FACE MATCH MACHINE

CAYMAN

XR MEDIA

19 August 2017

Joe: *«Tom & Dan, Virtual Reality is the world's newest medium. The feeling of being immersed in these virtual worlds is exhilarating. I'm telling you, It will change the way you communicate with your customers .»*

Tom: *«Joe, VR sounds incredible, but it doesn't solve our problem. I still can't verify whether the person who viewed our advertisement actually visited The Cayman Islands.»*

I considered Tom's problem for days on end and even posed it to my closest friends in both the travel industry and in marketing. There were two commonalities :

1) Everyone was aware of this problem
2) No one had a solution.

Then, at an event at the NYU Future Media Lab, I was kicking it it with a programmer and we began building the tech architecture to solve Tom's problem.

Cayman Face Match

Become Completely Aware of whether the Ad-Viewer Visited the Cayman Islands.

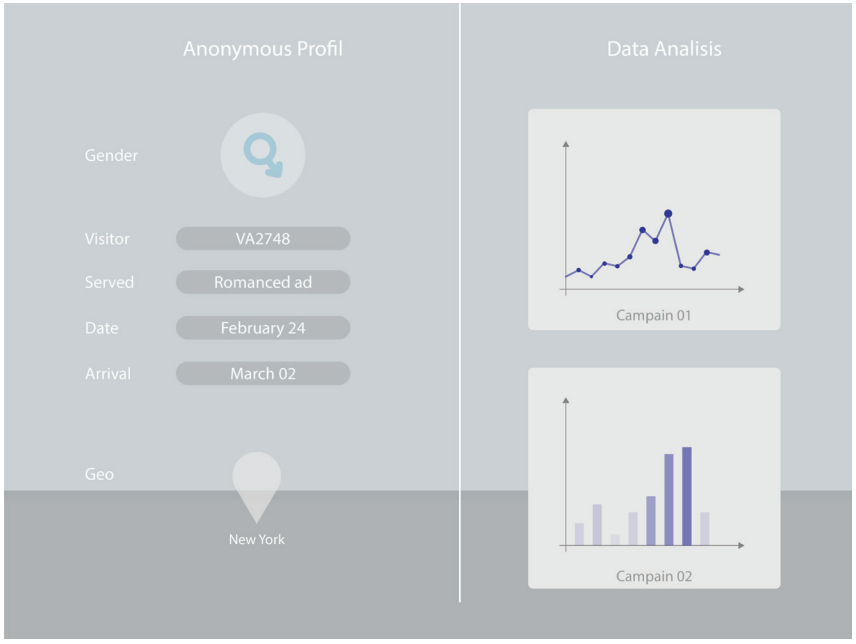
For decades, advertising agencies have been working to better understand the effectiveness of their campaigns. How do they know the rate at which their ads are resulting in sales? Clues and estimates are helpful, but the industry is missing a key metric: **viewer-visit verification**.

Today, when a user downloads a new app on their phone, a prompt emerges and they're asked whether the app may be allowed to access elements of their personal data (location, photos, etc.).

«Permissions [to allow access] are harmless by themselves and even useful to provide users a good mobile experience.»

Paul Oliveria, Researcher at the cyber security firm Trend Micro

With this permission from the user, we can analyze Facebook user log-in information (mainly photos and profile details) and we'll database the user's face, create an anonymous entry into the technology, and match them against headshot images captured at the immigration office. Matches will look like this:



Executive Summary

Objective

Implement a software that will explicitily determine when an ad-viewer visits Cayman.

Strategy

Use this software to cross check the facial data of ad-viewers with the data collected at airport immigration offices.

System Framework

- Facebook login photos
- Face API Encryption
- Database
- Face Match
- Immigration photo

Software Production

- **Phase 1,Design**

  Technological architecture and preliminary design. After six weeks you will be able to see a non-functioning example of the software.

- **Phase 2, Create**

  Develop, test, and deploy [16 weeks]

- **Phase 3, Refine**

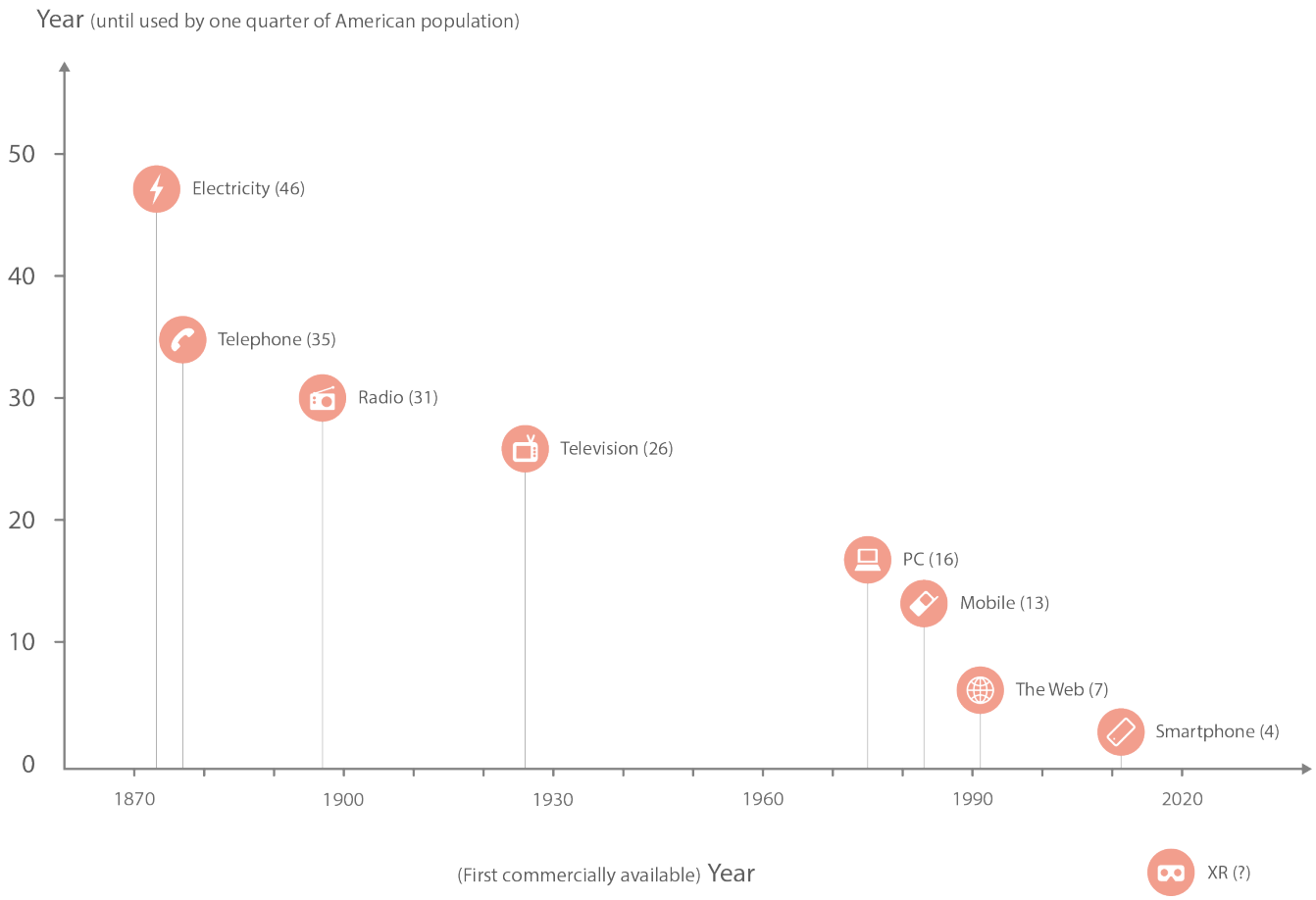
  QA, user test, and deploy [4 weeks]

- **Return on Investment**

  Finally gain access to data that holds media partners accountable for delivering tourism traffic. Once this happens, The Cayman Islands and its tax payers will experience the financial benefits.

Why Implement customized software

Media partners are missing the pivotal metric in the development of their content - the metric that will allow them to truly measure marketing success.
By installing this face recognition technology and achieving viewer-visit verification, Cayman Islands will have access to the exact percentage of ad viewers who become visitors of Cayman. Staying ahead of the technological advancements is more pivotal now than it's ever been, as we're innovating at an unfathomable rate.



Source : Economist.com

Accelerated technology chart

Pioneer the next media frontier

These cutting-edge advancements are powerful tools that will catapult early adopters ahead of their competitors. The companies that do not move toward these technologies will drop behind. Unlike in the past when a businesses could survive for decades with outdated technology, we've moved into a portion of the 21st century that no longer leaves space for those who don't move forward.

Implementing Face Recognition in 2017 feels similar to when browser cookies were added during the early 2000s. This technology is already being used at boarders around the world. The next step is to use it to benefit island tax payers.

Production

Phase 1: Design

Timeline: 6 weeks (3 sprints)

Projected Cost: $48,000 ($16,000/sprint)

Deliverables: Technical Architecture, Flow Design, Wireframe Set

Phase 2: Develop

Timeline: 16 weeks (6 sprints)

Projected Cost: $186,000 ($31,000/sprint)

Deliverables: Production User Interface Design, Developed Web application

Phase 3: Refine, Quality Assurance, and User testing

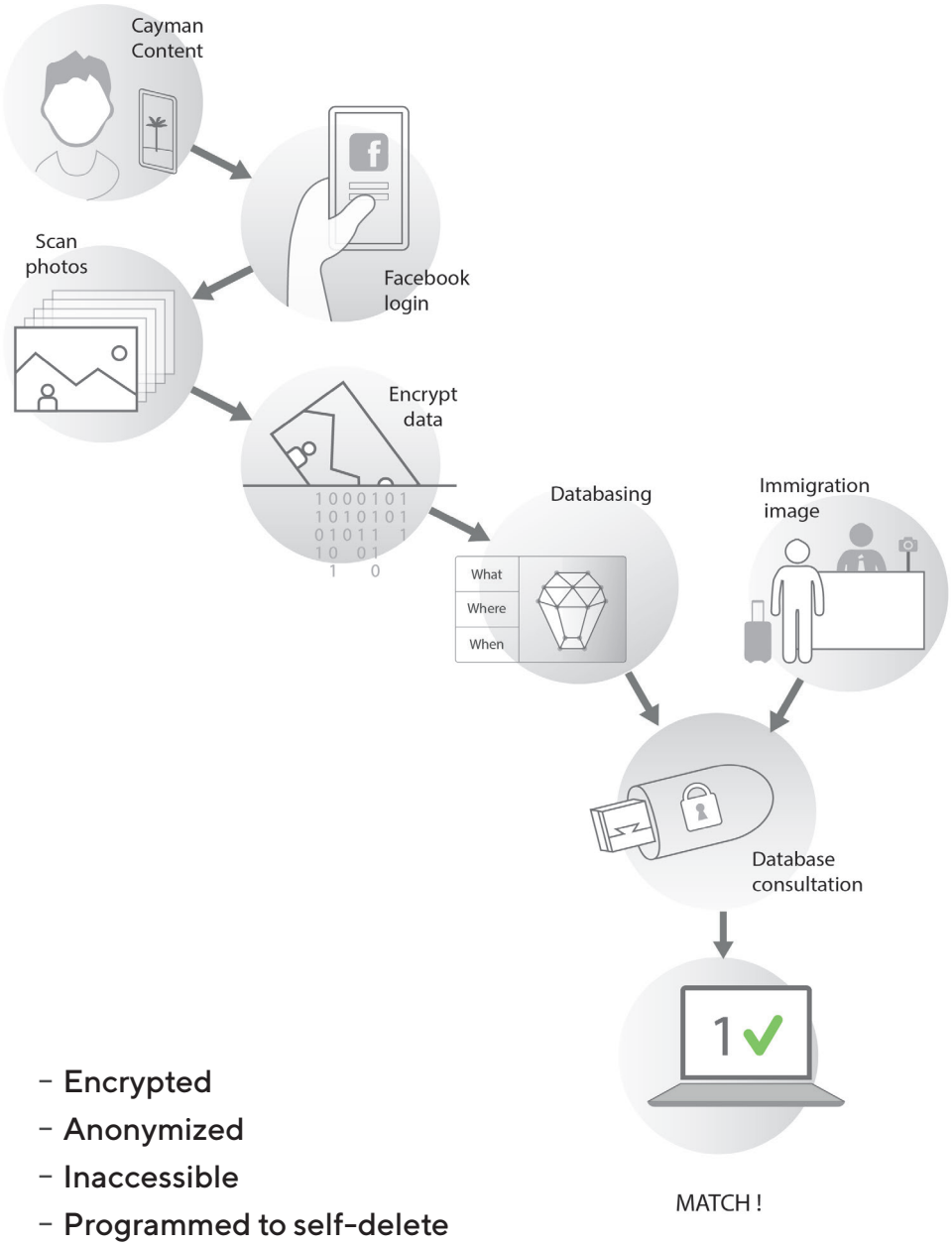
Timeline: 4 weeks (3 sprints)

Projected Cost: $93,000 ($31,000/sprint)

Deliverables: Deployed Re-designed Web application

Deliverables

The key metric, viewer-visitor verification, will improve advertising effectiveness. This information is required to hold media partners accountable for delivering results.



All data will be:

- **Encrypted**
- **Anonymized**
- **Inaccessible**
- **Programmed to self-delete**

Financial Strategy

Our customized ad-visitor verification tool will allow you to benchmark ad success. This means that you can finally make curcial advertising decisions based on performance and deploy increasingly effective marketing strategies.

The below chart is an example of a low-risk strategy designed to increase financial efficiency. Let's say that in this chart we've classified commercials (ads) into specific categories based on audiences and verticals. Now, we can better understand when and where to shift dollars

Commercial A is effective with youth but not with 25-34 year-olds.

As a result, you have two options:

1) Modify or Adapt the content
2) Refocus it's distribution audience.

With these new results, you will now be able to communicate the ad's performance with its creators - allowing them to become more precise in their creativity.

Suppose we start our semester with 3 types of targeted ads and benchmark them using our Cayman Face Match Machine.

saw ads [and] visited Cayman

Commercial	A	B	C			total
success rate	0,10%	0,05%	0,07%			0,68%
ads shown	100 000	200 000	150 000			450 000
total people	100	100	105			305

Test a new commercial:
Move half of the budget of Com B (worst performer) to Com D (best performer)

Commercial	A	B	C	D		total
success rate	0,10%	0,05%	0,07%	0,15%		
ads shown	100 000	100 000	150 000	100000		450 000
total people	100	50	105	150		405

Com C works the best. We move remaining budget from Com B to Com D.

Commercial	A	B	C	D		total
success rate	0,10%	0,05%	0,07%	0,15%		
ads shown	100 000	0	150 000	200000		450 000
total people	100	0	105	300		505

Test New Ad Again: half of the worst (Com C) goes into new ad (Com E)

Commercial	A	B	C	D	E	total
success rate	0,10%	0,05%	0,07%	0,15%	0,03%	
ads shown	100 000	0	75 000	200 000	75 000	450 000
total people	100	0	52.5	300	22.5	475

New ad performs terribly. Thankfully, this tech allows us to notice it and stop investing in these ads. Move all the commercial E budget to a new commercial, F

Commercial	A	B	C	D	E	**F**	total
success rate	0,10%	0,05%	0,07%	0,15%	0,03%	0,03%	
ads shown	100 000	0	75 000	200 000	0	75 000	450 000
total people	100	0	52.5	300	0	67,5	520

F performs pretty well, let's move the rest of type C into type F.

Commercial	A	B	C	D	E	F	total
success rate	0,10%	0,05%	**0,07%**	0,15%	0,03%	0,09	
ads shown	100 000	0	0	200 000	0	150 000	450 000
total people	100	0	0	300	0		475

Conclusion

Thanks to this tech, we could benchmark how types of ads performed and carefully try out new types. With a non-aggressive, safe strategy, budgeting otherwise impossible are now achievable. In the above scenario, we get over 40% increase in ad effectiveness after 6 iterations.

Traffic Cycle

Pivotal to this campaign is the unique ad experience afforded to the user. With this new information, the user will experience an interactive ad based on their interests. The interaction will be such a engaging experience that they'll share it with their friends. This personalized entertainment will serve as a more than worthwile exchange for their photos and profile data. (See Suggested Campaigns Doc.)

Run interactive ad on Facebook targeting travelers. Create your own ad?

– 100% users enter funnel

The ad requests access to a user's photos – ½ agree

– 50% of users continue and enter facial recognition process

Users are granted access to a custom interactive experience and prompted to post it on their Facebook wall – ½ agree

– 25% users repost the ad.

Friends of those who shared Cayman's VR experience will then enter the funnel

– If each shared post receives twenty views and 1/5 click the content, the traffic cycle will be in perfect equilibrium.

Face Matching

Match faces from Facebook Login with photos taken at immigration.

According to the Center on Privacy & Technology at the Georgetown Law Report, more than 125 million Americans are already filed in the facial recognition dataabase and on record with law enforcement.

Facial recognition analyzes the structural characteristics of a person's face. With access to photos, we can model the facial structure and recognize it uniquely with over 95% accuracy. Each human face has approximately 80 nodal points identifying their face. Some measured for F.R. technology are:

Distance between the eyes

Width of the nose

Depth of the eye sockets

The shape of the cheekbones

The length of the jaw line

Audience photos may function like browser cookies inthe way they identify, store, and utalize meta data.

Tech Architecture

OpenBR: A cutting-edge biometrics framework supporting the development of open algorithms and reproducible evaluations.

Facial Recognition

- Pre-processing Images using Facial Detection and Alignment
- Generating Facial Embeddings in Tensorflow (Google's flagship open-source software library for machine learning. It is a system for building and training polyvalent neural networks to detect and decipher patterns and correlations).
- Training an image classifier (neural net or support vector machine based depending on the available data)

Prerequisites to implement facial recognition technology:

- Advanced understanding of Linear Algebra
- Advanced understanding of Convolutional Neural Networks
- Advanced understanding Tensorflow or frameworks alike

Based on our six months of consultancy and development, we will deliver a ~50-page specification defining:

- The integration with the existing system
- The integration with Facebook facial data
- The database structure
- The application UI
- The application documentation

How the Cayman Face Match Machine works

Open BR

Design

Plugin framework
Algorithm description
Model Training

1 Detection

Eyes
Face
Keypoints
Landmarks

2 Normalization

Color convertion
Enhancement
Filtering
Registration

3 Representation

Binary patterns
Keypoint descriptors
Orientation histograms
Wavelets

4 Extraction

Clustering
Normalization
Subspace learning
Quantization

5 Matching

Classifiers
Density estimation
Distance Metrics
Regressors

Open BR

Gallery Management

Clustering and Fusion
Parallelization
Persistent storage

Evaluation

CMC and ROC
Error Rates
Score distributions

Deliverable timeline

Week	Deliverable	Client Action
1		$50,000
2	Sprint 1 report	
4	Sprint 2 report	$100,000
6	Sprint 3 report	
7	End of phase 1 report: tech architecture, flow design, wireframe sets	
8		$50,000
9	Sprint 4 report	
11	Sprint 5 report	
13	Sprint 6 report	$50,000
15	Sprint 7 report	
17	Sprint 8 report	
20	Sprint 9 report	
22	Sprint 10 report	
23	End of phase 2 report, production UI, deployed application	
24	Sprint 11 report	
26	Sprint 12 report	

Evolution of Development

2017

Discovery
Preliminary design
Pre-production
Ad strategy
Facial recognition software

2018

Sixteen weeks of production

May Launch Test and pilot through end of the year.

Closely monitor results and plan expansion

Track face-matches
- Monitor commercial success
- Collect data to improve AI algorithms
- Extrapolate ideas

Expansion planning

2019

Program software into AR content

2020

Program AR Content

Summary

We will Implament a software that will reveal the exact ratio at which ad-viewers visit Cayman. This will introduce far-superior metrics for evaluating each ad and thus improve the effectiveness of each campaign.

This turn-key solution will hold media partners accountable to quantifiably increase tourism visits.

Timing:	6-months
Deliverable:	Face Match Biometric Software
Software Provides:	Ad-viewer-visitor verification
Investment:	$325,000

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