Unmatched Channel	62	8853
Direct > Referral	53	486
Direct > Direct > Direct	51	3339
Direct > Organic Search	50	1052
Organic Search > Referral	45	253
Organic Search > Paid Search - Brand	42	254
Organic Search > Organic Search > Organic Search	38	2562

7 Create the path summary table

Pull down into R

Fractribution

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8 Run the attribution algorithm to calculate fractions

Fractional Attribution							
path	**direct**	**paid_search_generic**	**paid_search_brand**	**organic_search**	**email**	**referral**	
Direct > Paid Search - Generic > Paid Search - Brand	0.459	0.174	0.367	0.0	0.0	0.0	
Direct > Paid Search - Generic	0.784	0.216	0.0	0.0	0.0	0.0	
Direct > Paid Search - Brand	0.573	0.0	0.427	0.0	0.0	0.0	
Paid Search - Generic > Paid Search - Brand	0.0	0.198	0.802	0.0	0.0	0.0	
Direct > Email	0.572	0.0	0.0	0.0	0.428	0.0	...
Email > Organic Search	0.0	0.0	0.0	0.510	0.490	0.0	
Organic Search > Email	0.0	0.0	0.0	0.515	0.485	0.0	
Referral > Email	0.0	0.0	0.0	0.0	0.471	0.529	
Display - Prospecting > Referral	0.0	0.0	0.0	0.0	0.0	0.501	
...							

etc...

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Getting to ROAS?

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1 Path to fullVisitorId mapping

Path to fullVisitorId	
path	**fullVisitorId**
Direct > Paid Search - Generic > Paid Search - Brand	2248281639583218707
Direct > Paid Search - Generic > Paid Search - Brand	8647436381089107732
Direct > Paid Search - Generic	2055839700856389632
Direct > Paid Search - Brand	0750846065342433129
Direct > Paid Search - Brand	0573427169410921198
Paid Search - Generic > Paid Search - Brand	8313021323030224050
Direct > Email	9161549067325106850
Direct > Email	7712738124831804349
Direct > Email	6644155147493409979
...	

We establish this mapping through the path summary table creation process.

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1 Path to fullVisitorId mapping

Path to fullVisitorId	
path	**fullVisitorId**
Direct > Paid Search - Generic > Paid Search - Brand	2248281639583218707
Direct > Paid Search - Generic > Paid Search - Brand	8647436381089107732
Direct > Paid Search - Generic	2055839700856389632
Direct > Paid Search - Brand	0750846065342433129
Direct > Paid Search - Brand	0573427169410921198
Paid Search - Generic > Paid Search - Brand	8313021323030224050
Direct > Email	9161549067325106850
Direct > Email	7712738124831804349
Direct > Email	6644155147493409979
...	

2 fullVisitorId to crm_id mapping

fullVisitorId to crm_id	
fullVisitorId	**crm_id**
2248281639583218707	ca978112ca1bbdcafac231b3
8647436381089107732	2e7d2c03a9507ae265ecf5b5
2055839700856389632	3f79b27b435b05321651daef
0750846065342433129	cd0aa9856147b6c5b4ff2b7d
0573427169410921198	de7d1b721a1e0632b7cf04ed
8313021323030224050	3e23e8160039594a33894f65
9161549067325106850	18ac3e7343f016890c510e93
7712738124831804349	252f10c83610ebca1a059c0b
6644155147493409979	aaa9402664f1a41f40ebbc52
...	

Note: If your session event log is keyed on the crm_id anyway, no need for this step.

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1 Path to fullVisitorId mapping

Path to fullVisitorId	
path	**fullVisitorId**
Direct > Paid Search - Generic > Paid Search - Brand	2248281639583218707
Direct > Paid Search - Generic > Paid Search - Brand	8647436381089107732
Direct > Paid Search - Generic	2055839700856389632
Direct > Paid Search - Brand	0750846065342433129
Direct > Paid Search - Brand	0573427169410921198
Paid Search - Generic > Paid Search - Brand	8313021323030224050
Direct > Email	9161549067325106850
Direct > Email	7712738124831804349
Direct > Email	6644155147493409979
...	

2 fullVisitorId to crm_id mapping

fullVisitorId to crm_id	
fullVisitorId	**crm_id**
2248281639583218707	ca978112ca1bbdcafac231b3
8647436381089107732	2e7d2c03a9507ae265ecf5b5
2055839700856389632	3f79b27b435b05321651daef
0750846065342433129	cd0aa9856147b6c5b4ff2b7d
0573427169410921198	de7d1b721a1e0632b7cf04ed
8313021323030224050	3e23e8160039594a33894f65
9161549067325106850	18ac3e7343f016890c510e93
7712738124831804349	252f10c83610ebca1a059c0b
6644155147493409979	aaa9402664f1a41f40ebbc52
...	

3 CRM data, with revenue and demographics

CRM data								
crm_id	**revenue**	**tenure**	**customer type**	**lifetime value**	**age band**	**gender**	**custom segment**	
ca978112ca1bbdcafac231b3	$100.00	5 years	personal	high	55+	female	Mobile first	...
2e7d2c03a9507ae265ecf5b5	$487.20	3 years	business	high	N/A	N/A	Loyalists	
3f79b27b435b05321651daef	$17.57	6 months	personal	low	20 to 30	unspecified	Disengaged	
cd0aa9856147b6c5b4ff2b7d	$14.50	1 month	personal	medium	16 to 18	male	Aspiring minnows	
...								

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4 Join all to establish a link between revenue and attribution fractions

Path to fullVisitorId to crm_id

path	fullVisitorId	crm_id
Direct > Paid Search - Generic > Paid Search - Brand	2248281639583218707	ca978112ca1bbdcafac231b3
Direct > Paid Search - Generic > Paid Search - Brand	8647436381089107732	2e7d2c03a9507ae265ecf5b5
Direct > Paid Search - Generic	2055839700856389632	3f79b27b435b05321651daef
Direct > Paid Search - Brand	0750846065342433129	cd0aa9856147b6c5b4ff2b7d
...		

CRM data

crm_id	revenue	tenure	customer type	lifetime value	
ca978112ca1bbdcafac231b3	$100.00	5 years	personal	high	...
2e7d2c03a9507ae265ecf5b5	$487.20	3 years	business	high	
3f79b27b435b05321651daef	$17.57	6 months	personal	low	
cd0aa9856147b6c5b4ff2b7d	$14.50	1 month	personal	medium	
...					

Fractional Attribution

path	direct	paid_search_generic	paid_search_brand	organic_search	email	referral	
Direct > Paid Search - Generic > Paid Search - Brand	0.459	0.174	0.367	0.0	0.0	0.0	...
Direct > Paid Search - Generic	0.784	0.216	0.0	0.0	0.0	0.0	
Direct > Paid Search - Brand	0.573	0.0	0.427	0.0	0.0	0.0	
...							

You might also filter using the other demographic fields on the join, to do specific filtered attribution.

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4 Join all to establish a link between revenue and attribution fractions

Path to fullVisitorId to crm_id

path	fullVisitorId	crm_id
Direct > Paid Search - Generic > Paid Search - Brand	2248281639583218707	ca978112ca1bbdcafac231b3
Direct > Paid Search - Generic > Paid Search - Brand	8647436381089107732	2e7d2c03a9507ae265ecf5b5
Direct > Paid Search - Generic	2055839700856389632	3f79b27b435b05321651daef
Direct > Paid Search - Brand	0750846065342433129	cd0aa9856147b6c5b4ff2b7d
...		

CRM data

crm_id	revenue	tenure	customer type	lifetime value	
ca978112ca1bbdcafac231b3	$100.00	5 years	personal	high	...
2e7d2c03a9507ae265ecf5b5	$487.20	3 years	business	high	
3f79b27b435b05321651daef	$17.57	6 months	personal	low	
cd0aa9856147b6c5b4ff2b7d	$14.50	1 month	personal	medium	
...					

Fractional Attribution

path	direct	paid_search_generic	paid_search_brand	organic_search	email	referral	
Direct > Paid Search - Generic > Paid Search - Brand	0.459	0.174	0.367	0.0	0.0	0.0	...
Direct > Paid Search - Generic	0.784	0.216	0.0	0.0	0.0	0.0	
Direct > Paid Search - Brand	0.573	0.0	0.427	0.0	0.0	0.0	
...							

5 Distribute revenue by customer over the fractional attribution values

Fractional Revenue

path	crm_id	direct revenue	paid_search_generic revenue	paid_search_brand revenue	organic_search revenue	email revenue	
Direct > Paid Search - Generic > Paid Search - Brand	ca978112ca1bbdcafac231b3	$45.90	$17.40	$36.70	$0.0	$0.0	...
Direct > Paid Search - Generic > Paid Search - Brand	2e7d2c03a9507ae265ecf5b5	$223.62	$84.77	$178.80	$0.0	$0.0	
Direct > Paid Search - Generic	3f79b27b435b05321651daef	$13.77	$3.80	$0.0	$0.0	$0.0	
Direct > Paid Search - Brand	cd0aa9856147b6c5b4ff2b7d	$8.31	$0.0	$6.19	$0.0	$0.0	
...							

0.427 × $14.50 = $6.19

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6 Aggregate channels to get attributed conversions, and attributed revenue

Attribution Report				
channel	**Attributed Conversions**	**Attributed Revenue**	**Actual Spend (Ads, etc)**	**ROAS**
Direct	40,451	$2,948,878	N/A	N/A
Paid Search - Generic	28,852	$2,103,311	$1,237,242	1.70
Paid Search - Brand	10,785	$597,732	$711,585	0.84
Organic Search	25,033	$1,291,828	N/A	N/A
Email	807	$41,645	$44,303	0.94
Referral	19,803	$1,021,934	$811,059	1.26
...				

$2,103,311
$1,237,242

= sum(direct) = 0.459 + 0.784 + 0.573 + ...

= sum(direct revenue) = $45.90 + $223.62 + $13.77 + $8.31 + ...

path	direct
Direct > Paid Search - Generic > Paid Search - Brand	0.459
Direct > Paid Search - Generic	0.784
Direct > Paid Search - Brand	0.573
...	

direct revenue
$45.90
$223.62
$13.77
$8.31
...

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Demos

Code examples: https://goo.gl/M567GT

```
01_google_merchandise_store_demo.Rmd
02_fractribution_model_quick_start.Rmd
03_attribution_fit_details.Rmd
10_channelattribution_overview.Rmd
```

Thanks!

Any questions?

Code examples: https://goo.gl/M567GT

Slides: https://goo.gl/oGpAqd

GitHub: **dan-booth**
LinkedIn: https://www.linkedin.com/in/**danielbooth1**/