Project Proposal:
Product Analytics Dashboard - User Retention & Engagement Dashboard

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Project Title: User Retention & Engagement Dashboard
Category: Product Analytics, SQL, Python, Dashboarding

Problem Identification

Problem Statement:
In many digital products and mobile applications, user acquisition is only half the challenge, retaining users and keeping them engaged over time is far more crucial for long-term growth.

However, product teams often lack a unified, data-driven view of retention trends, churn behavior, and user engagement across cohorts.

This project aims to build an **interactive User Retention and Engagement Dashboard** that provides insights into how users interact with the product over time, measuring retention rates, churn patterns, cohort behavior, and platform-level engagement.

The goal is to help stakeholders make informed product decisions that increase user lifetime value (LTV) and satisfaction.

Context:

Retention is one of the most critical drivers of business growth. Companies like Netflix, Spotify, and Airbnb analyze retention daily to optimize onboarding, feature adoption, and reactivation strategies.

This project replicates a **real-world product analytics workflow**, combining SQL, Python, and visualization tools to measure retention metrics and reveal behavioral insights.

It represents the work of a **Product Analyst or Data Scientist** in growth and product teams focused on engagement and retention optimization.

Criteria for Success:
- Build a clean, analysis-ready dataset using SQL and Python.
- Define and compute key metrics:
  - **DAU, WAU, MAU (Daily/Weekly/Monthly Active Users)**

- ○ **Retention Rate (Day 1, Day 7, Day 30)**
- ○ **Churn Rate**
- ○ **Cohort Retention Matrix**
- ○ **Stickiness Ratio (DAU/MAU)**
- ○ **Average Session Duration and Frequency**
- Build an **interactive Streamlit or Tableau dashboard** for visual exploration.
- Provide clear, actionable recommendations to improve user retention.
- Support findings with clear visualizations and insights in a final report.

Scope of Solution Space:

In-Scope:
- Data cleaning, transformation, and aggregation (Python & SQL)
- Retention and churn analysis
- Cohort analysis (weekly/monthly cohorts)
- Funnel and engagement metrics visualization
- Dashboard design (Streamlit/Plotly/Tableau)
- Strategic recommendations

Out-of-Scope:
- Real-time analytics pipeline
- Predictive churn modeling (optional extension)
- A/B testing implementation

Constraints:
- Dataset may include missing or inconsistent timestamps requiring preprocessing.
- Sparse user activity may affect retention metric accuracy.
- Large aggregations may require optimization for performance.
- Visualization dashboards need careful layout for interpretability.

Stakeholders:

Primary Stakeholder (Hypothetical):
Product Growth and Analytics Team at a SaaS or mobile app company

Secondary Stakeholders:
- **Product Managers:** Track retention and engagement KPIs
- **Marketing Team:** Design reactivation and user lifecycle campaigns
- **Leadership:** Monitor LTV and user growth trends
- **Engineering Team:** Identify UX or technical bottlenecks causing churn

Data Sources
Dataset: [How to Do Product Analytics (Kaggle)](#)

Description:
A simulated event-level dataset capturing user behavior and interactions within a digital product.
Key Columns:
- `user_id`
- `event_name` (e.g., signup, login, view_page, purchase)
- `event_time`
- `session_id`
- `platform` (web, iOS, Android)
- `country`
- `device_type`
- `purchase_value` (if applicable)

This dataset enables time-based retention, churn, and engagement analyses across cohorts and platforms.

Tools & Technologies

Category	Tools / Libraries
Data Handling & Analysis	Python, Pandas, NumPy, SQL (SQLite or PostgreSQL)
Visualization & Dashboard	Matplotlib, Seaborn, Plotly, Streamlit or Tableau
Environment & Development	Jupyter Notebook, VS Code
Version Control & Collaboration	GitHub
Optional Extensions	Polars (for faster processing), Power BI (for visual comparison)

1. Data Exploration (EDA)
- Inspect event logs and session data using Pandas and SQL queries.
- Analyze user distribution by country, platform, and event frequency.
- Identify missing values, duplicates, and outliers.

2. Data Transformation
- Convert timestamps to datetime format and derive key variables:
    - `signup_date`, `last_active_date`, `days_active`, `days_since_signup`

- Group users into **weekly or monthly cohorts** based on signup date.
- Compute churn and retention intervals.

3. Metric Computation
- Calculate:
    - DAU, WAU, MAU
    - Retention rate and churn rate by cohort
    - Stickiness (DAU/MAU)
    - Engagement depth (average sessions/user)
- Create cohort retention matrices and retention curves.

4. Dashboard Development
- Build an interactive dashboard in **Streamlit** or **Tableau** featuring:
    - Retention curves by cohort
    - DAU/WAU/MAU trends over time
    - Platform and geography breakdowns
    - Feature usage vs. retention correlation
    - Churn rate visualization

5. Insights & Recommendations
- Identify at-risk cohorts with steep drop-offs.
- Suggest feature, onboarding, or engagement changes to boost retention.
- Recommend follow-up experiments (e.g., push notifications, email re-engagement).

Deliverables
- **Jupyter Notebook** with SQL, Python code, and visualizations
- **Interactive Dashboard** (Streamlit or Tableau)
- **Final Report (PDF)** summarizing methodology, insights, and recommendations
- **Slide Deck Presentation** for stakeholders

Expected Impact
This project will demonstrate my ability to:
- Build a complete **product analytics pipeline** from raw events to insights
- Apply SQL and Python to derive retention and engagement metrics
- Design a visually appealing **dashboard** communicating user behavior patterns
- Deliver actionable insights for business growth and customer retention