CLAIMS

What is claimed is:

1. A computer-implemented method for rendering advertisements in a Mixed Reality (MR) space in a data processing system comprising a processor and a memory comprising instructions which are executed by the processor, the method comprising:

detecting, by the processor, movements of each user in a plurality of users relative to other users in the plurality of users, wherein the plurality of users share the MR space;

providing, by the processor, one or more advertisements having a private content for one or more target users selected from the plurality of users based on the detected movements, by:

profiling, by the processor, the plurality of users sharing the MR space,

building, by the processor, a social network graph between the plurality of users, indicating a relationship between the plurality of users based on profiles of the plurality of users,

building, by the processor, a user embedding matrix based on the social network graph,

recommending, by the processor, a plurality of first advertisements for the one or more target users, wherein the one or more target users are selected from the plurality of users,

building, by the processor, an advertisement embedding matrix based on the plurality of first advertisements,

building, by the processor, a joint embedding matrix across the plurality of users and the plurality of first advertisements, wherein the joint embedding matrix is built based on a Siamese network, wherein the Siamese network includes the user embedding matrix, the advertisement embedding matrix, a first long short-term memory (LSTM)

network for the user embedding matrix, and a second LSTM network for the advertisement embedding matrix, and

selecting, by the processor, the one or more advertisements from the plurality of first advertisements based on the joint embedding matrix;

identifying, by the processor, a particular position and a particular time period for the one or more target user, wherein the particular position is viewable by the one or more target users during the particular time period and not viewed by one or more untargeted users selected from the plurality of users during the particular time period; and

rendering, by the processor, the one or more advertisements having the private content to the one or more target users at the particular position during the particular time period.

2. The method of claim 1, further comprising:

detecting, by the processor, movements of each target user by a motion detector.

3. The method of claim 1, further comprising:

detecting, by the processor, eye-gaze movements of each of the plurality of users.

4. The method of claim 1, wherein the one or more advertisements are close to the one or more target users, but far away from remaining users in the joint embedding matrix.

5. The method of claim 1, further comprising:

caching, by the processor, the one or more advertisements to one or more hub points close to the particular position.

6. A computer program product for rendering advertisements in a Mixed Reality (MR) space, the computer program product comprising a computer readable storage medium having program instructions embodied therewith, the program instructions executable by a processor to cause the processor to:

detect movements of each user in a plurality of users relative to other users in the plurality of users, wherein the plurality of users share the MR space;

provide one or more advertisements having a private content for one or more target users selected from the plurality of users based on the detected movements, wherein providing the one or more advertisements having the private content further causes the processor to

profile the plurality of users sharing the MR space,

build a social network graph between the plurality of users, indicating a relationship between the plurality of users based on profiles of the plurality of users,

build a user embedding matrix based on the social network graph,

recommend a plurality of first advertisements for the one or more target users, wherein the one or more target users are selected from the plurality of users,

build an advertisement embedding matrix based on the plurality of first advertisements,

build a joint embedding matrix across the plurality of users and the plurality of first advertisements, wherein the joint embedding matrix is built based on a Siamese network, wherein the Siamese network includes the user embedding matrix, the advertisement embedding matrix, a first long short-term memory (LSTM) network for the user embedding matrix, and a second LSTM network for the advertisement embedding matrix,

build a temporal eye-gaze map relative to a plurality of positions in the MR space, and

select the one or more advertisements from the plurality of first advertisements based on the joint embedding matrix;

identify one or more positions and a particular time period for the one or more target users, wherein the one or more positions are viewable by the one or more target users during the particular time period and not viewed by one or more untargeted users selected from the plurality of users during the particular time period; and

cache the one or more advertisements having the private content to one or more hub points close to the one or more positions.

7. The computer program product as recited in claim 6, wherein the processor is further caused to detect movements of each target user by a motion detector.

8. The computer program product as recited in claim 6, wherein the processor is further caused to detect eye-gaze movements of each user.

9. The computer program product as recited in claim 6, wherein the one or more advertisements are close to the one or more target users, but far away from remaining users in the joint embedding matrix.

10. The computer program product as recited in claim 6, wherein the processor is further caused to render the one or more advertisements to the one or more target users from the one or more hub points.

11. A system for rendering advertisements in a Mixed Reality (MR) space, comprising: a processor configured to:

detect movements of each user in a plurality of users relative to other users in the plurality of users, wherein the plurality of users share the MR space;

provide one or more advertisements having a private content for one or more target users selected from the plurality of users based on the detected movements, wherein providing the one or more advertisements having the private content further causes the processor to

profile the plurality of users sharing the MR space,

build a social network graph between the plurality of users, indicating a relationship between the plurality of users based on profiles of the plurality of users,

build a user embedding matrix based on the social network graph,

recommend a plurality of first advertisements for the one or more target users, wherein the one or more target users are selected from the plurality of users,

build an advertisement embedding matrix based on the plurality of first advertisements,

build a joint embedding matrix across the plurality of users and the plurality of first advertisements, wherein the joint embedding matrix is built based on a Siamese network, wherein the Siamese network includes the user embedding matrix, the advertisement embedding matrix, a first long short-term memory (LSTM) network for the user embedding matrix, and a second LSTM network for the advertisement embedding matrix,

build a temporal eye-gaze map relative to a plurality of positions in the MR space, and

select the one or more advertisements from the plurality of first advertisements based on the joint embedding matrix;

identify one or more positions and a particular time period for the one or more target users, wherein the one or more positions are viewable by the one or more target users during

the particular time period and not viewed by one or more untargeted users selected from the plurality of users during the particular time period;

cache the one or more advertisements having the private content to one or more hub points close to the one or more positions; and

render the one or more advertisements to the one or more target users from the one or more hub points.

12. The system as recited in claim 11, wherein the processor is further configured to detect movements of each target user by a motion detector.

13. The system as recited in claim 11, wherein the processor is further configured to detect eye-gaze movements of each user.

14. The system as recited in claim 11, wherein the one or more advertisements are close to the one or more target users, but far away from remaining users in the joint embedding matrix.