CLAIMS

1. A multi-window time-aware personalized recommendation system, the system comprising:

a memory having computer-readable instructions stored therein; and

a processor configured to:

access purchase history of one or more users;

select a pair of items purchased by the one or more users based on the purchase history,

determine a contributory affinity value between a first item and a second item of the selected pair of items for each of the one or more users; wherein the contributory affinity value is determined based on a first time-decay function and a second time-decay function associated with purchase times of the first and second items;

estimate the first time-decay function $f1(x)$ based upon a time difference between purchases of the first item and the second item, in accordance with the relationship:

$f1(x) = 1 - 1/(1 + e^{\Lambda}(a1 - b1 * x))$, where $a1$ and $b1$ are parameters associated with the decay of the first time-decay function $f1(x)$;

estimate the second time-decay function $f2(x)$ based upon a time difference between a reference time and a maximum of the purchase time of the first and second items, in accordance with the relationship:

$f2(x) = 1 - 1/(1 + e^{\Lambda}(a2 - b2 * x))$, where $a2$ and $b2$ are parameters associated with the decay of the second time-decay function $f2(x)$; and

combine the contributory affinity values for each of the one or more users to estimate the affinity value between the first and second item.

2. The multi-window time-aware personalized recommendation system of claim 1, wherein the processor is further configured to execute the computer-readable instructions to select the pair of items from a plurality of items available in a retail store, listed on a web portal of a retail store, or combinations thereof.

3. The multi-window time-aware personalized recommendation system of claim 1, wherein the processor is further configured to execute the computer-readable instructions to estimate the contributory affinity value ($A1$) between the first item $i1$ and the second item $i2$ purchased by a user at time $t1$ and $t2$ respectively in accordance with the relationship:
$A1 = f1(|t1 - t2|) * f2(|tf - \max(t1, t2)|)$, where $f1$ and $f2$ are the first and second time –decay functions respectively and tf is the reference time.

4. The multi-window time-aware personalized recommendation system of claim 1, wherein the processor is further configured to execute the computer-readable instructions to:
estimate a plurality of values of the contributory affinity value (A1) corresponding to the user's purchase of the first item *i1* and the second item *i2* at different points in time of a time-window;
estimate a representative affinity value (RA1) using the multiple A1 values for the corresponding user;
determine a window affinity value (WA1) for the time-window based on the representative affinity value for the user; and
estimate a final affinity value (FA) between the first item *i1* and the second item *i2* based on a weighted combination of the individual window affinity values.

5. The multi-window time-aware personalized recommendation system of claim 4, wherein the processor is further configured to execute the computer-readable instructions to select items purchased corresponding to an average, maximum, or minimum by each of the one or more users to determine the contributory affinity value between the first item and the second item of each of the selected pair of items.

6. The multi-window time-aware personalized recommendation system of claim 1, wherein a value of the first and second time-decay functions is between 0 and 1.

7. The multi-window time-aware personalized recommendation system of claim 1, wherein the processor is further configured to execute the computer-readable instructions to generate a personalized item ranking of each of the plurality of items for each user based on contribution of affinity of each item in the purchase history of the respective user towards the rest of the items, wherein the contribution of the first item $i1$ purchased at a time $t1$ to each of the other items ik in accordance with the relationship:
$FA(i1, ik) * f3(|tf - t1|)$, where $FA(i1, ik)$ is multi-window affinity between $i1$ and ik, $f3$(x) is a time-decay function and tf is a reference time.

8. The multi-window time-aware personalized recommendation system of claim 7, wherein the processor is further configured to execute the computer-readable instructions to estimate the time-decay function $f3(x)$ in accordance with the relationship:
$f3(x) = 1 - 1/(1 + e^{\Lambda}(a3 - b3 * x))$.

9. The multi-window time-aware personalized recommendation system of claim 7, wherein the processor is further configured to execute the computer-readable instructions to combine the contributions of each pair of items towards other items to estimate item relevancy scores of each of the items for the respective user.

10. The multi-window time-aware personalized recommendation system of claim 9, wherein the processor is further configured to execute the computer-readable instructions to rank the items based on the item relevancy scores and to generate personalized recommendations for the respective user.

11. The multi-window time-aware personalized recommendation system of claim 9, further comprising a user interface to transmit the generated personalized recommendations to the user.

12. The multi-window time-aware personalized recommendation system of claim 8, wherein the processor is further configured to execute the computer-readable instructions to adjust parameters of the first time-decay function, the second time decay function, and the time-decay function $f3(x)$ such that the first time-decay function, the second time-decay function, and the time-decay function $f3(x)$ have a concave, a convex shape, or combinations thereof.

13. A method for generating personalized recommendations for a user, the method comprising:

accessing purchase history of one or more users of an establishment;

selecting an item training data set for determining item-item affinity for the item training data set;

identifying a plurality of item pairs for each user in the item training data set based upon the purchase history of the respective user;

determining a contributory affinity value between a first item and a second item of each of the item pairs for each user; wherein the contributory affinity value is determined based on a first time-decay function and a second time-decay function associated with purchase times of the first and second items;

estimating the first time-decay function $f1(x)$ based upon a time difference between purchases of the first item and the second item, in accordance with the relationship:

$f1(x) = 1 - 1/(1 + e^{\Lambda}(a1 - b1 * x))$, where $a1$ and $b1$ are parameters associated with the decay of the first time-decay function $f1(x)$;

estimating the second time-decay function $f2(x)$ based upon a time difference between a reference time and a maximum of the purchase time of the first and second items, in accordance with the relationship:

$f2(x) = 1 - 1/(1 + e^{\Lambda}(a2 - b2 * x))$, where $a2$ and $b2$ are parameters associated with the decay of the second time-decay function $f2(x)$;

combining the contributory affinity values for each user to estimate the affinity value between the first and second item of each of the item pairs;

generating a personalized item ranking of each of the plurality of items for each user based on contribution of affinity of each item in the purchase history of the respective user; and

generating personalized recommendations for each user based on the generated item ranking of each of the plurality of items.

14. The method of claim 13, wherein generating the personalized recommendations further comprises combining contributions of each pair of items towards other items to estimate item relevancy scores of each of the plurality of items and generating the personalized recommendations based on the item relevancy scores.

15. The method of claim 13, wherein determining a contributory affinity value further comprises:

estimating the contributory affinity value ($A1$) between the first item $i1$ and the second item $i2$ purchased by a user at time $t1$ and $t2$ respectively in accordance with the relationship:

$A1 = f1(|t1 - t2|) * f2(|tf - \max(t1, t2)|)$, where $f1$ and $f2$ are the first and second time-decay functions respectively and tf is the reference time.