

Predictive AI in Marketing:

The Case of Amazon DSP Performance+

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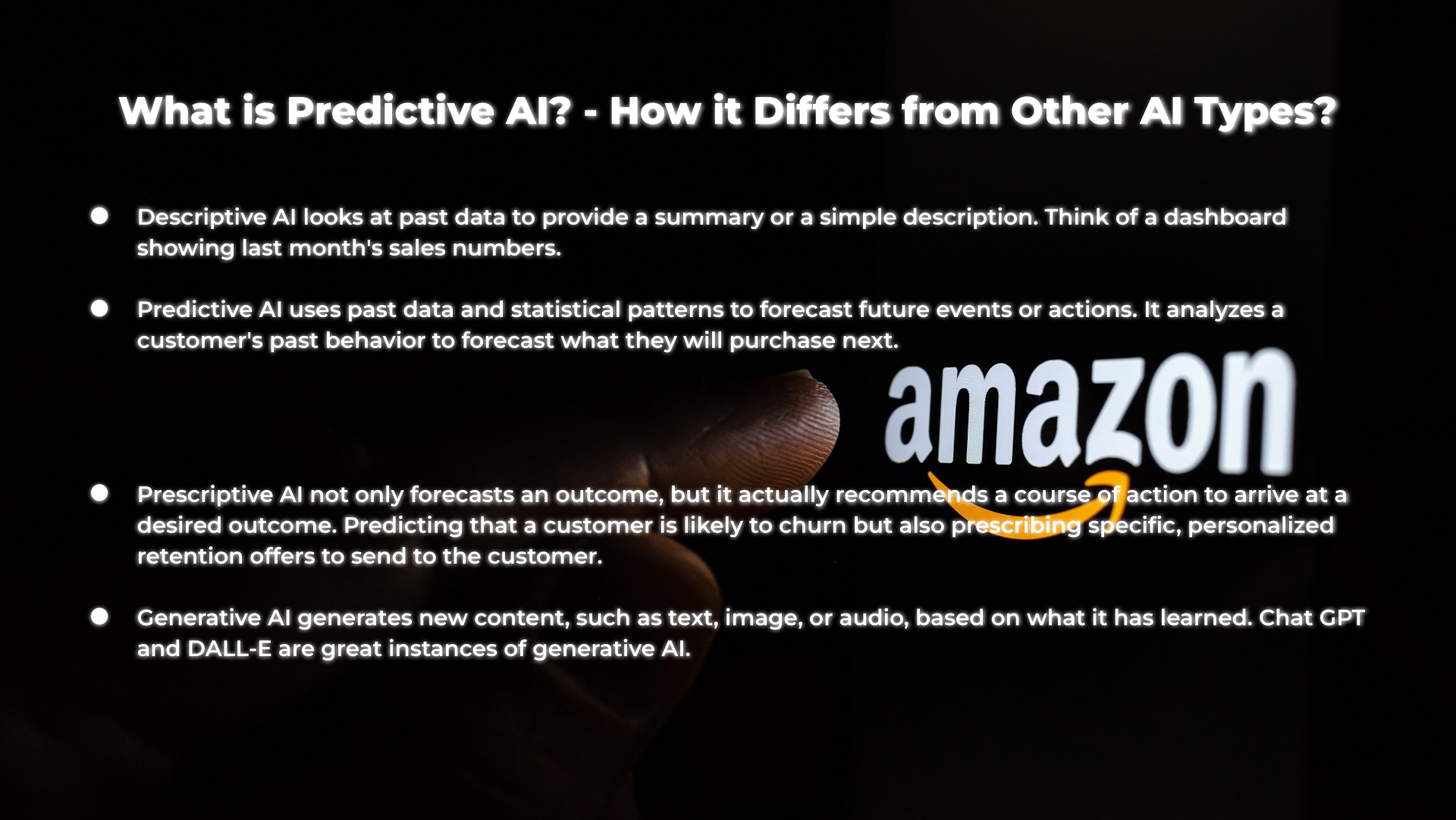
DID YOU KNOW?

Our predictive AI model makes over 1 million relevant ad decisions every second, using insights to help each impression deliver more impact. With billions of opportunities each day, our AI model drives results in every interaction.

What is Predictive AI? - How it Differs from Other AI Types?

- Descriptive AI looks at past data to provide a summary or a simple description. Think of a dashboard showing last month's sales numbers.

- Predictive AI uses past data and statistical patterns to forecast future events or actions. It analyzes a customer's past behavior to forecast what they will purchase next.



- Prescriptive AI not only forecasts an outcome, but it actually recommends a course of action to arrive at a desired outcome. Predicting that a customer is likely to churn but also prescribing specific, personalized retention offers to send to the customer.

- Generative AI generates new content, such as text, image, or audio, based on what it has learned. Chat GPT and DALL-E are great instances of generative AI.

Predictive AI with Amazon DSP Performance+

Amazon DSP Performance+ is an ad solution that uses machine learning to improve the performance of video and display ads.

- **How it Works: The tool evaluates first party data from Amazon and a brand's own data to predict which customers are most likely to convert.**

- **The Goal: It forecasts future customer behavior like the likelihood of a purchase and then automatically delivers ads to realize that prediction, moving marketing from a "test and learn" to a "predict and act" phase.**



The Three Pillar Approach

Strong Data Foundations: Pillar A collects and structures pseudonymized behavior signals like views, searches, brands, prices, and purchases in Amazon's ecosystem, e.g., Amazon.com and Prime Video.

Predictive Power: Pillar B uses a transformer based model to decode signals and predict future behavior along with past data and patterns. It builds a "two tower" neural network to create numerical representations, or embeddings, for customers and ads so that predictive ad matching is possible.

Performance Accuracy: Pillar C involves real time optimization. The AI system ranks ad candidates and bid prices in real time based on the predicted likelihood of engagement or conversion. Over 1 million ad decisions are taken by the system per secon

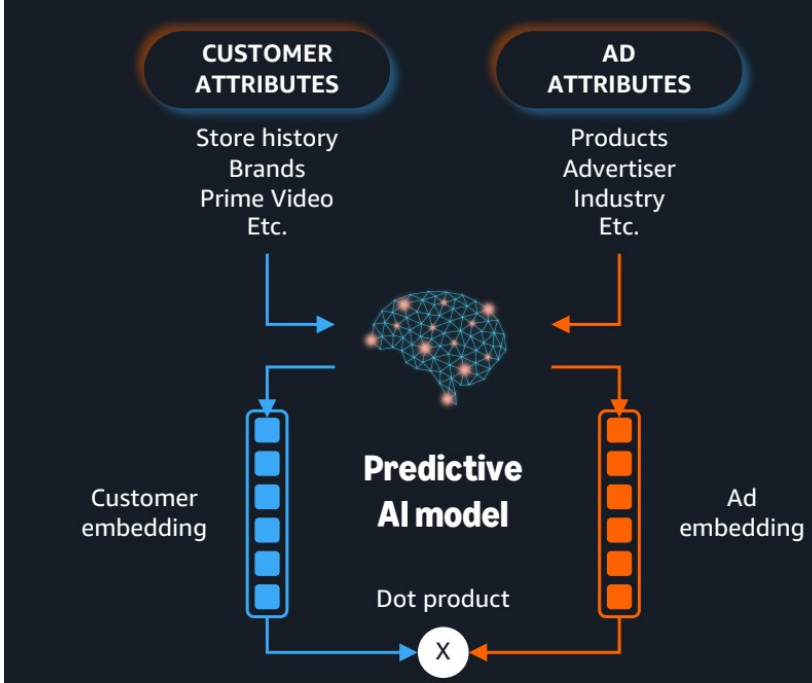


Figure 1: our proprietary AI model data processing framework shows how pseudonymized customer and ad attributes are transformed for matching.

WHY THIS MATTERS

Amazon DSP Brand+ and Performance+ are more than AI-powered tools—they are intelligent growth engines designed for dynamic, outcome-focused advertising. As Blueair and Thorne discovered, placing predictive AI at the center of their Amazon DSP strategy delivered measurable outcomes—whether driving sales on Amazon.com or their own websites.

Pillar A - Powerful Data Foundations

Data Sources: The model uses proprietary, privacy conscious signals from across Amazon's ecosystem:

- Shopping signals (views, purchases, searches).
- Streaming signals (Prime Video, Twitch).
- Conversion signals from off-Amazon websites (e.g. test drive bookings, form completions) via the Amazon Ad Tag or Conversions API.



Data Organization: These signals are organized using Amazon Standard Identification Numbers (ASINs) and grouped by parent ASINs to unify variations.

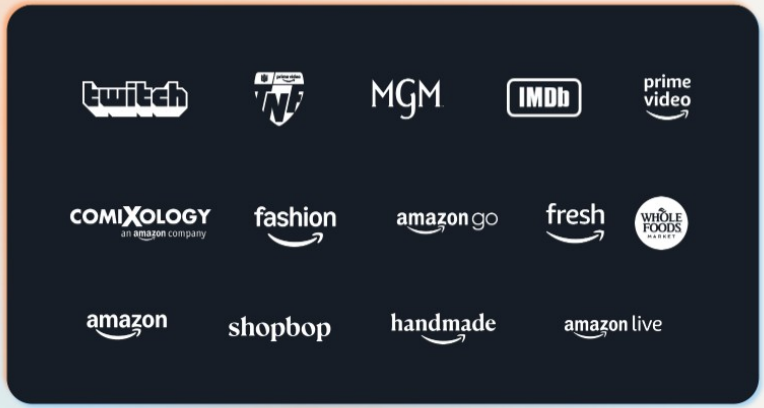
- Key Insight: This unified schema, built from both Amazon and advertiser signals, is essential for modeling intent accurately.

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PILLAR A: POWERFUL DATA FOUNDATIONS – CONSOLIDATING AND STRUCTURING BEHAVIORAL SIGNALS

Step 1: Organizing behavioral data - schema creation and signal consolidation

At the core of Amazon's advertising intelligence is a broad network of privacy-conscious signals across our digital properties—including Amazon.com, Prime Video, Amazon Music, and more. These signals—such as product views, searches, and interactions—help inform a dynamic understanding of interest and intent, fueling relevance at scale.



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Pillar B - Predictive Power

Transformer Based Model: A purpose built, transformer based model analyzes behavioral patterns with context and timing in mind.

Match Ready Embeddings: The model creates numerical embeddings for both customers and ads. A "two tower" neural network is used to compare these embeddings.

Key Insight: These embeddings enable the model to make predictions about potential ad engagement and conversion likelihood with millisecond latency. The closer the embeddings in a mathematical "embedding space," the stronger the match.

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PILLAR B: PREDICTIVE POWER – LEARNING WHAT DRIVES ACTION

Step 2: Understanding behavioral signals – our transformer architecture and signal analysis

The predictive engine powers decision-making in Amazon DSP's Brand+ and Performance+ campaigns. Purpose-built for Ad Tech, our model is a transformer-based model designed to operate at massive scale and in real time, analyzing behavioral patterns to predict future actions.

Where the earlier section introduced our predictive AI model's role in connecting signals to outcomes, here, we zoom in to see how it works. Whether a customer is browsing on Amazon or streaming on Prime Video, our model transforms these interactions into forward-looking predictions: Will they buy a product? Switch brands? Subscribe? Take action off Amazon? Unlike traditional audience targeting, which often relies on static rules or past behavior alone, our model interprets signals with context and timing in mind. The result? Ads that feel helpful rather than disruptive.



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Pillar C - Performance Precision

Response Prediction: Estimating the likelihood of engagement with a specific ad based on recent activity.

Real time Bidding: Adjusting bid amounts in real time. Conversion likelihood scores help determine when to bid aggressively or hold back to conserve budget.

Continuous Learning: The system constantly learns from ad performance (clicks, conversions, efficiency) and refines the embeddings, creating a feedback loop that improves future predictions.

Key Insight: Amazon DSP Performance+ makes over 1 million relevant ad decisions per second, prioritizing impact over just impressions.

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PILLAR C: PERFORMANCE PRECISION – MATCHING AND OPTIMIZATION

Step 5: scoring, matching, and acting in real time - dot product matching and bidding

Now, let's dive deeper into how our proprietary AI model operates in real-time to deliver relevant ad experiences. Every time a page loads, our proprietary AI model springs into action! In just milliseconds, it decides which ads to consider, what behavioral patterns they're right for, and how much to bid. The system works through multiple stages, balancing massive scale with precision to surface the right message at the right time.

WHY THIS MATTERS

High-speed, high-precision matching means your ads are prioritized for impact, not just impressions—all in under 100ms.

Matching: dot product scoring

Once we've generated compact numerical representations—called embeddings for both customers and ads, the next step is assessing how closely they align. This is done through dot product matching, a straightforward mathematical process that measures the affinity between the two.

The closer the pseudonymized customer and ad embeddings are in our shared space, the more naturally relevant the ad will feel—helping ensure we surface the ads most likely to resonate with each individual.



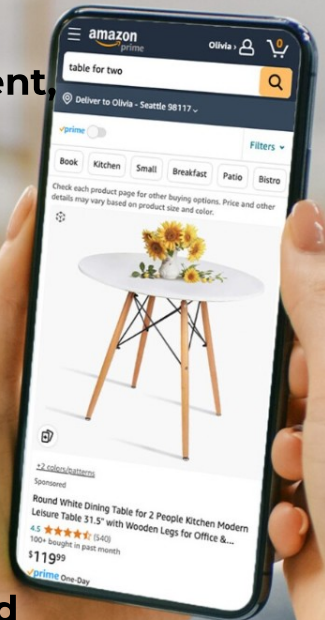
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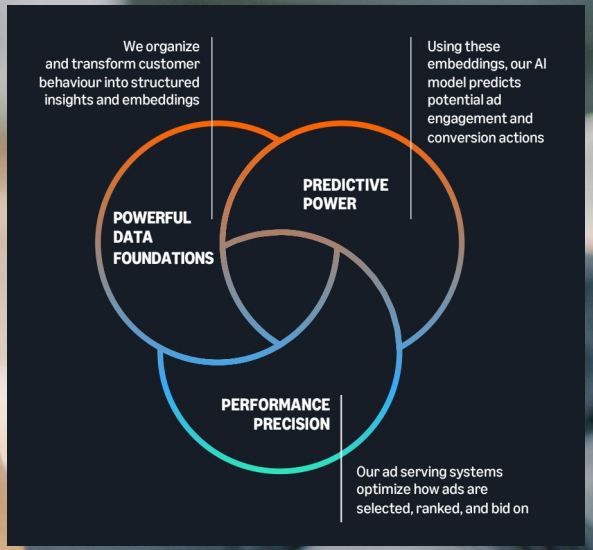
How DSP Performance+ Reshapes the Marketing Process

Greater Efficiency: It automates campaign budgeting and management, freeing up marketers for high level strategy and creative development.

Enhanced ROI: By predicting which customers are most likely to buy, the tool reduces wasteful ad spend and increases return on investment.

Customer Focused Marketing: It leverages first party data to tailor ad delivery, creating a more personalized and positive shopping experience.





Conclusion & References

Conclusion: Amazon's predictive AI, through DSP Performance+ and Brand+, is a powerful example of how AI can transform marketing from a reactive to a proactive, highly efficient process.

- Amazon. *Amazon DSP: Reach, Engage, & Convert Audiences.* https://advertising.amazon.com/solutions/products/amazon-dsp
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