[006] A need therefore exists to provide methods and devices that seek to overcome or at least minimize the above-mentioned problems so as to provide an enhanced content rendering with optimized objectives.

SUMMARY

[006a] In an aspect, the present disclosure refers to a method for rendering organic and paid content, the method comprising:

in a device, of a social networking system, that includes a content provider determination device, a feature score ranking device, and an objective optimization device:

receiving, by the content provider determination device, a request for content from a user device of a user of the social networking system;

in response to the request, determining, by the content provider determination device, one or more organic content providers and one or more paid content providers for the user based on user's historical data on the social networking system;

ranking, by the feature score ranking device, the one or more organic content providers and the one or more paid content providers together, the ranking comprising:

ranking, by the objective optimization device, a revenue score of each of the one or more organic content providers and a revenue score of each of the one or more paid content providers, wherein the revenue score of each of the one or more organic content providers is associated with one or more features of a corresponding organic content provider of the one or more organic content providers, and wherein the revenue score of each of the one or more paid content providers is associated with one or more features of a corresponding paid content provider of the one or more paid content providers;

optimizing, by the objective optimization device, weights of the one or more features of the one or more organic content providers and the one or more features of the one or more paid content providers based on a single objective optimization or a multi-objective optimization, wherein the optimizing of the weights includes:

applying a first set of weights for the one or more features of the one or more organic content providers in a case where the one or more organic content providers are in a first user's group, and

applying a second set of weights for the one or more features of the one or more paid content providers in a case where the one or more paid content providers are in a second user's group, wherein the second set of weights is different from the first set of weights;

computing, by the objective optimization device, final revenue scores for the one or more organic content providers and the one or more paid content providers based on the first set of weights of the one or more features of the one or more organic content providers and the second set of weights of the one or more features of the one or more paid content providers; and

re-ranking, by the objective optimization device, an order of the one or more organic content providers and the one or more paid content providers according to the computed final revenue scores; and

selecting, by the objective optimization device for the rendering of the organic and paid content, a list of organic content providers and paid content providers based on the re-ranking of the order of the one or more organic content providers and the one or more paid content providers.

[006b] In another aspect, the present disclosure refers to a device for rendering organic and paid content, the device comprising:

at least one processor; and

a memory including computer program code for execution by the at least one processor, the computer program code instructs the at least one processor to:

receive a request for content from a user device of a user of a social networking system;

in response to the request, determine one or more organic content providers and one or more paid content providers for the user based on the user's historical data on the social networking system;

rank the one or more organic content providers and the one or more paid content providers together, the ranking comprising:

rank a revenue score of each of the one or more organic content providers and a revenue score of each of the one or more paid content providers, wherein the revenue score of each of the one or more organic content providers is associated with one or more features of a corresponding organic content provider of the one or more organic content providers, and wherein the revenue score of each of the one or more paid content providers is associated with one or more features of a corresponding paid content provider of the one or more paid content providers,

optimize weights of the one or more features of the one or more organic content providers and the one or more features of the one or more paid content providers based on a single objective optimization or a multi-objective optimization, wherein the optimizing of the weights includes:

applying a first set of weights for the one or more features of the one or more organic content providers in a case where the one or more organic content providers are in a first user's group, and

applying a second set of weights for the one or more features of the one or more paid content providers in a case where the one or more paid content providers are in a second user's group, wherein the second set of weights is different from the first set of weights;

compute final revenue scores for the one or more organic content providers and the one or more paid content providers based on the first set of weights of the one or more features of the one or more organic content providers and the second set of weights of the one or more features of the one or more paid content providers; and

re-rank an order of the one or more organic content providers and the one or more paid content providers according to the computed final revenue scores; and

select a list of organic content providers and paid content providers based on the re-ranking of the order of the one or more organic content providers and the one or more paid content providers.

[006c] In another aspect, the present disclosure refers to a non-transitory computer readable storage medium having instructions encoded thereon that, when executed by a processor, cause the processor to:

receive a request for content from a user device of a user of a social networking system;

in response to the request, determine one or more organic content providers and one or more paid content providers for the user based on user's historical data on the social networking system;

rank the one or more organic content providers and the one or more paid content providers together, the ranking comprising:

rank a revenue score of each of the one or more organic content providers and a revenue score each of the one or more paid content providers, wherein the revenue score of each of the one or more organic content providers is associated with one or more features of a corresponding organic content provider of the one or more organic content providers, and wherein the revenue score of each of the one or more paid content providers is associated with one or more features of a corresponding paid content provider of the one or more paid content providers,

optimize weights of the one or more features of the one or more organic content providers and the one or more features of the one or more paid content providers based on a single objective optimization or a multi-objective optimization, wherein the optimizing of the weights includes:

applying a first set of weights for the one or more features of the one or more organic content providers in a case where the one or more organic content providers are in a first user's group, and

applying a second set of weights for the one or more features of the one or more paid content providers in a case where the one or more paid content providers are in a second user's group, wherein the second set of weights is different from the first set of weights;

compute final revenue scores for the one or more organic content providers and the one or more paid content providers based on the first set of weights of the one or more features of the one or more organic content providers and the second set of weights of the one or more features of the one or more paid content providers; and

re-rank an order of the one or more organic content providers and the one or more paid content providers according to the computed final revenue scores; and

select a list of organic content providers and paid content providers based on the re-ranking of the order of the one or more organic content providers and the one or more paid content providers.

[007] According to an example, there is provided a method for rendering organic and paid content. The method comprises: receiving a request for content from a user of a social networking system; in response to the request, determining one or more organic content providers and one or more paid content providers for the user based on the user's historical data on the social networking system, and ranking the one or more organic content providers and the one or more paid content providers together, the ranking comprising: ranking revenue scores of the one or more organic content providers and revenue scores of the one or more paid content providers, wherein the revenue score of each of the one or more organic content providers is associated with one or more features of the corresponding organic content provider, and wherein the revenue score of each of the one or more paid content providers is associated with one or more features of the corresponding paid content provider; optimizing weights of features of the one or more organic content providers and features of the one or more paid content providers based on a single objective optimization or a multi-objective optimization; computing final revenue scores for the one or more organic content providers and the one or more paid content providers based on optimized weights of the features of the one or more organic content providers and the features of the one or more paid content providers; and re-ranking an order of the one or more organic content providers and the one or more paid content providers according to their final revenue scores.

[008] According to another example, there is provided a device for rendering organic and paid content. The device comprises: at least one processor; and a memory including computer program code for execution by the at least one processor, the computer program code instructs the at least one processor to: receive a request for content from a user of a social networking system; in response to the request, determine one or more organic content providers and one or more paid content providers for the user based on the user's historical data on the social networking system, and rank the one or more organic content providers and the one or more paid content providers together, the ranking comprising: rank revenue scores of the one or more organic content providers and revenue scores of the one or more paid content providers, wherein the revenue score of each of the one or more organic content providers is associated with one or more features of the corresponding organic content provider, and wherein the revenue score of each of the one or more paid content providers is

Claims

1. A method for rendering organic and paid content, the method comprising:

in a device, of a social networking system, that includes a content provider determination device, a feature score ranking device, and an objective optimization device:

receiving, by the content provider determination device, a request for content from a user device of a user of the social networking system;

in response to the request, determining, by the content provider determination device, one or more organic content providers and one or more paid content providers for the user based on user's historical data on the social networking system;

ranking, by the feature score ranking device, the one or more organic content providers and the one or more paid content providers together, the ranking comprising:

ranking, by the objective optimization device, a revenue score of each of the one or more organic content providers and a revenue score of each of the one or more paid content providers, wherein the revenue score of each of the one or more organic content providers is associated with one or more features of a corresponding organic content provider of the one or more organic content providers, and wherein the revenue score of each of the one or more paid content providers is associated with one or more features of a corresponding paid content provider of the one or more paid content providers;

optimizing, by the objective optimization device, weights of the one or more features of the one or more organic content providers and the one or more features of the one or more paid content providers based on a single objective optimization or a multi-objective optimization, wherein the optimizing of the weights includes:

applying a first set of weights for the one or more features of the one or more organic content providers in a case where the one or more organic content providers are in a first user's group, and

applying a second set of weights for the one or more features of the one or more paid content providers in a case where the one or more paid content providers are in a second user's group, wherein the second set of weights is different from the first set of weights;

computing, by the objective optimization device, final revenue scores for the one or more organic content providers and the one or more paid content providers based on the first set of weights of the one or more features of the one or more organic content providers and the second set of weights of the one or more features of the one or more paid content providers; and

re-ranking, by the objective optimization device, an order of the one or more organic content providers and the one or more paid content providers according to the computed final revenue scores; and

selecting, by the objective optimization device for the rendering of the organic and paid content, a list of organic content providers and paid content providers based on the re-ranking of the order of the one or more organic content providers and the one or more paid content providers.

2. The method according to claim 1, wherein during the optimizing of the weights, the single objective optimization includes:

$$\max_{w}\left(a * R_{food} + (1-a) * R_{ads}\right)$$
$$subject\ to\ w_{n1} * x_{n1} + w_{n2} * x_{n2} + \cdots + w_{nI} * x_{nI} = s_n\ for\ n \in 1 \ldots N,$$

wherein

R_{food} is a sum of revenue scores of the one or more organic content providers, wherein the one or more organic content providers are one or more food merchants,

R_{ads} is a sum of revenue scores for the one or more paid content providers, wherein the one or more paid content providers are one or more ads merchants,

a is a weight for the sum of revenue scores of the one or more organic content providers,

x_{ni} is an ith feature of an organic content provider or a paid content provider ranked at nth position in the ranking of revenue scores,

ω_{ni} is a weight of the ith feature of the organic content provider or paid content provider ranked at nth position in the ranking of revenue scores, and

s_n is a final revenue score of the organic content provider or paid content provider ranked at nth position in the ranking of revenue scores.

3. The method according to any one of the preceding claims, wherein during the optimizing of the weights, the multi-objective optimization includes:

$$\max_{w} R_{food}\ and \max_{w} R_{ads}$$
$$subject\ to\ w_{n1} * x_{n1} + w_{n2} * x_{n2} + \cdots + w_{nI} * x_{nI} = s_n\ for\ n \in 1 \ldots N,$$

wherein

R_{food} is a revenue score for one of the one or more organic content providers, wherein the organic content provider is a food merchant,

R_{ads} is a revenue score for one of the one or more paid content providers, wherein the paid content provider is an ads merchant,

x_{ni} is an ith feature of an organic content provider or a paid content provider ranked at nth position in the ranking of revenue scores,

ω_{ni} is a weight of the ith feature of the organic content provider or paid content provider ranked at nth position in the ranking of revenue scores, and

s_n is a final revenue score of the organic content provider or paid content provider ranked at nth position in the ranking of revenue scores.

4. The method according to any one of the preceding claims, wherein the one or more features of each of the one or more organic content providers or each of the one or more paid content

providers comprise one or more predicted conversion rate (pCVR) and/or predicted click-through rate (pCTR) of each of the one or more organic content providers or each of the one or more paid content providers.

5. The method according to claim 2 or claim 3, wherein the weight of the ith feature of the organic content provider or paid content provider is generated at a personalization data platform.

6. A device for rendering organic and paid content, the device comprising:

at least one processor; and

a memory including computer program code for execution by the at least one processor, the computer program code instructs the at least one processor to:

receive a request for content from a user device of a user of a social networking system;

in response to the request, determine one or more organic content providers and one or more paid content providers for the user based on the user's historical data on the social networking system;

rank the one or more organic content providers and the one or more paid content providers together, the ranking comprising:

rank a revenue score of each of the one or more organic content providers and a revenue score of each of the one or more paid content providers, wherein the revenue score of each of the one or more organic content providers is associated with one or more features of a corresponding organic content provider of the one or more organic content providers, and wherein the revenue score of each of the one or more paid content providers is associated with one or more features of a corresponding paid content provider of the one or more paid content providers,

optimize weights of the one or more features of the one or more organic content providers and the one or more features of the one or more paid content providers based on a single objective optimization or a multi-objective optimization, wherein the optimizing of the weights includes:

applying a first set of weights for the one or more features of the one or more organic content providers in a case where the one or more organic content providers are in a first user's group, and

applying a second set of weights for the one or more features of the one or more paid content providers in a case where the one or more paid content providers are in a second user's group, wherein the second set of weights is different from the first set of weights;

compute final revenue scores for the one or more organic content providers and the one or more paid content providers based on the first set of weights of the one or more features of the one or more organic content providers and the second set of weights of the one or more features of the one or more paid content providers; and

re-rank an order of the one or more organic content providers and the one or more paid content providers according to the computed final revenue scores; and

select a list of organic content providers and paid content providers based on the re-ranking of the order of the one or more organic content providers and the one or more paid content providers.

7. The device according to claim 6, wherein during the optimizing of the weights, the device is configured to perform the single objective optimization according to:

$$\max_{w}\left(a * R_{food} + (1-a) * R_{ads}\right)$$
$$subject\ to\ w_{n1} * x_{n1} + w_{n2} * x_{n2} + \cdots + w_{nI} * x_{nI} = s_n\ for\ n \in 1 \ldots N,$$

wherein

R_{food} is a sum of revenue scores of the one or more organic content providers, wherein the one or more organic content providers are one or more food merchants,

R_{ads} is a sum of revenue scores for the one or more paid content providers, wherein the one or more paid content providers are one or more ads merchants,

a is a weight for the sum of revenue scores of the one or more organic content providers,

x_{ni} is an ith feature of an organic content provider or a paid content provider ranked at nth position in the ranking of revenue scores,

ω_{ni} is a weight of the ith feature of the organic content provider or paid content provider ranked at nth position in the ranking of revenue scores, and

s_n is a final revenue score of the organic content provider or paid content provider ranked at nth position in the ranking of revenue scores.

8. The device according to claim 6 or claim 7, wherein during the optimizing of the weights, the device is configured to perform the multi-objective optimization according to:

$$\max_{w} R_{food}\ and \max_{w} R_{ads}$$
$$subject\ to\ w_{n1} * x_{n1} + w_{n2} * x_{n2} + \cdots + w_{nI} * x_{nI} = s_n\ for\ n \in 1 \ldots N,$$

wherein

R_{food} is a revenue score for one of the one or more organic content providers, wherein the organic content provider is a food merchant,

R_{ads} is a revenue score for one of the one or more paid content providers, wherein the paid content provider is an ads merchant,

x_{ni} is an ith feature of an organic content provider or a paid content provider ranked at nth position in the ranking of revenue scores,

ω_{ni} is a weight of the ith feature of the organic content provider or paid content provider ranked at nth position in the ranking of revenue scores, and

s_n is a final revenue score of the organic content provider or paid content provider ranked at nth position in the ranking of revenue scores.

9. The device according to any one of claims 6 to 8, wherein the one or more features of each of the one or more organic content providers or each of the one or more paid content providers comprise one or more predicted conversion rate (pCVR) and/or predicted click-through rate (pCTR) of each of the one or more organic content providers or each of the one or more paid content providers.

10. The device according to claim 7 or claim 8, wherein the weight of the ith feature of the organic content provider or paid content provider is generated at a personalization data platform.

11. A non-transitory computer readable storage medium having instructions encoded thereon that, when executed by a processor, cause the processor to:

receive a request for content from a user device of a user of a social networking system;

in response to the request, determine one or more organic content providers and one or more paid content providers for the user based on user's historical data on the social networking system;

rank the one or more organic content providers and the one or more paid content providers together, the ranking comprising:

rank a revenue score of each of the one or more organic content providers and a revenue score each of the one or more paid content providers, wherein the revenue score of each of the one or more organic content providers is associated with one or more features of a corresponding organic content provider of the one or more organic content providers, and wherein the revenue score of each of the one or more paid content providers is associated with one or more features of a corresponding paid content provider of the one or more paid content providers,

optimize weights of the one or more features of the one or more organic content providers and the one or more features of the one or more paid content providers based on a single objective optimization or a multi-objective optimization, wherein the optimizing of the weights includes:

applying a first set of weights for the one or more features of the one or more organic content providers in a case where the one or more organic content providers are in a first user's group, and

applying a second set of weights for the one or more features of the one or more paid content providers in a case where the one or more paid content providers are in a second user's group, wherein the second set of weights is different from the first set of weights;

compute final revenue scores for the one or more organic content providers and the one or more paid content providers based on the first set of weights of the one

or more features of the one or more organic content providers and the second set of weights of the one or more features of the one or more paid content providers; and

re-rank an order of the one or more organic content providers and the one or more paid content providers according to the computed final revenue scores; and

select a list of organic content providers and paid content providers based on the re-ranking of the order of the one or more organic content providers and the one or more paid content providers.

12. The non-transitory computer readable storage medium according to claim 11, further including instructions enclosed thereon that, when during the optimizing of the weights, cause the processor to perform the single objective optimization according to:

$$\max_{w}\left(a * R_{food} + (1-a) * R_{ads}\right)$$
$$subject\ to\ w_{n1} * x_{n1} + w_{n2} * x_{n2} + \cdots + w_{nI} * x_{nI} = s_n\ for\ n \in 1 \ldots N,$$

wherein

R_{food} is a sum of revenue scores of the one or more organic content providers, wherein the one or more organic content providers are one or more food merchants,

R_{ads} is a sum of revenue scores for the one or more paid content providers, wherein the one or more paid content providers are one or more ads merchants,

a is a weight for the sum of revenue scores of the one or more organic content providers,

x_{ni} is an ith feature of an organic content provider or a paid content provider ranked at nth position in the ranking of revenue scores,

ω_{ni} is a weight of the ith feature of the organic content provider or paid content provider ranked at nth position in the ranking of revenue scores, and

s_n is a final revenue score of the organic content provider or paid content provider ranked at nth position in the ranking of revenue scores.

13. The non-transitory computer readable storage medium according to claim 11 or 12, further including instructions enclosed thereon that, when during the optimizing of the weights, cause the processor to perform the multi-objective optimization according to:

$$\max_{w}\left(a * R_{food} + (1-a) * R_{ads}\right)$$
$$subject\ to\ w_{n1} * x_{n1} + w_{n2} * x_{n2} + \cdots + w_{nI} * x_{nI} = s_n\ for\ n \in 1 \ldots N,$$

wherein

R_{food} is a revenue score for one of the one or more organic content providers, wherein the organic content provider is a food merchant,

R_{ads} is a revenue score for one of the one or more paid content providers, wherein the paid content provider is an ads merchant,

x_{ni} is an ith feature of an organic content provider or a paid content provider ranked at nth position in the ranking of revenue scores,

ω_{ni} is a weight of the ith feature of the organic content provider or paid content provider ranked at nth position in the ranking of revenue scores, and

s_n is a final revenue score of the organic content provider or paid content provider ranked at nth position in the ranking of revenue scores.

14. The non-transitory computer readable storage medium according to any one of claims 11 to 13, wherein the one or more features of each of the one or more organic content providers or each of the one or more paid content providers comprise one or more predicted conversion rate (pCVR) and/or predicted click-through rate (pCTR) of each of the one or more organic content providers or each of the one or more paid content providers.

15. The non-transitory computer readable storage medium according to claim 12 or claim 13, wherein the weight of the ith feature of the organic content provider or paid content provider is generated at a personalization data platform.