
Taxonomy of User Signals

Users generate a wide variety of behavioral signals as they use mobile apps and visit websites, and not all signals are created equal. The amount, type, and value of information conveyed by any individual signal varies greatly depending on whether that signal is generated by liking a post, purchasing an item, toggling a user setting, or any other user activity.

Signals can be characterized on at least four different spectrums:

- **Impulsive to Deliberative:** This spectrum represents the user's state of mind when interacting with the recommender system, i.e., whether they are acting automatically (impulsively) or with a degree of intention or conscious self-reflection (deliberatively). Users could be acting impulsively when scrolling through their feeds for long periods of time, for example, and deliberately when writing long comments or selecting from among different videos. Similar examples exist in other domains, for example, impulsively eating potato chips versus deliberately choosing a healthy meal.
- **Effortless to Onerous:** This spectrum represents the level of effort users expend when using different affordances or features of an online platform. Some actions on a platform require more time, focus, and steps to complete than others.
- **Inferred to Stated Preferences:** This spectrum represents the manner in which users express their preferences to platforms' recommender systems. In some cases, user preferences are inferred from their activity, while in others this process can be more explicit. For example, a platform might infer users' preferences based on the users dwelling on an item, or users may explicitly state their preferences when toggling user controls or responding to surveys.
- **Ambiguous to Clear:** This spectrum represents the confidence with which a given signal accurately captures information about what it purports to measure. For some signals there can be multiple interpretations about their meaning and therefore uncertainty as to whether they communicate meaningful information. For example, sometimes users comment on items they like, while at other times they comment on items they do not like, creating ambiguity about what the act of commenting (setting aside the content of the comment) indicates.

These spectrums are not entirely independent of one another. Some characteristics of signals will tend to correlate. For example, if a signal indicates a user behavior that occupies a lot of time (e.g., filling out a long survey), that onerous signal is also more likely to be deliberative.

The existence of specific signals can also be intertwined with the incentive structures of the platform. Content creators might encourage their followers to like a post or send a direct message because they perceive this behavior to be algorithmically beneficial to their content. Retailers might encourage users to leave reviews or reshare content to be entered into contests or sweepstakes.

Examples of Each Signal Type

Spectrum	Examples
Impulsive ←→ Deliberative	<p>Impulsive: resharing a link without clicking on it first, liking a video without watching most of it, writing short/quick comments</p> <p>Deliberative: writing long comments, filling out surveys, long watch time, bookmarks, user controls</p>
Effortless ←→ Onerous	<p>Effortless: clicks, reactions, reshares, upvotes/downvotes</p> <p>Onerous: writing long comments, filling out long surveys, long watch time</p>
Inferred preference ←→ Stated preference	<p>Inferred preference: dwell time, clicks, reshares</p> <p>Stated preference: user controls, survey responses, purchases, value-based reactions (e.g., “insightful”, “respect” buttons), up-votes, searches for specific keywords</p>
Ambiguous ←→ Clear	<p>Ambiguous: dwell time, watch time, clicks, likes, reshares, comments, feature usage, upvotes/downvotes, purchases (due to impulse buys), follows (due to tracking disfavored accounts)</p> <p>Clear: user controls, survey responses, value-based reactions, long-term user retention</p>