Memory Orbs Technical Research Brief

Mission

Exhaustively explore all possible data sources and contextual cues that could transform transaction data into memories. Focus on breadth over depth - we need to know what Lego pieces we're playing with.

1. Plaid Transaction Data

What We Get Directly

- `merchant_name` - cleaned merchant names
- `category` & `detailed_category` - spending categories
- `datetime` - exact timestamp
- `amount` - transaction amount
- `location` - lat/long when available
- `payment_channel` - online vs in-store
- `pending` status
- `account_id` - which account used

Questions to Investigate

- What % of transactions have location data? (anecdotal: ~30-40% for in-store)
- Do certain merchant types have better location coverage?
- What's in the `merchant_entity_id` - can we build merchant profiles?
- How reliable is category data for inferring purchase type?
- Can we detect patterns in `authorized_datetime` vs `datetime` gaps?

2. Location & Maps Integration

Possibilities

- Show map pin/image via lat/long coordinates
- Reverse geocode to neighborhood names (“Castro district” vs exact address)
- Distance from home/work (if we know those)
- Weather at time/location of purchase
- Local events happening nearby that day
- Travel detection (purchases far from usual locations)

Questions to Investigate

- Google Maps Static API pricing for map thumbnails
- MapBox alternatives for visual context
- Can we detect “home” and “work” from transaction patterns?
- Privacy implications of location tracking

3. Time & Calendar Context

Possibilities

- Day of week patterns (weekend vs weekday behavior)
- Time of day categorization (breakfast/lunch/dinner/late night)
- Paycheck proximity (day after deposit = different context)
- Holiday/event detection (Black Friday, Valentine’s Day)
- Recurring transaction detection
- Unusual timing flags (3am purchase vs usual patterns)

Questions to Investigate

- Can we access user’s calendar with permission?
- Public holiday APIs for context
- How to detect pay cycles from deposits
- Timezone handling for travel

4. Amount & Pattern Analysis

Possibilities

- Relative size (“3x your usual grocery spend”)
- Round numbers vs precise (likely split bills)
- Multiple same-merchant same-day (coffee meeting?)
- Tip detection in restaurant amounts
- Subscription vs one-time detection
- Price-per-item inference ($14.50 at coffee = 2 drinks)

Questions to Investigate

- Statistical analysis for “unusual” amounts
- How to infer item counts from totals
- Building merchant-specific price models

5. Email Receipt Integration

Possibilities

- Line item details from email receipts
- Product names and quantities
- Digital receipt parsing (Amazon, Target, etc.)
- Order confirmation context
- Shipping vs pickup detection
- Return/refund matching

Questions to Investigate

- Gmail API integration requirements
- Receipt parsing services (Sensibill, Microblink)
- Email permission and privacy concerns
- Coverage % - how many merchants email receipts?
- Complexity of parsing different receipt formats

6. Merchant Intelligence

Possibilities

- Business hours (late night McDonald’s vs dinner)
- Merchant type beyond category (fast food vs restaurant)
- Price tier of establishment
- Popular items at that merchant
- Merchant logos/imagery
- Chain vs local business

Questions to Investigate

- Merchant enrichment APIs (Plaid’s own, or third-party)
- Google Places API for business details
- Yelp/Foursquare APIs for context
- Building our own merchant database over time

7. Social & Shared Context

Possibilities

- Multiple cards charged at same merchant/time (group dinner)
- Venmo/Zelle near transaction (splitting costs)
- Contact proximity (if they share KANE)
- Special occasions in social circle

Questions to Investigate

- Privacy boundaries and user comfort
- Detecting split bills without being creepy
- Opt-in social features

8. Device & Behavioral Signals

Possibilities

- Purchase made via app vs physical card
- New merchant vs repeat visit
- Shopping session detection (multiple stores in sequence)
- Impulse vs planned (search history?)
- Post-purchase behavior (immediate return?)

Questions to Investigate

- What device/channel data does Plaid provide?
- Browser extension for online purchase context?
- Mobile app location permissions

9. External Data Enrichment

Possibilities

- Weather data (rainy day shopping)
- Stock market that day (stress shopping?)
- News events (pandemic panic buying)
- Sports scores (celebration/consolation)
- Traffic/transit delays (grabbed Uber instead)

Questions to Investigate

- Cost of weather/news APIs
- Relevance vs noise in external data
- How to connect external events to spending

10. User-Provided Context

Possibilities

- Photo attachment to transactions
- Voice memo about purchase
- Quick tags/emojis
- Future purchase planning that provides context
- Sharing why they bought something

Questions to Investigate

- Storage costs for media
- Minimal friction input methods
- How much will users actually annotate?

11. LLM Analysis Capabilities

Possibilities

- Narrative generation from multiple signals
- Sentiment analysis of purchase patterns
- Anomaly detection in spending
- Category inference beyond Plaid’s
- Natural language summaries

Questions to Investigate

- OpenAI vs Claude vs Llama for transaction analysis
- Cost per transaction for LLM processing
- Latency requirements
- Fine-tuning on transaction data
- Privacy/security of sending financial data to LLMs

12. Cross-Transaction Intelligence

Possibilities

- Purchase chains (coffee after gym)
- Complementary purchases (groceries + wine)
- Substitute detection (Starbucks vs Blue Bottle)
- Lifecycle tracking (furniture purchases = moving?)
- Seasonal patterns

Questions to Investigate

- How much history needed for patterns?
- Real-time vs batch processing
- Storage of derived insights

Priority Research Questions

1. **Coverage mapping**: For each data type, what % of transactions will have it?
2. **Latency budget**: How fast must memory generation be?
3. **Privacy boundaries**: What's too creepy even if technically possible?
4. **Cost per transaction**: What's our budget for external API calls?
5. **Fallback strategy**: What's the minimum viable memory when data is sparse?

Next Steps

Engineering team should:

1. Spike on Plaid's enhanced data to map actual coverage
2. Price out top 3 external APIs (maps, weather, merchant)
3. Test LLM transaction summarization with real data
4. Build proof-of-concept for email receipt parsing
5. Survey users on comfort with different data types

Design team needs:

- List of guaranteed vs maybe vs unlikely data types
- Latency constraints for memory generation

- Understanding of coverage gaps

Open Questions

- Should memories be generated real-time or batch processed?
- How do we handle transactions with zero context available?
- What’s our stance on storing derived insights vs regenerating?
- Can we build this incrementally or does it need critical mass?
- How do we measure if a memory “worked”?