Android Market Discovery: helping users discover apps!

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Outline

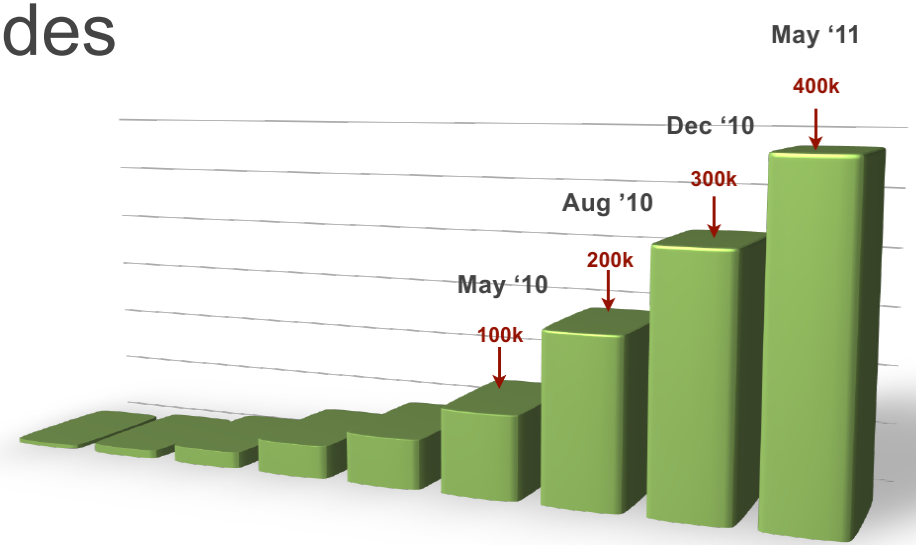
- Android and its growth
- Main challenges for users and developers
- Enabling discovery
- Discovery across the shopping funnel
- Features and algorithms
- Whats next?

Android - a growth story

Huge growth on the platform!

Main reasons:

1. Platform openness
2. High quality, Quick upgrades
3. Manufacturer adoption
3. Developer adoption



~550k activations a day
~300 devices (models) running Android 1.5 - 2.3
~6 billion installs of apps to date!

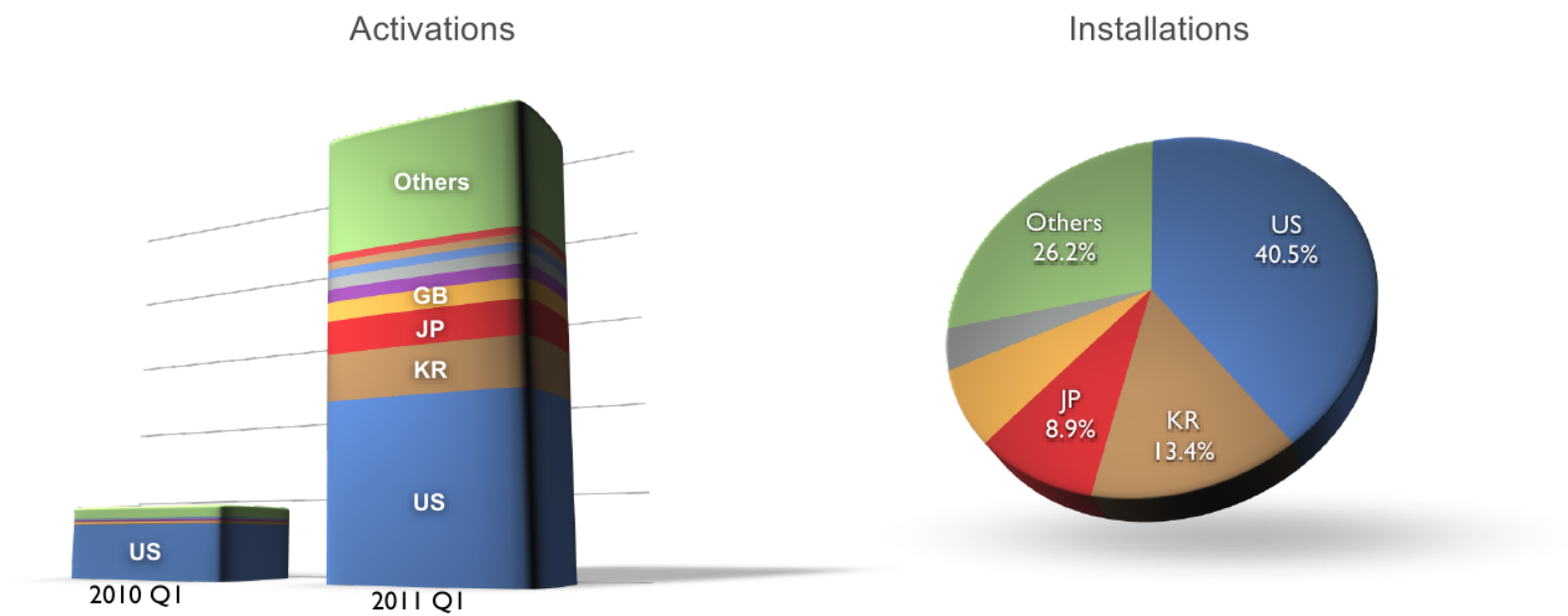
Android's global growth

Global growth in 2011, as opposed to US only!

Users from all over the world

1. Applications developed are both global and local
2. Very diverse user base, needs are very different
Users from 131 countries can download paid apps!

Platform's success ultimately depends on apps usage!



Android Apps: Oppurtunities and Challenges

Open App publishing platform leads to low entry barrier

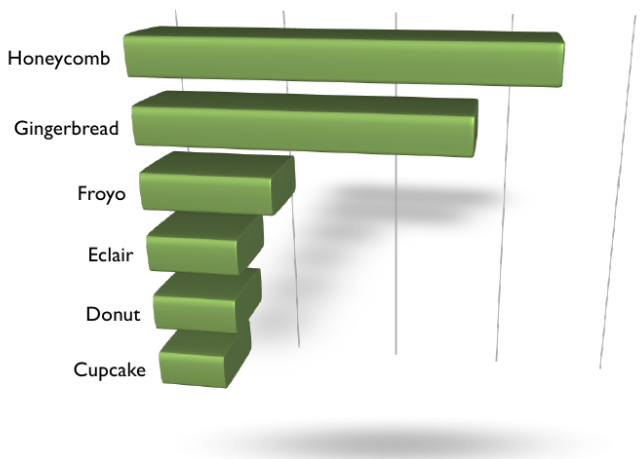
Developers from all over the world can create apps

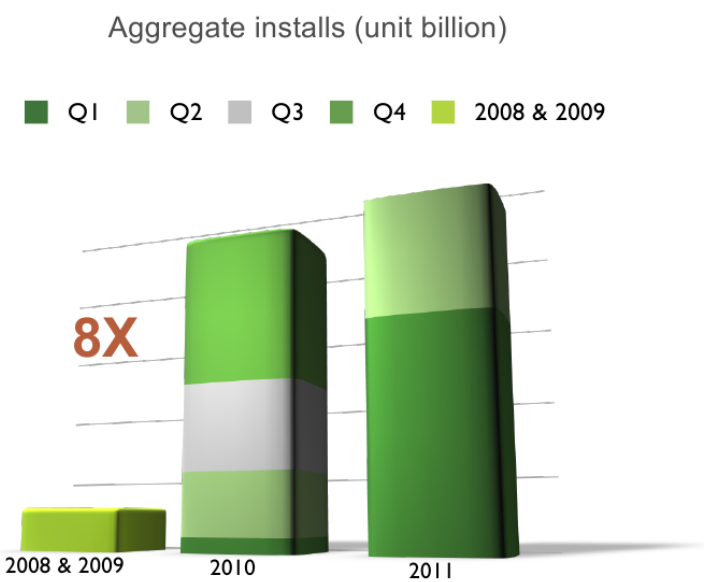
Whats working well

- Fast growth of app base: > 200k growing XY%
- Newer OS versions more conducive to app usage
- User adoption of popular apps

Main challenges

- Users: find interesting apps easily
- Developers: merchandise new apps





A New Android Market for Phones

Enabling App Discovery

Users want to find out what they are missing!

Fast growing corpora more conducive to discovery

- Search is harder to do: smaller/untrusted text descriptions
- Users' intent unclear: 'new hottest games'

Pivoting of early adopters and the crowd:

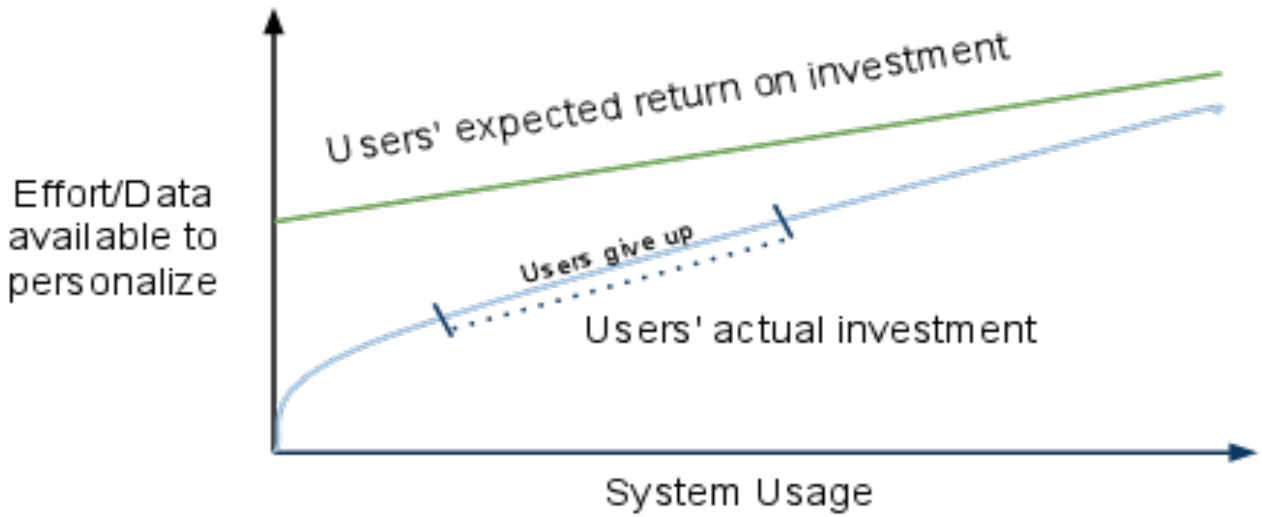
- What are other users doing?
- What hot apps am I missing?
- What is the best keyboard?
- What is popular amongst people in my city/country?
- What do people like me/my friends do?

Device constraints

- Scrolling is easier than typing!
- Browsing more comfortable/easier than searching

Challenges with Personalized Discovery

Motivation: Serving our users better requires understanding them better, and in totality.



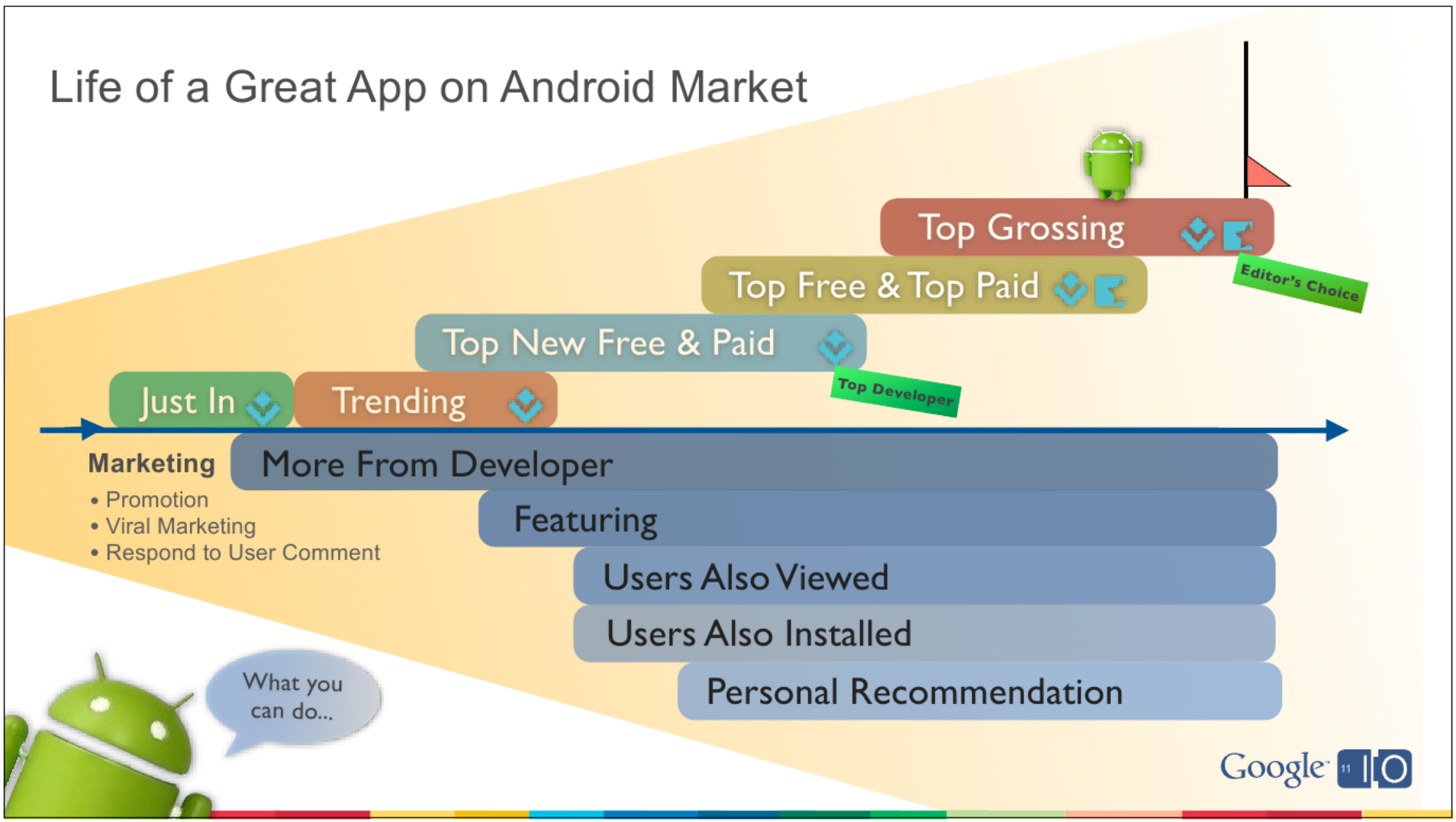
Challenges with Personalized discovery

- User investments are higher
- Benefits take longer
- User expectations are higher

Solution: Use "Wisdom of the crowds" extensively

Discovery across the funnel: Android Market

Objective: Help users discover apps, drive engagement!



1. Trending Apps Recommendations

Objective: Show apps which are gaining popularity

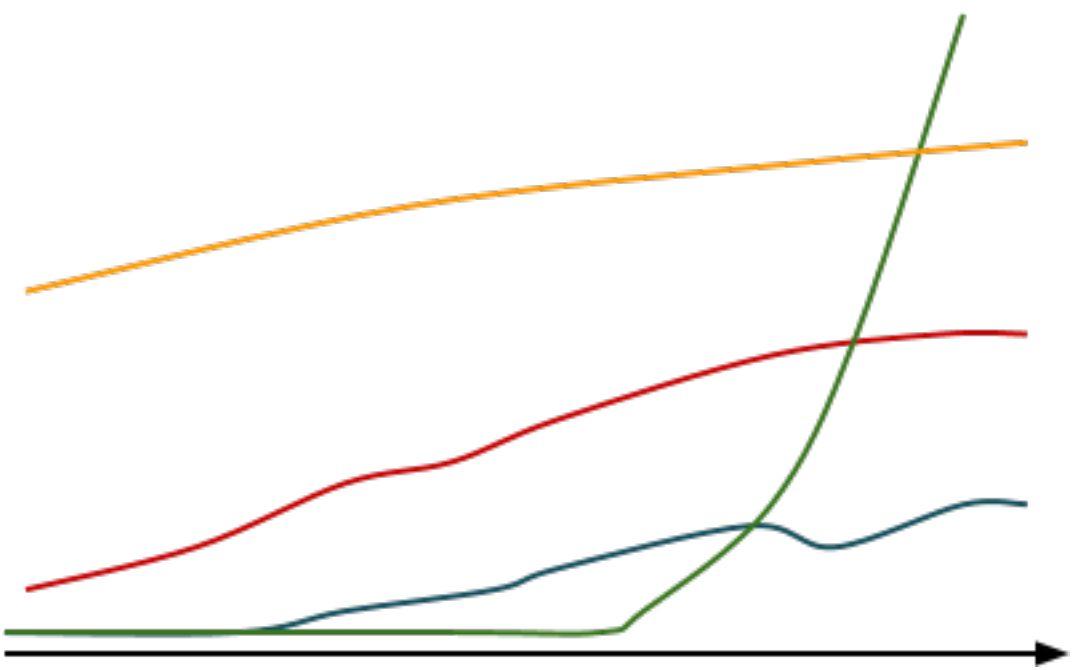
What we use:

Step 1: Collect recent installation logs from Android Market

Step 2: Calculate normalized "force" per app

Step 3: Rank & filter

Status: Launched on Web + Phone



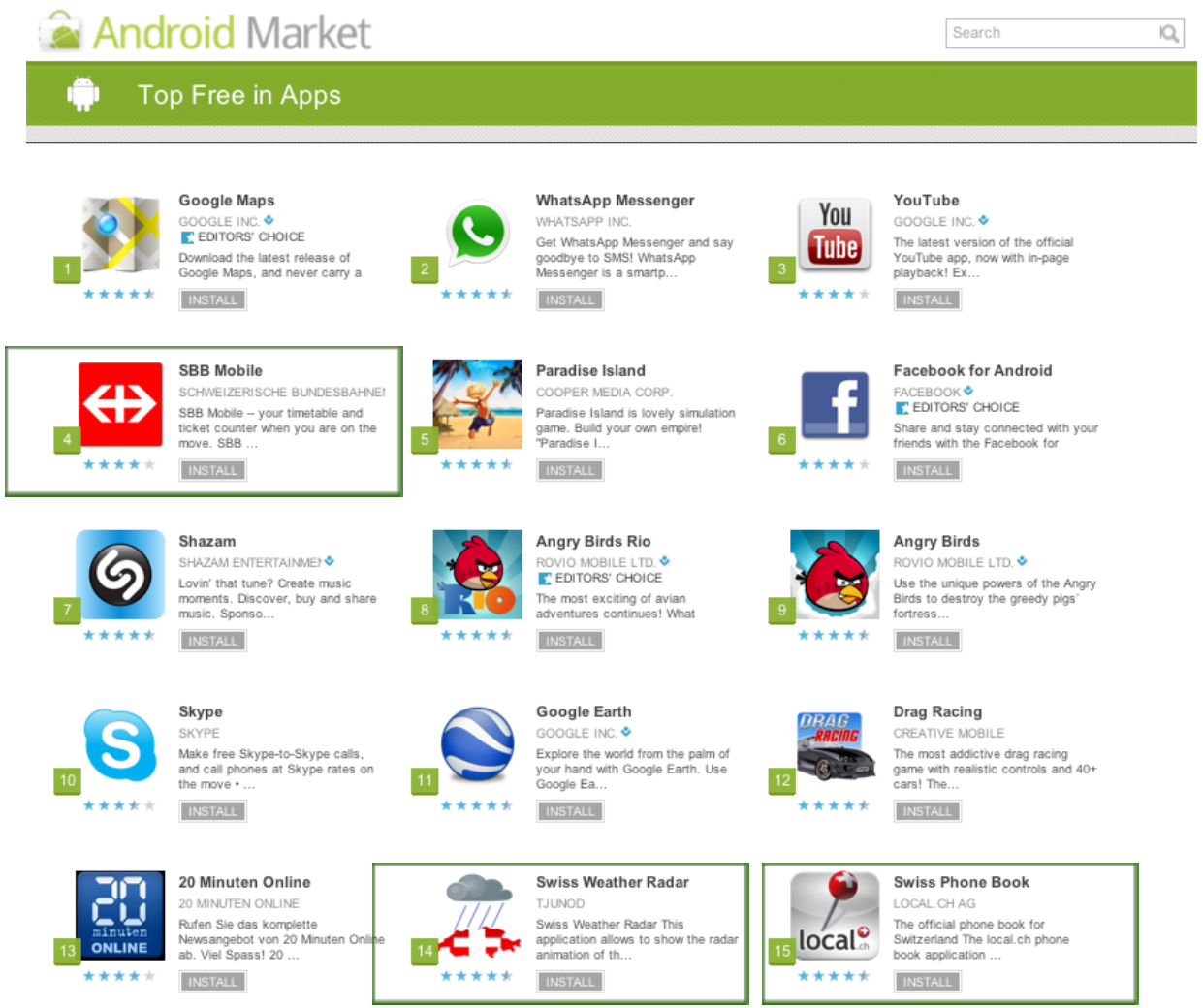
2. Top Lists

Give users a new way to discover apps that are local!

- New lists:Top New Free/ Top New Paid
- Revamped lists: Top Paid/ Top Free
- Top Grossing Apps

Encourages local developers, helps user find niche apps easily!

Also, top grossing list encourages in-app purchase integration and higher average price.



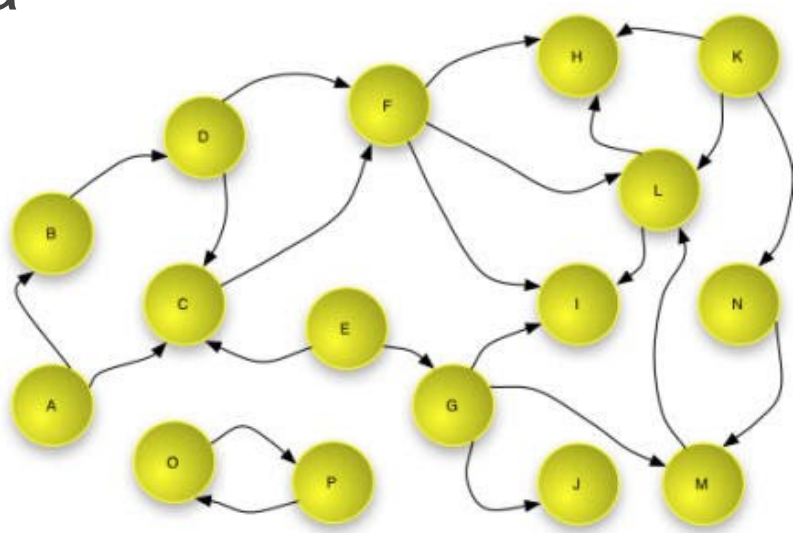
3. Related Apps Recommendations - shallow dive

Related Items Recommendations

- Formally: hard to describe: *graph problem*?
- For each items
  - Most likely items to be clicked next (YT Related Video)
  - Most likely Replacement (Product search, Android)
  - Most similar thematically (books, similar pages)
- Objective: Find a list to match criteria

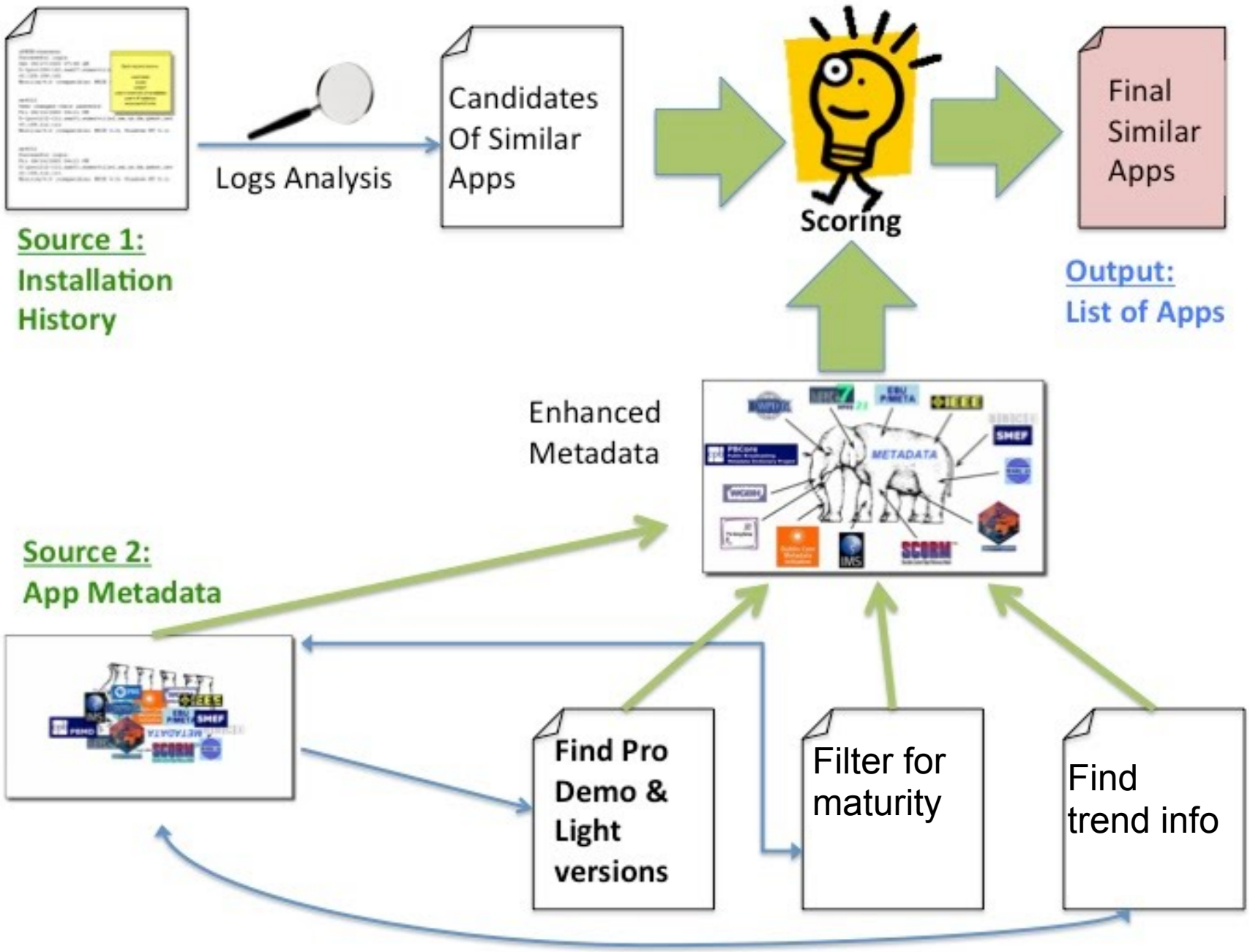
Common Methods:

Association rule mining
Graph methods
Bayesian models



Simple view counts
What we use: Association rule mining++ (Using content, metadata, category, ratings, social signals, filtering, recency)

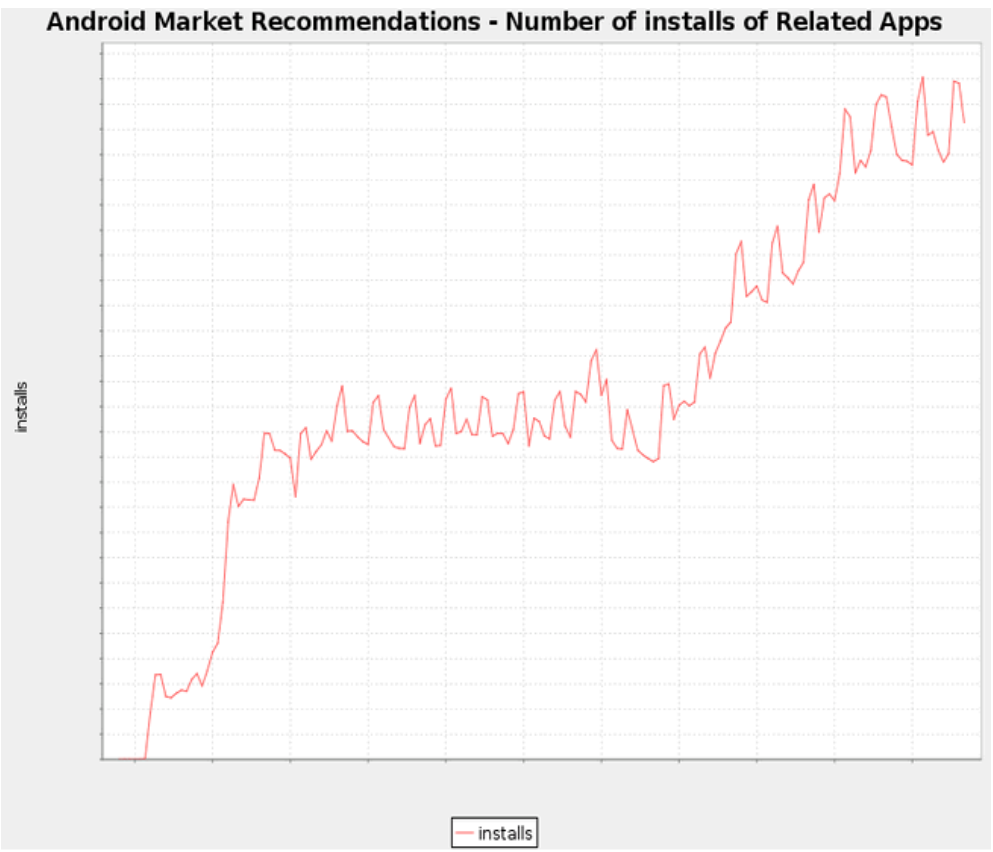
3(b) Architecture: Related Apps Generation

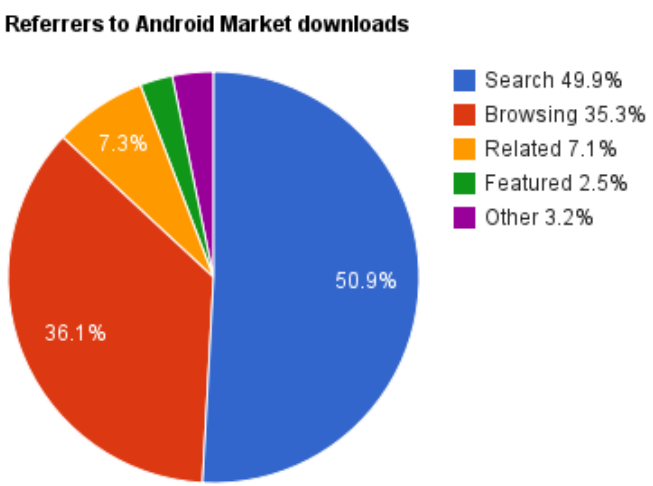


3(c) Related App Usage

Objective: For each app, find *Most likely Replacement*

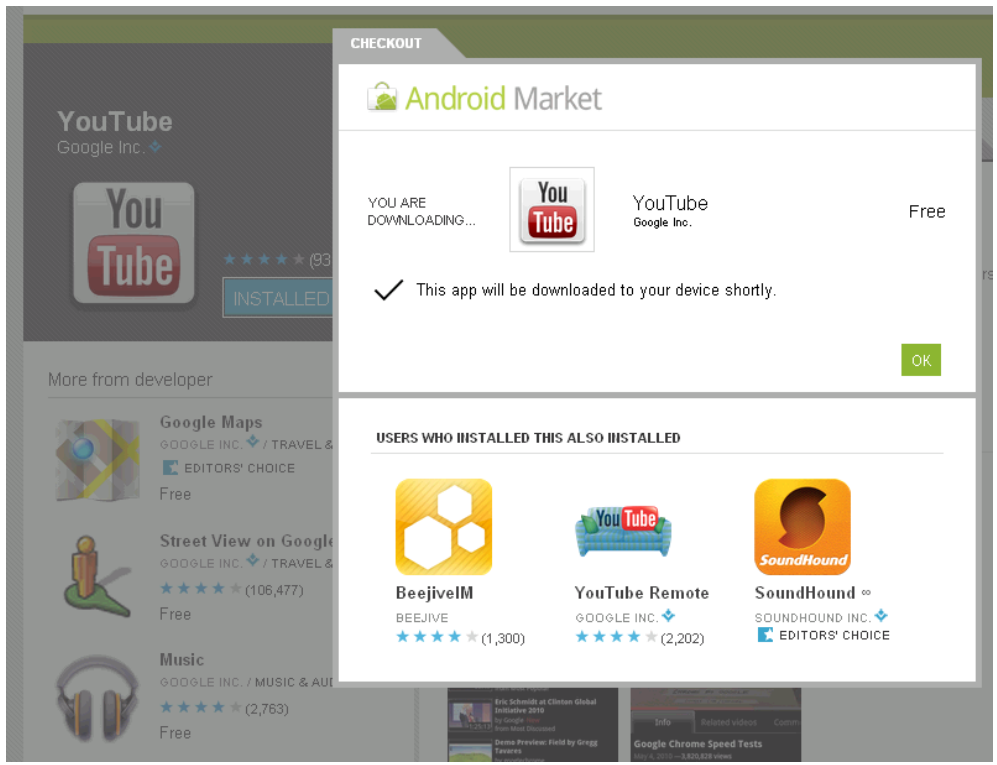
Stats:
7-8% of daily installs from Related >1k QPS





4. Cross Sell recommendations - shallow dive

Objective: When a user installs an app, show the other apps they might be interested in.



What we use:

Step 1: Analyze install patterns, merge versions

Step 2: Probabilistic model for ranking/scoring

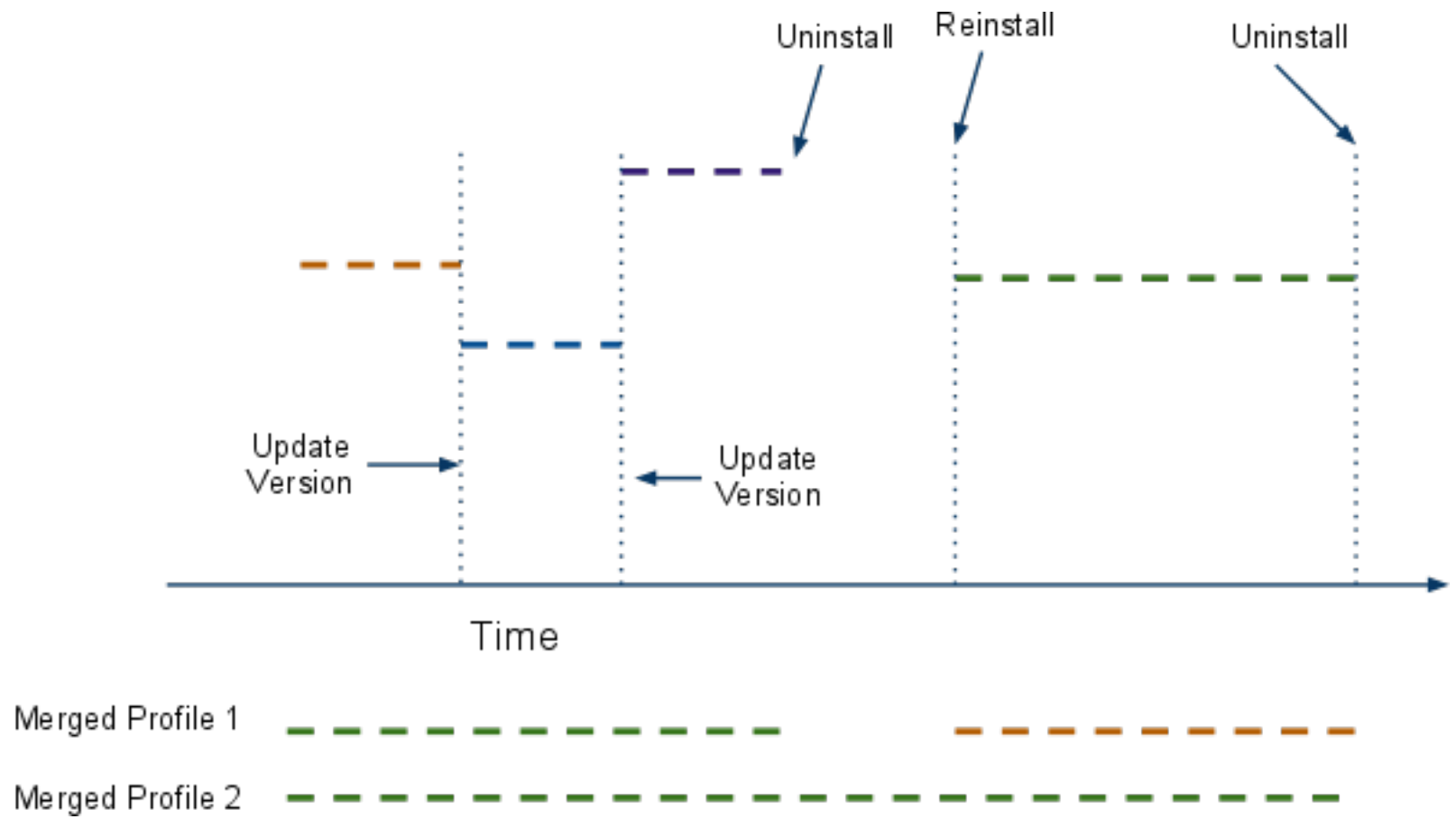
Step 3: Removal of low-quality apps

~5 billion un/installs, analyzed daily: (increasing x% per month)

4(a) Life of an Installed App

- Users install, uninstall, re-install, update apps frequently.
- Results in noisy data for co-install analysis

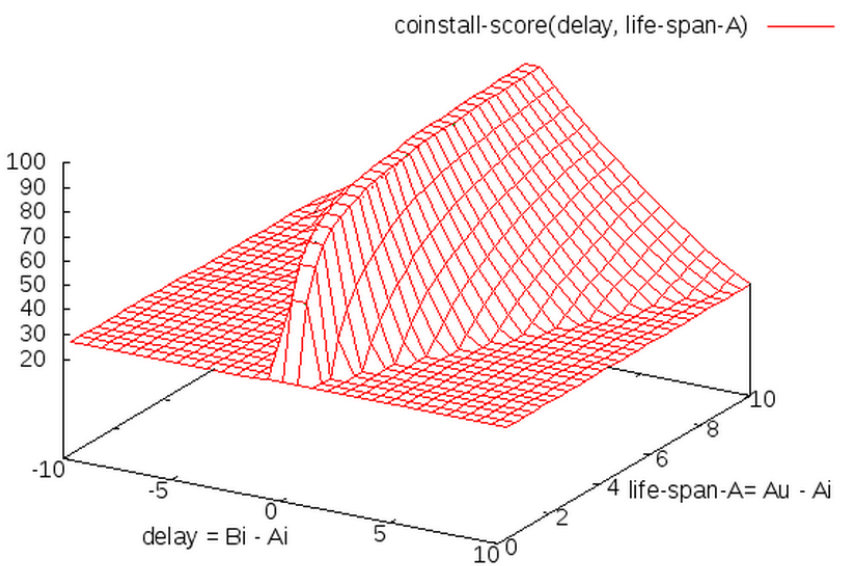
Merging installs is important!



4(b) Scoring Co-installs

1. Weight co-installs

- For each user, consider
  - Consider all pairs (A, B) of installed apps
  - MR: Output(A&B, co-install-weight(A,B)); (non-symmetric)
  - MR: Output(A, 1.0); Output(B, 1.0);
- Co-install weight takes into account
  - A & B installed closely after each other
  - B installed after A is uninstalled/long after A is installed



4(c) Scoring Candidates

2. Normalize co-installs, and compute probability scores

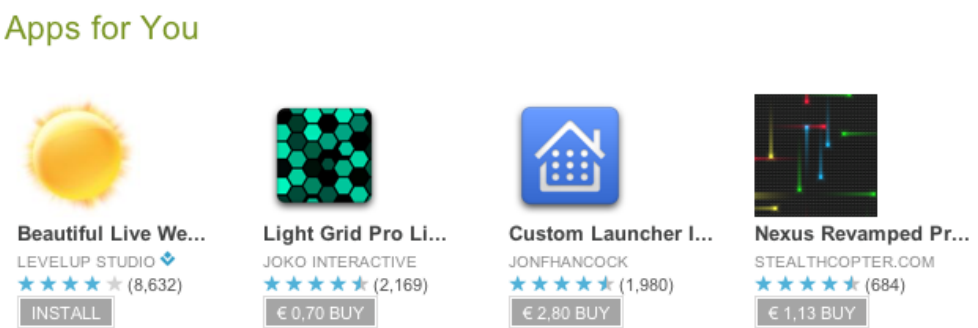
- For each pair of App, consider w(A,B), w(A), w(B)
  - Independence: $I = 1 - P(!A \mid B)$
  - Lift $L = P(A|B)$
  - Score = $k * I^a * L^b$
  - Normalization is key!

3. Remove Noise

- For each App, consider all candidate
  - Remove low rated, low quality apps (< 10 install)
  - Remove apps in incompatible category*
  - Remove apps rated mature.
  - Multiply score by quality score
  - Rerank!

5. Personalized Recommendations

Objective: Given users a ranked list personalized for them



What we use:

Step 1: Candidate generation item2itemCF,recent, local, popular

Step 2: Perceptron learning over chosen features (is this a top 100 app? in same language as user locale?)

80+ million profiles, 5 billion un/installs: (increasing x% per month) *One of the largest recommender system in the world!*

Whats next for Android Market Discovery?

Measure and iterate
Extend to other media e.g. Books

From ***Wired***:

"*The biggest problem we have in the Market is discovery," said Michael Novak, Android engineer for Groupme.com, in an interview. "Google has definitely heard the complaints from people like me, and these new features being rolled out are proof.*"