Smart-Gaze: AI powered coding for efficient Eye Tracking

"What you see is what you buy"

It is believed that 95% of the purchase decisions happen in the subconscious (let's call it monkey mind). The decisions taken by the monkey mind are strongly influenced by what we see. When walking across a supermarket aisle, we see hundreds of packs of different products. But then there are some products that capture our attention. When we such products, the monkey mind kicks into action, it fixates its attention on that packaging that looks interesting ("ooh shiny!!!") and before we know it - we enter the process of seriously considering to purchase that product.

Eye-tracking is a well known tool to **implicitly** measure how people respond to different product packs, advertisement copies, web-page layouts, banner placements and more. Performing eye-tracking studies have the potential to generate tremendous RoI on your packaging, advertisement creatives and placement decisions. But, we (and the clients we speak to) believe that the industry is only beginning to scratch the surface when it comes to using this technique for generating insights. The reasons cited include that it is - expensive, slow, not objective (as participants get influenced by the process). However, we believe that the key reason is that the technology is not that developed yet.

With this whitepaper, we intend to demonstrate how embedding of Artificial Intelligence (AI) into the current eye tracking technology can make the process of eye tracking analysis much more powerful and cost-effective. Note that we assume that the reader is familiar with the eye tracking process for physical environments.

Eye-Tracking at a Glance

There are two primary methodologies associated with eye tracking: Physical and Online. In Physical eye-tracking, research participants wear eye tracking-hardware (glasses) and walk around a physical space (usually a retail-shelf) where the actual copies of the research subject are kept. However, in a virtual environment, participants look at the research subject (typically a virtual shelf, website layout, video ad) through a computer screen and a webcam is used to track the gaze movements.
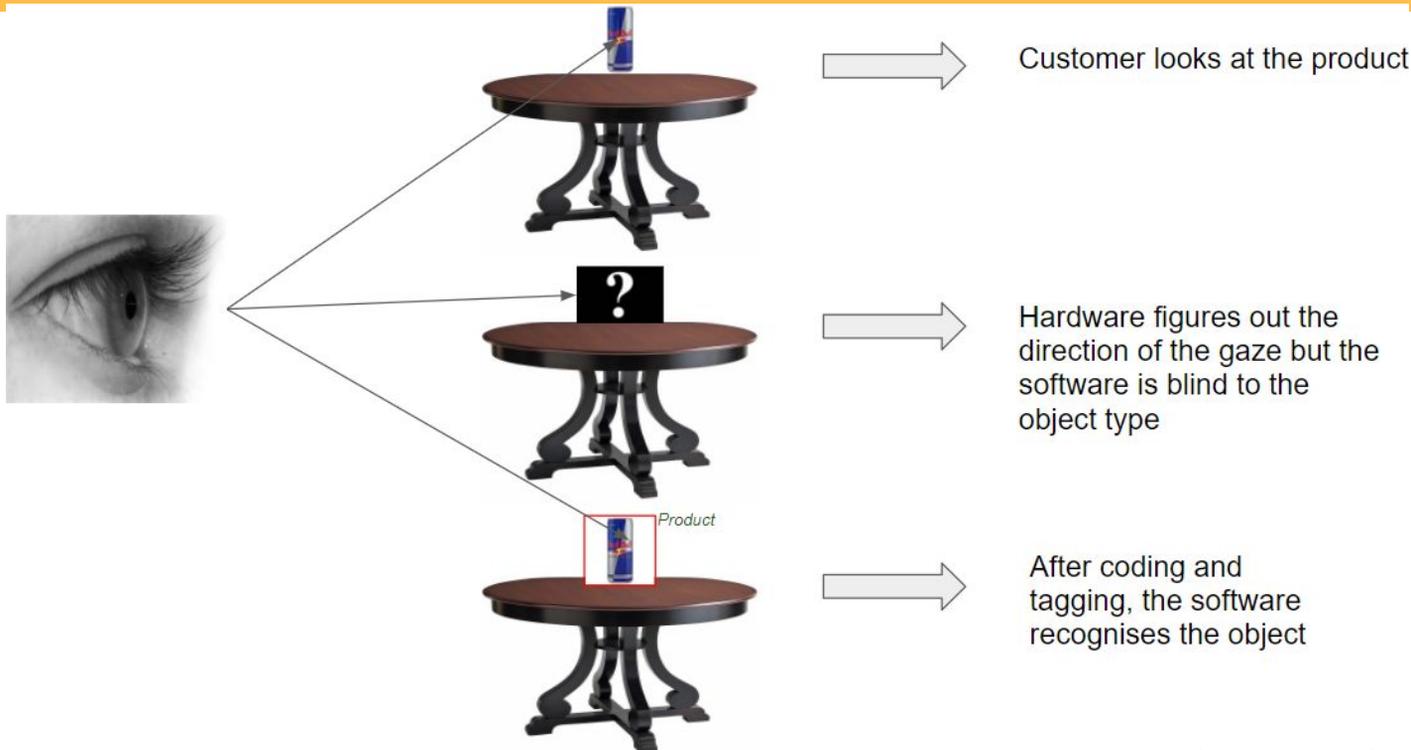

Physical Eye Tracking

Online Eye Tracking

While virtual eye-tracking is faster and cheaper, it has disadvantages of being less accurate (webcam is not as accurate as eye tracking hardware) and not being close to reality (a virtual shelf is very different from what it would look in real life). In this whitepaper, we are going to specifically focus our attention to Physical Eye Tracking for the purpose of testing the visual appeal of product packages on retail shelves.

Coding in Physical Eye Tracking

The key constraint with eye tracking technology is that it can tell you *'where'* the customer is looking, but not '*what*' the customer is looking at. The hardware figures out the direction and location where the gaze of a person is fixated. However it has no knowledge about what exactly the person is seeing. It is blind to whether the person is looking at a price tag, RedBull can, Gatorade can, her mobile phone etc.

Customer looks at the product

Hardware figures out the direction of the gaze but the software is blind to the object type

After coding and tagging, the software recognises the object

The only way to overcome this shortcoming is by seeking human help (i.e. coding). Currently, researchers have to manually code the raw gaze videos frame-by-frame using an eye tracking software. When doing this for a research project involving 100 participants, 10 minute gaze videos for each participant and assuming a very low frame rate of 1 frame per second, this translates to manual coding of 60,000 frames

Manual Coding has many challenges

The current coding solutions in the market for physical eye tracking don't offer fully automated coding of gaze videos. They are essentially an annotation/tagging software designed to make manual coding more efficient. Manual coding creates following challenges in a typical physical eye tracking project:

- It is manual labour intensive and not scalable across a large number of videos.
- It's a slow process which ends up making the turnaround time of an entire research exercise high (which is big roadblock in today's fast-paced business environment).
- Manual coding can also lead to human errors affecting accuracy of the final analysis
- Logistics of managing a manual coding pipeline is challenging
- Sometimes researchers influence the behaviour of the respondents in order to make coding easier - this takes the exercise away from objectivity.

Smart-Gaze - AI Solution for Eye Tracking Coding

Smart-Gaze uses Deep Neural Networks based architecture to analyse raw gaze videos. Through some training, the algorithm understands what the key areas of interests (AOIs) look like and once that it is done, it does the coding automatically. And this done with accuracy that is comparable to what a human coder would achieve.

Area of Interest (AOI)	Time Spent (s)
Skippy 1 kg brown	23 sec
Skippy 1.5 kg brown	12 sec
Skippy Classic Blue	33.5 sec

Raw Gaze Video from Eye-Tracking Glasses   AI-powered visual content analysis   Accurate and Automated AOI Coding

SmartGaze makes coding for physical eye tracking projects much more effective due to following advantages:

- It is very fast v/s human coding leading to faster insights and more RoI.
- Much more cost effective compared to human coding.
- Highly scalable due to automation.
- Removes possibility of human errors due to fatigue or boredom.
- No need to worry about coding logistics - send the raw data and get the coded data in return.
- No need to influence research participant behaviour as coding is no longer a worry

How Does It Work?

At the moment, Smart-Gaze is not a self-serving product that a researcher can log into and use. At the moment it is a solution where the researcher captures raw gaze videos from eye tracking glasses (any brand works, no constraints here), briefs us about the key Areas of Interest and then we take over. Within a period of 3 days, our team at Karna AI trains an AI algorithm and codes the data as per the client's need.

The accuracy can be assessed through a coding visualisation tool. Some other key benefits of this model include:

- There is no constraint of eye-tracking hardware brand (our system works for any type of glasses).
- There is no need for up-front investment in a eye-tracking software license.
- This is a pay-as-you-go model where the client is charged on a per video basis.
- The process and nature of output are completely customisable.

Metric	Manual Coding	SmartGaze	Additional Comment
Scalability	:(	:)	Scalable to large number of respondents due to automation
Speed	:(	:)	Turnaround time of a few hours v/s a week for humans
Cost	:|	:)	Cost Effective
Accuracy	:)	:)	Accuracy at par with manual coding
Logistics	:(	:)	Smart Gaze removes all constraints attached to coding logistics
Coding Flexibility	:|	:)	Respondents have complete flexibility as low quality videos donot impact research quality
Hardware Constraints	:|	:)	Compatiable with all eye tracking glasses
Financial Flexibility	:(	:)	Pay-per-use model ; software subscription is not required

Why KARNA AI?

Karna-AI has one of the best applied AI research groups in the world. Through our research platform, we have contributed to the AI/Deep Learning research community through our technical publications - which have been recognised by leading peer-reviewed conferences like NIPS, ICIAR and ISBI. The team has a strong background in consumer insights and is focused on leveraging AI to make market research more economical and effective.

AI Solutions for Market Research

We believe AI will be at the core of successful market research undertakings of the future. Our vision is to help drive this shift.

Karna-AI is the Market Research AI solutions division of ParallelDots, a premier applied AI research group. ParallelDots provide AI solutions and consulting to some of the largest enterprises in the world. Our APIs are used by 1,000+ developers across the globe.

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Contact Us:

Kushank Poddar
Head of Business

kushank@paralleldots.com
+91-9820353142