WHAT IS CLAIMED IS:

1. A computer-implemented method for evaluating a recurrent neural network (RNN)-based deep learning model, comprising:

generating, with at least one processor, a first graphical user interface (GUI) based on model data generated by a RNN-based deep learning model, the model data comprising a plurality of events associated with a plurality of states in an environment, the first GUI comprising a chart visually representing a timeline for the plurality of events in relation to at least one parameter value based on the plurality of events and the plurality of states;

generating, with the at least one processor, a second GUI comprising a point chart visually representing a two-dimensional projection of multi-dimensional intermediate data, each point of the point chart representing a time step and at least one event from the time step based on the multi-dimensional intermediate data between transformations in the RNN-based deep learning model that connect at least one state of the plurality of states to at least one event of the plurality of events;

co-displaying, with the at least one processor, the first GUI and the second GUI on a computing device; and

perturbing, with the at least one processor, the environment at a time step based on user interaction with at least one of the first GUI and the second GUI.

2. The computer-implemented method of claim 1, further comprising:

generating, with the at least one processor, a third GUI based on at least one hidden state and/or cell state of the RNN-based deep learning model.

3. The computer-implemented method of claim 2, further comprising:

identifying, with the at least one processor, a hidden state and/or cell state from the at least one hidden state and/or cell state impacting an event of the plurality of events.

4. The computer-implemented method of claim 2, wherein generating the third GUI comprises generating a visual representation of contrasted distributions over different subsets of a plurality of steps.

5. The computer-implemented method of claim 2, wherein generating the third GUI comprises generating at least two rows including a plurality of visual representations, each visual of the plurality of visual representations visualizing a hidden state and/or a cell state for one dimension of a plurality of dimensions of the model, wherein a first row of the at least two rows visually represents static global information of the plurality of steps, and wherein a second row of the at least two rows visually represents local information of a single step associated with the first GUI.

6. The computer-implemented method of claim 1, wherein the first GUI and second GUI comprise different windows within the same primary GUI.

7. The computer-implemented method of claim 1, further comprising:

updating, with the at least one processor, at least one of the first GUI and the second GUI based on output resulting from perturbing the environment.

8. The computer-implemented method of claim 1, further comprising:

determining at least one predicted rule generated by the RNN-based deep learning model based on data underlying the first and/or second GUI, wherein the at least one predicted rule comprises at least one condition and at least one predicted response to the at least one condition; and

verifying that the RNN-based deep learning model implements the at least one predicted rule by:

perturbing the environment based on the at least one condition; and

analyzing a response of the RNN-based deep learning model to the perturbation based on the at least one predicted response.

9. The computer-implemented method of claim 1, further comprising:

training, with the at least one processor, a second deep learning model using the RNN-based deep learning model.

10. The computer-implemented method of claim 1, wherein the environment comprises a simulator performing a simulated event, wherein the plurality of events and the plurality of states are associated with the simulated event.

11. The computer-implemented method of claim 10, wherein the simulated event comprises a simulated electronic payment fraud determination event.

12. The computer-implemented method of claim 11, wherein perturbing the environment comprises submitting a simulated electronic payment transaction to the RNN-based deep learning model.

13. The computer-implemented method of claim 1, wherein the environment comprises an electronic payment processing network, wherein the plurality of events comprise a plurality of transactions associated with transaction data, and wherein each state of the plurality of states comprises at least one of the following: a plurality of fraud determinations, a plurality of charge-backs, a plurality of cross-border transactions, or any combination thereof.

14. The computer-implemented method of claim 13, wherein the model data is generated based on historical transaction data, further comprising:

extracting at least one rule generated by the RNN-based deep learning model; and

applying the at least one rule to future transactions by a transaction processing system.

15. The computer-implemented method of claim 13, further comprising:

integrating the RNN-based deep learning model with a transaction processing system processing new transaction data associated with a new transaction by:

evaluating the new transaction data with the RNN-based deep learning model; and

determining the state of the new transaction with the RNN-based deep learning model.

16. The computer-implemented method of claim 15, further comprising:

denying the new transaction in response to determining the state of the new transaction to be a fraudulent state.

17. The computer-implemented method of claim 1, wherein the parameter value represents at least one effect of a plurality of effects or at least one state of the plurality of states.

18. The computer-implemented method of claim 1, wherein the RNN-based deep learning model is based on the plurality of states, the plurality of events, and a plurality of rewards associated with at least one state of the plurality of states and/or at least one event of the plurality of events.

19. A system for evaluating a recurrent neural network (RNN)-based deep learning model, comprising:

at least one data storage device comprising model data generated by a RNN-based deep learning model, the model data comprising a plurality of events associated with a plurality of states in an environment;

at least one processor in communication with the at least one data storage device, the at least one processor programmed or configured to:

generate a first graphical user interface (GUI) based on the model data comprising a chart visually representing a timeline for the plurality of events in relation to at least one parameter value based on the plurality of events and the plurality of states;

generate a second GUI comprising a point chart visually representing a two-dimensional projection of multi-dimensional intermediate data, each point of the point chart representing a time step and at least one event from the time step, based on the multi-dimensional intermediate data between transformations in the RNN-based deep learning model that connect at least one state of the plurality of states to at least one event of the plurality of events;

co-display the first GUI and the second GUI on a computing device; and

perturb the environment at a time step based on user interaction with at least one of the first GUI and the second GUI.

20. The system of claim 19, wherein the environment comprises a simulator performing a simulated event, wherein the plurality of events and the plurality of states are associated with the simulated event, and wherein the at least one processor is programmed or configured to submit a simulated electronic payment transaction to the RNN-based deep learning model for a simulated fraud determination.

21. The system of claim 19, further comprising:

a transaction processing system in communication with at least one merchant system and at least one issuer system within an electronic payment processing network, wherein the transaction processing system comprises the at least one processor, and wherein the at least one processor is further programmed or configured to evaluate new transaction data received by the transaction processing system with the RNN-based deep learning model.

22. The system of claim 21, wherein the at least one processor is further programmed or configured to determine the state of the new transaction with the RNN-based deep learning model; and deny the new transaction in response to determining the state of the new transaction to be a fraudulent state.

23. The system of claim 19, wherein the at least one processor is programmed or configured to generate a third GUI based on at least one hidden state and/or cell state of the RNN-based deep learning model.

24. The system of claim 23, wherein the at least one processor is programmed or configured to identify a hidden state and/or cell state from the at least one hidden state and/or cell state impacting an event of the plurality of events.

25. The system of claim 23, wherein generating the third GUI comprises generating a visual representation of contrasted distributions over different subsets of a plurality of steps.

26. The system of claim 23, wherein generating the third GUI comprises generating at least two rows including a plurality of visual representations, each visual of the plurality of visual representations visualizing a hidden state and/or a cell state for one dimension of a plurality of dimensions of the model, wherein a first row of the at least two rows visually represents static global information of the plurality of steps, and wherein a second row of the at least two rows visually represents local information of a single step associated with the first GUI.

27. The system of claim 19, wherein the first GUI and second GUI comprise different windows within the same primary GUI.

28. The system of claim 19, wherein the at least one processor is programmed or configured to update at least one of the first GUI and the second GUI based on output resulting from perturbing the environment.

29. The system of claim 19, wherein the at least one processor is programmed or configured to:

determine at least one predicted rule generated by the RNN-based deep learning model based on data underlying the first and/or second GUI, wherein the at least one predicted rule comprises at least one condition and at least one predicted response to the at least one condition; and

verify that the RNN-based deep learning model implements the at least one predicted rule by:

perturbing the environment based on the at least one condition; and

analyzing a response of the RNN-based deep learning model to the perturbation based on the at least one predicted response.

30. The system of claim 19, wherein the at least one processor is programmed or configured to train a second deep learning model using the RNN-based deep learning model.

31. The system of claim 19, wherein the environment comprises an electronic payment processing network, wherein the plurality of events comprise a plurality of transactions associated with transaction data, and wherein each state of the plurality of states comprises at least one of the following: a plurality of fraud determinations, a plurality of charge-backs, a plurality of cross-border transactions, or any combination thereof.

32. The system of claim 31, wherein the model data is generated based on historical transaction data, wherein the at least one processor is programmed or configured to:

extract at least one rule generated by the RNN-based deep learning model; and

apply the at least one rule to future transactions by a transaction processing system.

33. The system of claim 19, wherein the parameter value represents at least one effect of a plurality of effects or at least one state of the plurality of states.

34. The system of claim 19, wherein the RNN-based deep learning model is based on the plurality of states, the plurality of events, and a plurality of rewards associated with at least one state of the plurality of states and/or at least one event of the plurality of events.

35. A computer program product for evaluating a recurrent neural network (RNN)-based deep learning model, comprising at least one non-transitory computer-readable medium including program instructions that, when executed by at least one processor, cause the at least one processor to:

generate a first graphical user interface (GUI) based on model data generated by a RNN-based deep learning model, the model data comprising a plurality of events associated with a plurality of states in an environment, the first GUI comprising a chart visually representing a timeline for the plurality of events in relation to at least one parameter value based on the plurality of events and the plurality of states;

generate a second GUI comprising a point chart visually representing a two-dimensional projection of multi-dimensional intermediate data, each point of the point chart representing a time step and at least one event from the time step, based on the multi-dimensional intermediate data between transformations in the RNN-based deep learning model that connect at least one state of the plurality of states to at least one event of the plurality of events;

co-display the first GUI and the second GUI on a computing device; and

perturb the environment at a time step based on user interaction with at least one of the first GUI and the second GUI.