

## **Real-Time Behavioral Personalization (RTBP)**

RTBP is a real-time personalization engine that dynamically adapts content, workflows, interfaces, and interventions within milliseconds based on continuously inferred user behavior, intent, emotional state, and cognitive load.

Unlike traditional personalization systems that rely on static profiles or batch updates, RTBP operates as a live behavioral control system, responding during an interaction rather than after one. .

Dr. Scott M. Martin, Inventor, Architect

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### **Core Design Principle**

Personalization is a control loop, not a recommendation.

RTBP continuously:

- Observes behavior
  - Infers latent state
  - Selects an optimal action
  - Measures impact
  - Adapts immediately
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### **Behavioral Signal Ingestion Layer**

RTBP ingests high-frequency, multi-modal behavioral signals in real time.

Behavioral Signals:

- Click paths, scroll depth, dwell time
- Task switching, retries, abandonment
- Typing speed, corrections, pauses
- Voice pace, tone, hesitation (if available)

Temporal & Interaction Signals:

- Sequence order of actions
- Time-between-events
- Acceleration / deceleration patterns
- Repetition or looping behavior

Contextual Modifiers:

- Device type and modality
- Environmental constraints (time pressure, noise, interruptions)
- Workflow stage and task complexity

Signals are processed as streams, not as events.

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### **Real-Time State & Intent Inference Engine**

At the heart of RTBP is a streaming inference engine that estimates latent human states

**Inferred States (Continuously Updated)**

Intent: goal-driven, exploratory, blocked, disengaging  
 Urgency: low → critical  
 Sentiment: positive, neutral, frustrated  
 Cognitive Load: under-utilized, optimal, overloaded  
 Confidence / Uncertainty  
 Error Likelihood

**Modeling Approach**

Sliding-window time-series models  
 Bayesian belief updates per user  
 Ensemble inference (LLM + statistical + ML)  
 Confidence-weighted state vectors

User are represented as a live state vector updated every interaction.

**Personalization Decision Engine**

RTBP selects next-best personalization actions in real time

**Action Categories:****Content Adaptation**

Simplify, summarize, expand  
 Change modality (text → visual → voice)

**Interface Adaptation**

Reduce UI density  
 Highlight critical paths  
 Change pacing or interaction style

**Workflow Adaptation**

Skip steps  
 Defer non-critical tasks  
 Reorder actions

**Intervention**

Just-in-time guidance  
 Confirmation prompts  
 Human escalation

**Decision Logic:**

Utility-based optimization  
 Policy and compliance constraints  
 User-specific reward functions  
 Exploration vs exploitation balancing

Two users performing the same task may receive opposite adaptations

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### **Millisecond-Level Execution & Orchestration**

RTBP executes adaptations across live interaction surfaces:

- Web & mobile UI
- Conversational interfaces
- Dashboards & notifications
- Embedded tools and copilots

Actions are:

- Reversible
- Context-scoped
- Continuously re-evaluated

*Hyper-Personalization can be applied, rolled back, or adjusted mid-interaction*

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### **Continuous Feedback & Learning Loop**

RTBP measures micro-outcomes, not just success/failure.

Feedback Signals:

- Task completion speed
- Error reduction
- Drop-off prevention
- Reduced hesitation or rework
- User overrides or rejections

Learning Mechanisms:

- Online reinforcement learning
- Per-user adaptation curves
- Cross-user pattern extraction
- Drift detection and recalibration

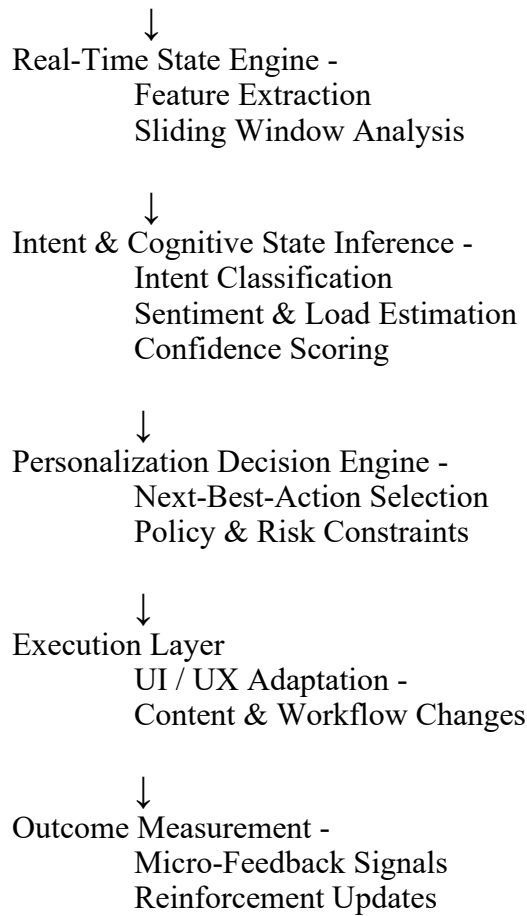
Learning occurs:

- In-session
- Across sessions
- Across similar users (without disclosing identities)

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### **Reference Architecture**

Behavioral Signal Streams -  
Interaction Events  
Temporal Metrics  
Context Modifiers



### Patent-Relevant

RTBP is not:

- A recommender system
- A rules engine
- A static personalization layer

RTBP is:

- A real-time behavioral control system
- Cognitive-load-aware personalization
- Streaming inference of latent human state
- Millisecond adaptation within live interactions

Sample Example Claim:

A system and method for dynamically modifying user interfaces, content, and workflows in real-time based on continuously inferred user intent, emotional states, and cognitive load derived from streaming behavioral signals.

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