Explanation Document

Pixie random walks are a real-time recommendation algorithm originally developed for Pinterest to enable its discovery system, allowing users to find similar content they showed interest in. This system provides tailor-made, scalable results using a traversal technique called "biased random walks". These pixie walks use a bipartite graph that contains nodes representing users and items in a system, as well as edges representing a user's interest in another item. These edges can hold different weights, which determine how likely that edge is to be traversed in comparison to other edges leading out from a given node. A pixie-inspired system like this would make use of features like: a large graph of interactions between users and items, a random walk algorithm that incorporates teleports, bias, and weights, and a method to filter and interpret the results into actual recommendations.

In a random walk, the algorithm begins at a chosen node (which is normally an item the user in question favors) and follows the edges to traverse the graph. The probability of following any given edge while at a node depends on the structure of the graph and traversal rules. Since the random walk starts on a specific user node, the random walk is personalized for them and is affected by biases such as recency, popularity, and other factors. There is also a chance that the walk will teleport at any given node instead of traversing to encourage exploration near the user. What makes random walks so efficient is that they are easy to explain (e.g., "people with similar interests also liked this"), scalable, and easy to update as interests change.

As mentioned earlier, Pinterest is a prime example of this being applied in the real world, as users interact with pins via different methods (liking, downloading, favoriting, marking "not interested"), it helps update a user's node and the edges that connect it with other nodes. This

allows for active updating of the graph as the user reveals more about their interests. This also works with movies and streaming platforms such as Netflix, where the types of films you watch, how long you watch them, and the percentage of episodes you watch all go towards building your recommended feed. Additionally it can be also used for E-commerce websites like Amazon and Etsy, or for Social Media platforms like LinkedIn and Facebook for similar purposes.