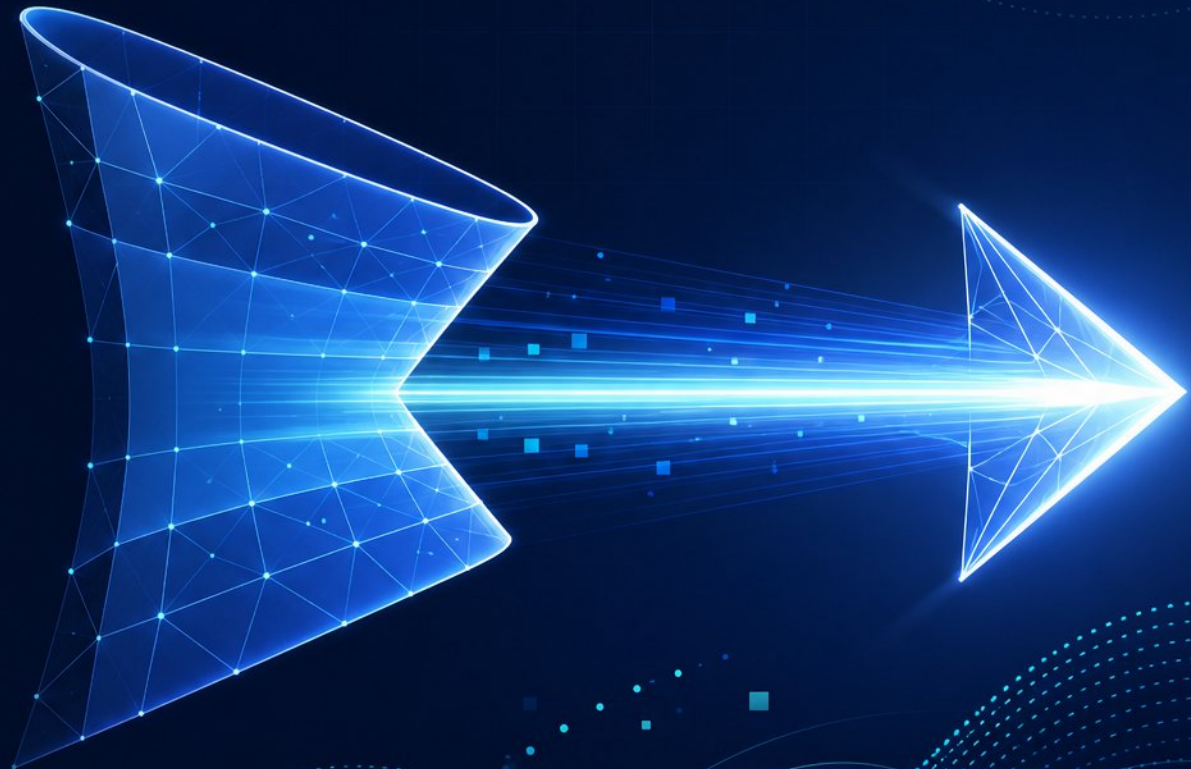


Machine Learning in Marketing Analytics

- Moving from backward-looking reports to forward-looking predictions and optimization
- Built for marketing analysts and growth teams, not ML theoreticians
- Learning path: use cases, data prep, segmentation, prediction, recommendations, MMM, and responsible AI



Why ML Matters for Marketing Analytics Today



-  - Evolution: manual reports → dashboards → conversational AI
-  - Shift from descriptive to predictive and prescriptive analytics
-  - Real-time anomaly detection flags issues in minutes, not days
-  - Predictive forecasting uses 6–12 months of data for reliable projections
-  - Generative AI automates summaries; natural language queries replace dashboard building

Core ML Concepts for Marketing Analysts



- Supervised: churn prediction; unsupervised: behavioral segments



- Customer attributes as features; purchase/churn as labels



- Historical campaigns as training data



- Evaluate with accuracy, precision, recall, ROC-AUC



- Prioritize business impact over raw model fit

FIELD GUIDE: CUSTOMER BEHAVIOR SPECIMENS



Churn Label



Unlabeled Customer Segment



Data Preparation and Feature Engineering for Marketing Data

- - Sources: CRM, web/app events, ad platforms, transactions, loyalty data
- - Clean missing values, outliers, class imbalance; use time-based splits
- - Build RFM features, engagement scores, lifecycle stage, response indicators



Customer Segmentation with Clustering



- K-means and hierarchical methods group by behavioral similarity, not rules



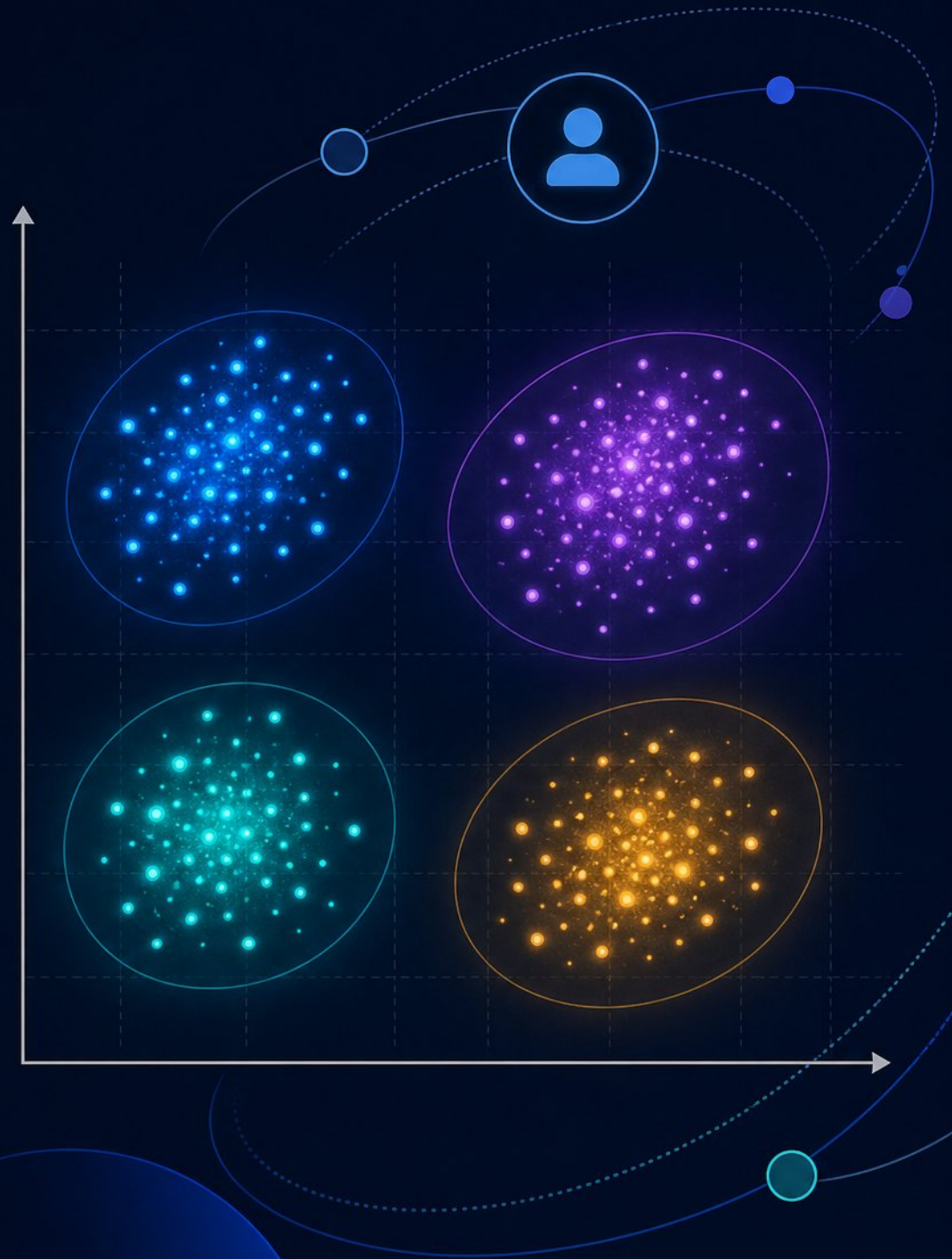
- RFM, engagement, and demographics as segmentation features



- Validate segment stability to ensure reliable targeting



- Link each segment to tailored campaigns and messaging



Predicting Churn and Customer Lifetime Value



- Frame churn and LTV as supervised learning with clear labels and time windows



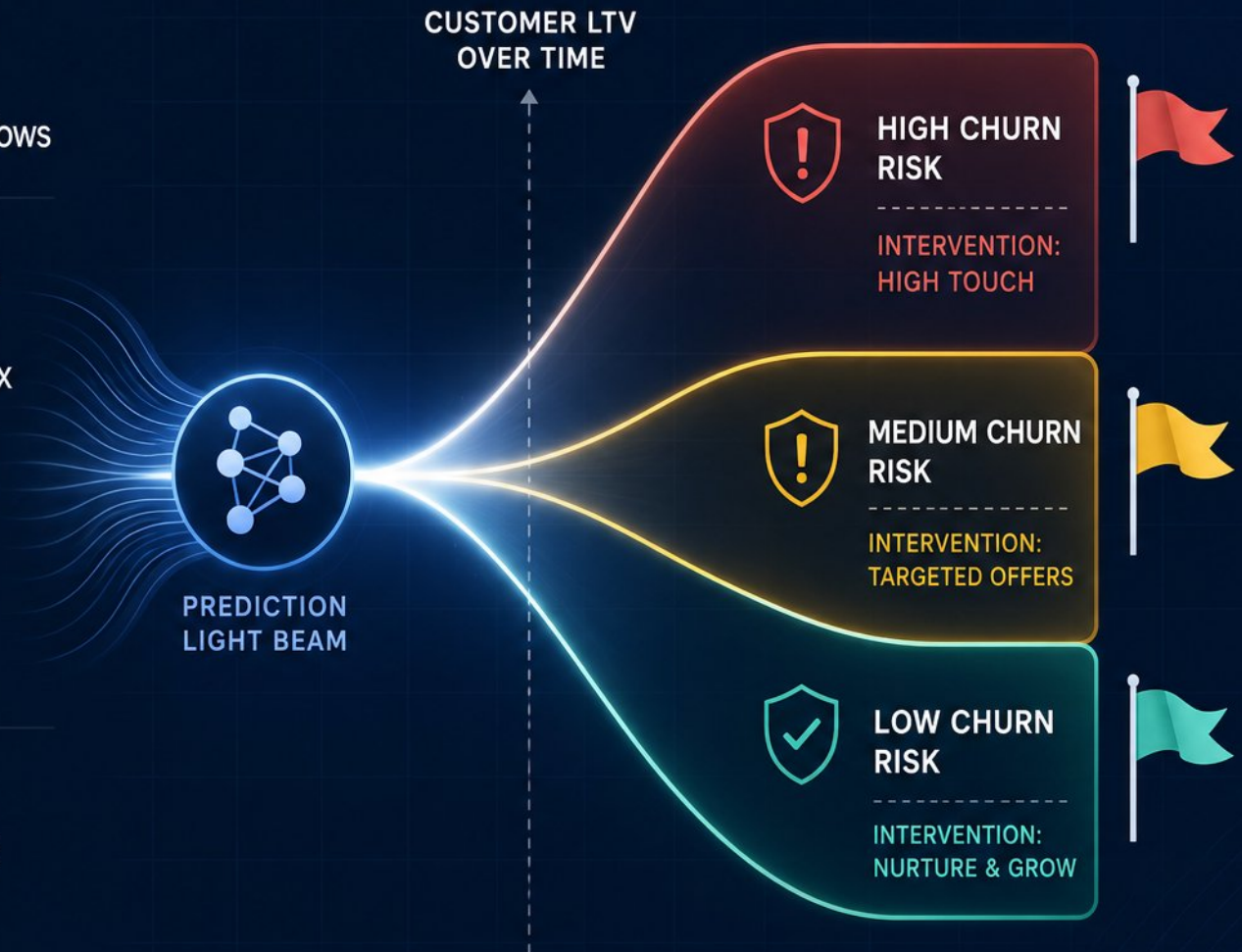
- Logistic regression offers interpretability; gradient boosting captures complex patterns



- Translate outputs into churn risk tiers and retention offers



- Use LTV predictions to prioritize acquisition and nurture efforts



Campaign Targeting and Recommendation Engines

- **ML boosts targeting:**
propensity scoring,
lookalikes, next-best-action
- **Recommender types:**
collaborative,
content-based, hybrid
- **Hybrid approaches**
combine behavior +
product attributes, with
embeddings
- **Applications:**
cross-sell, upsell, email
personalization,
post-purchase engagement

Collaborative Filtering



Recommends based on
patterns and interactions
from similar users.

Content-based Filtering



Recommends based on
item attributes and user
preferences.

Hybrid Approaches



Combines behavior +
product attributes,
enhanced with embeddings.

Marketing Mix Modeling and AI-Assisted Measurement



- Marketing mix modeling (MMM) measures channel impact without user-level tracking



- Privacy-resilient alternative to attribution for budget allocation decisions



- Modern tools: Google Meridian, open-source MMM frameworks, GenAI analysis layers



- Scenario planning, finance-ready reporting, and defending marketing spend



- Pair with dashboards: MMM guides medium-term strategy, attribution informs tactics

DATA AS FUEL



Paid Media Spend



Email Spend



Search Spend



Social Spend



Other Channel Spend



Marketing Mix Model (MMM)



AI-Assisted Analysis Layer

Identify drivers and estimate channel impact

Budget Reallocation Guidance

Evaluating Model Performance

from a Business Perspective



- Translate model metrics into lift, ROI, incremental revenue, and payback



- A/B tests and holdout groups prove true incremental impact



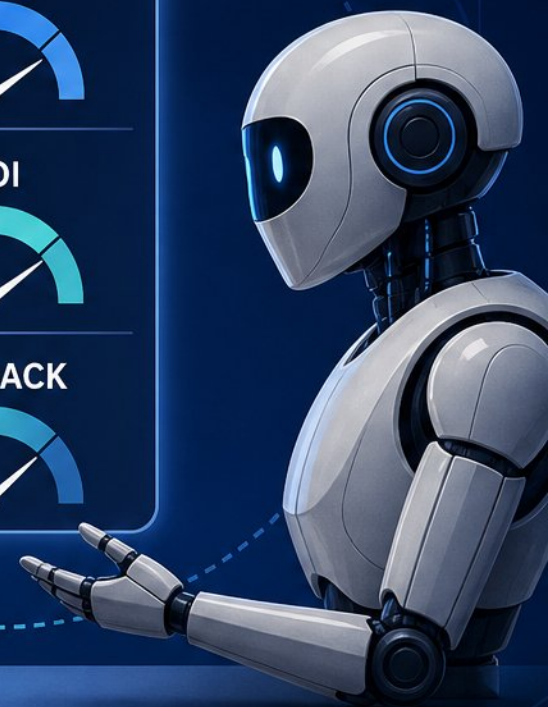
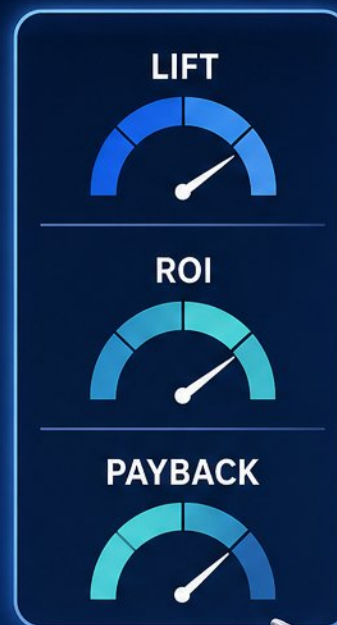
- Time-based validation guards against leakage and stale models



- Avoid overfitting and recommendations ignoring inventory, margins, or consent

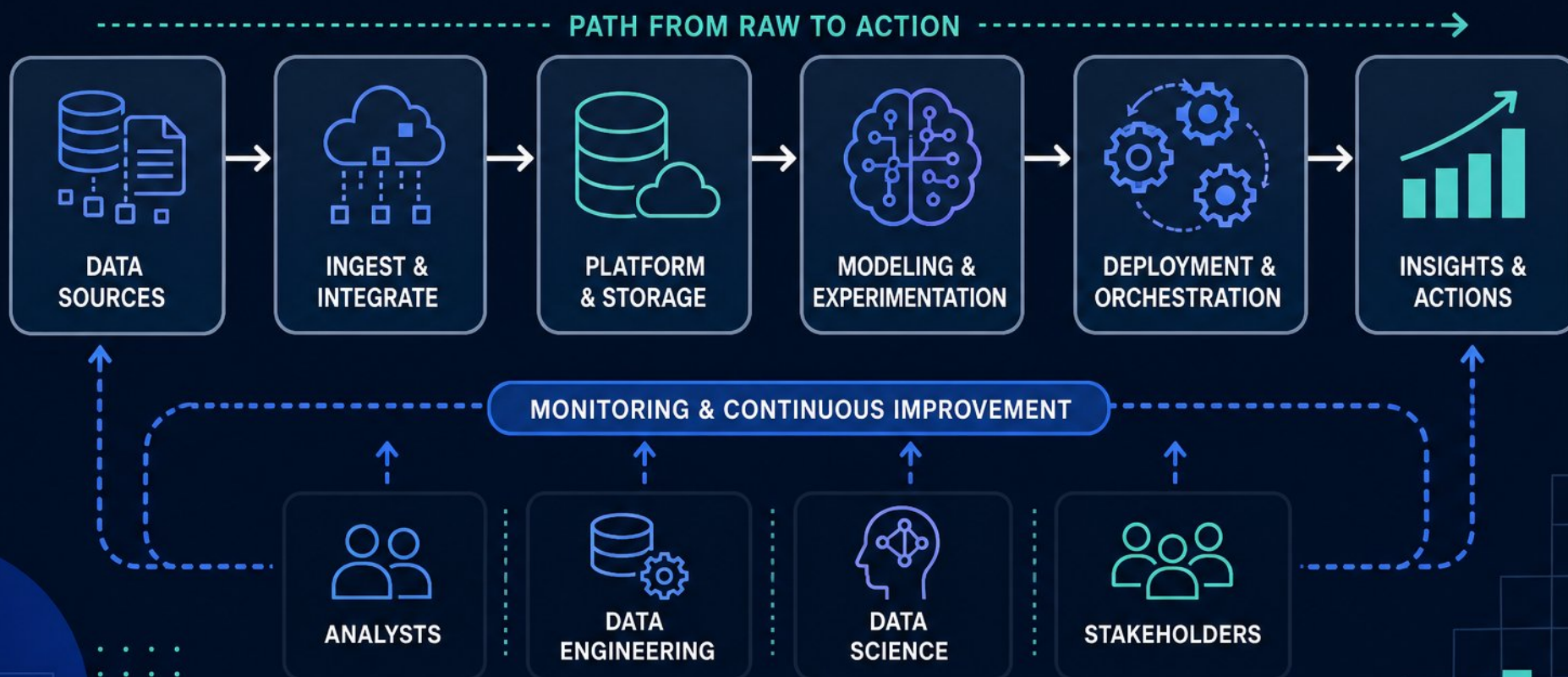


- Report honest results; never guarantee fixed percentage uplifts



Implementation, Tools, and Team Workflows

- - Tooling: Python, cloud ML, CDPs, BI with AI, agentic systems
- - Agentic platforms: Improvado, LayerFive Juno, BlueAlpha, Atlas
- - MMM on Databricks: Infocepts Mix Studio with MLflow governance
- - Pair analysts, data engineering, data science, stakeholders
- - Automate monitoring, retraining, drift detection; prototype to production



Ethics, Bias, and Responsible Marketing ML



- Bias risks: discriminatory targeting, exclusionary segments, unfair recommendations



- Practices: human review, audit trails, accountability in customer journeys



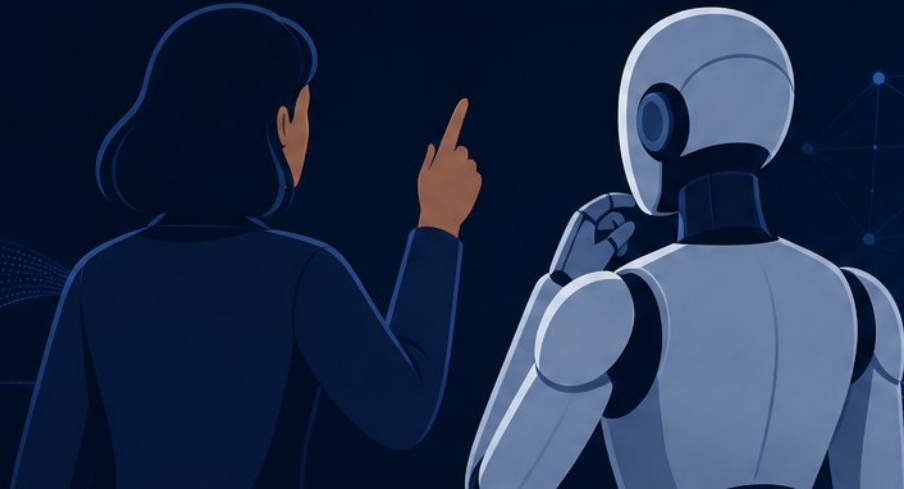
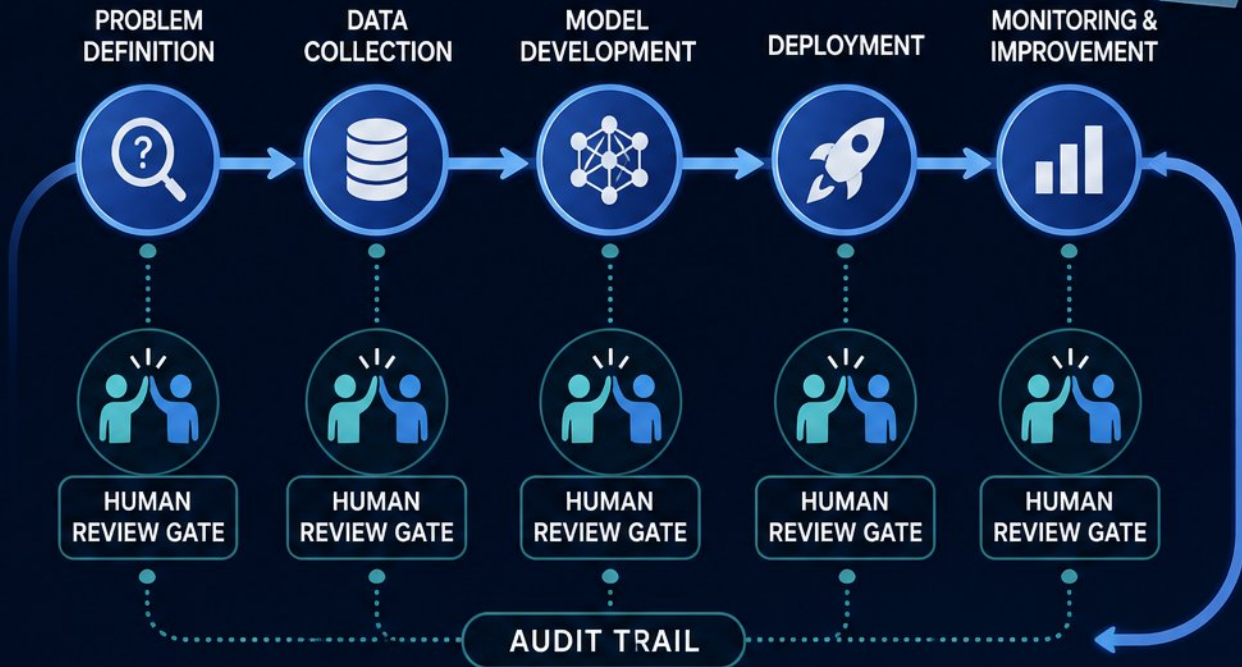
- Fairness testing and explainability embedded in the model lifecycle



- EU AI Act: ban on manipulative AI in force since February 2025



- Transparency duties and synthetic content marking due by December 2026



Privacy Regulations and AI Disclosure Requirements



- Most marketing AI isn't "high-risk" under the EU AI Act



- The real burdens: GDPR profiling rules, DSA ad transparency



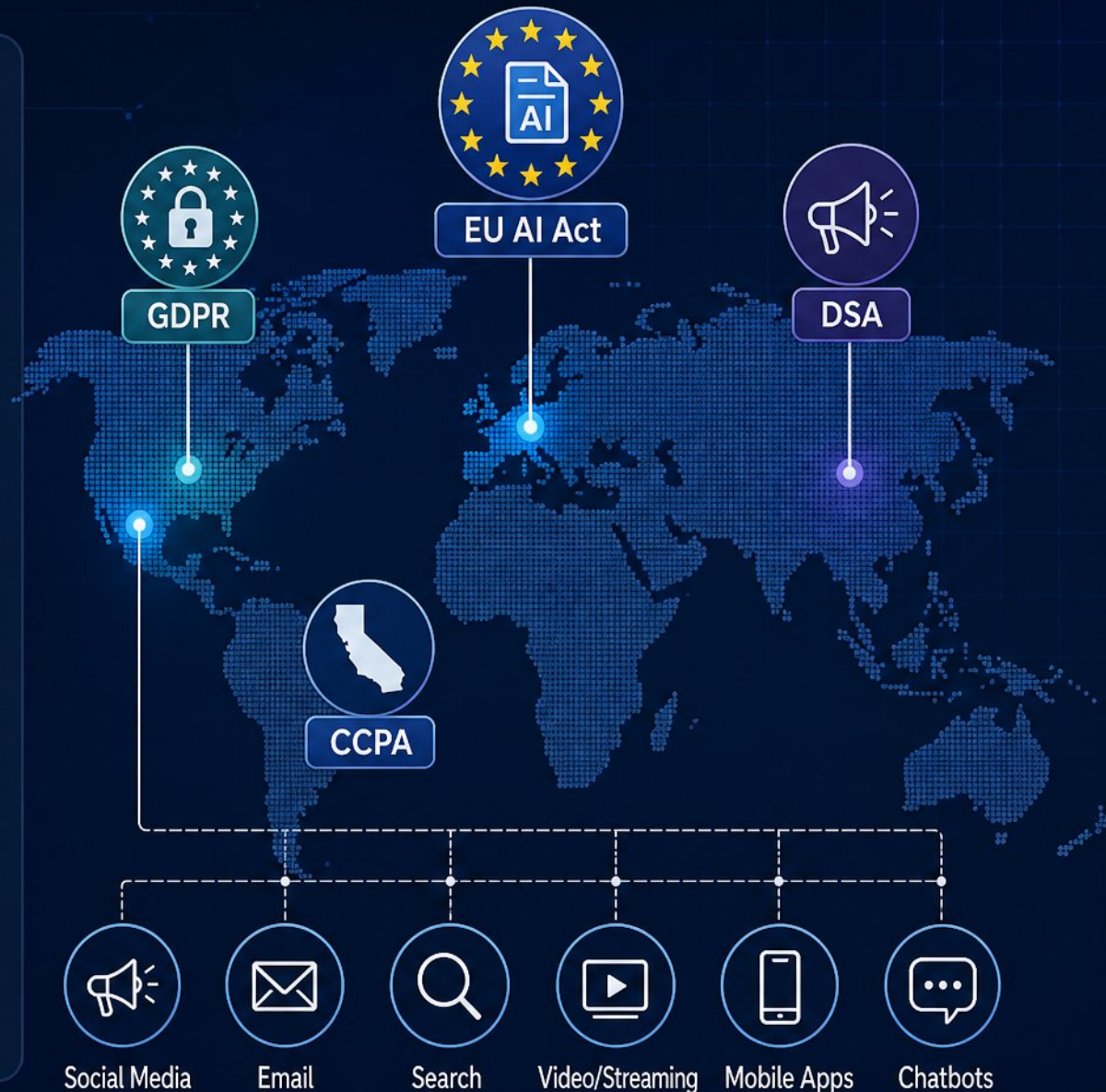
- Key deadlines drive compliance: AI Act transparency and marking



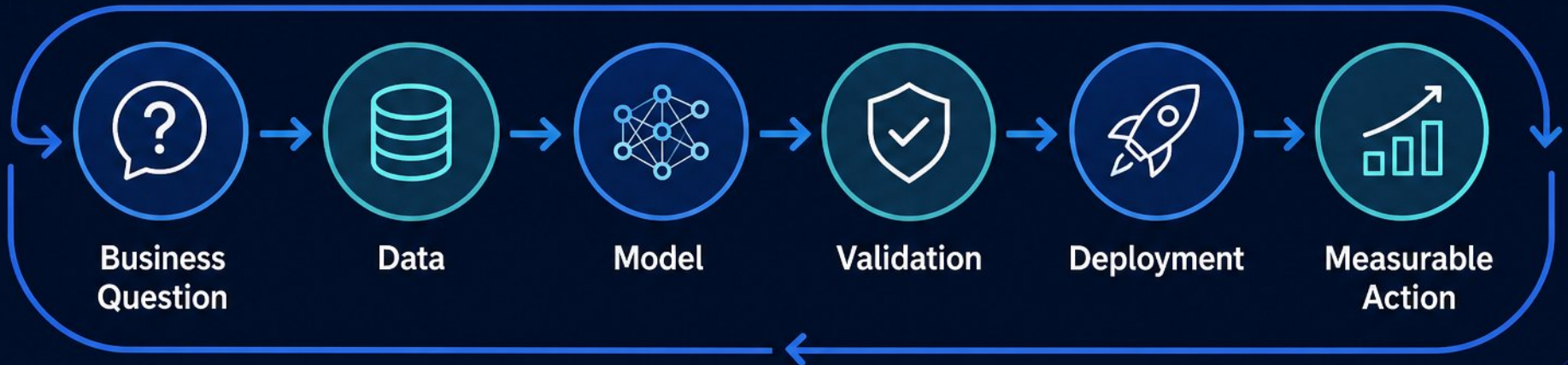
- Practical duties: chatbot disclosure, deepfake labeling, profiling transparency



- Compliance is layered; meeting one regulation doesn't satisfy others



From Model to Decision: Operationalizing Marketing ML



- Define the path: business question → data → model → validation → deployment → measurable action
- Apply to churn-risk campaigns, LTV budget allocation, recommendations, MMM reallocation
- Establish measurement cadence with holdout groups and incremental lift
- Monitor continuously: model drift, retraining, and performance oversight
- Use MLflow for experiment tracking, versioning, and reproducibility

Key Takeaways and Next Steps



- - Core capabilities: segmentation, churn/LTV prediction, recommendations, targeting, MMM, responsible deployment



- Start with clean first-party data and one high-impact use case



- Expand with validation and governance as you scale



- Success = business understanding + data quality + experimentation



- Responsible AI: comply with EU AI Act, GDPR, and disclosure rules



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