What is claimed is:

1. A system for operating a remotely operated vehicle (ROV) leveraging synthetic data to train machine learning models comprising:

a synthetic training engine comprising:

a ROV with a video camera and a positional sensor;

a video dataset to store video data and real images coming from the ROV;

a telemetry dataset to store telemetry data coming from the ROV;

a 3D model dataset with 3D model data of a scene where an ROV may operate;

a synthetic dataset to store synthetic video data or label data;

a simulator module, operable to replay a mission in a pilot training simulator of the ROV and generate the synthetic data set; and

a machine learning trainer module, operable to use at least the synthetic data set and real videos to train machine learning models.

~~; and~~

~~a model module.~~

2. The system according to claim 1, wherein the simulator module has access to the video dataset, the telemetry dataset, the 3D model dataset, and the synthetic dataset~~ and the simulator module includes a ROV's piloting simulator~~.

3. A system according to any of claims 1 - 2, wherein the machine learning trainer module has access to the video

dataset and the synthetic dataset.

4. A system according to any of claims 1 - 3, wherein the system further comprises a model module that includes an application using a model trained in the machine learning trainer module and the model module is connected to at least one ROV.

~~5. A system according to any of claims 1 - 4, wherein the simulator module is operable to replay a mission in a ROV's pilot training simulator.~~

5~~6~~. The system according to any of claims 1-4~~claim 5~~, wherein the simulator module replays the mission by retrieving ROV telemetry from the telemetry dataset and 3D model data from the 3D model dataset, denoises the telemetry data, and generates a synthetic video of the mission.

6~~7~~. A system according to any of claims 1 - 5~~6~~, wherein the synthetic training engine is operable to automatically annotate the real images.

7~~8~~. The system according to claim 6~~7~~, wherein the synthetic training engine is operable to automatically annotate the real images for object segmentation, depth map estimation, and classifying whether a specific structure is in the real image.

8~~9~~. A system according to any of claims 1 - 7~~8~~, wherein the synthetic training engine is operable to replay a mission and annotate the real images.

9~~10~~. A system according to any of claims 1 - 8~~9~~, wherein the synthetic training engine maps both the real images and the synthetic video data into a shared feature representation.

10~~11~~. A system according to any of claims 1 – 9~~10~~, wherein the synthetic training engine has three training settings: (i) a *simreal* setting where both simulated data and real data are available, (ii) a *sim* setting where only simulated data is available, and (iii) a *real* setting where only real data is available.

11~~12~~. The system of claim 10~~11~~, wherein the synthetic training engine trains the three training settings simultaneously and randomly samples one of the three training settings at each training iteration.

12~~13~~. A system for undersea exploration comprising:

a remote operated vehicle (ROV) comprising a camera for acquiring a real video;

a networked operating system comprising a computer and computer executable software comprising a synthetic training engine, wherein the synthetic training engine comprises:

a ROV with a video camera and a positional sensor;

a video dataset to store video data and real images coming from the ROV;

a telemetry dataset to store telemetry data coming from the ROV;

a 3D model dataset with 3D model data of a scene where an ROV may operate;

a synthetic dataset to store synthetic video data or label data;

a simulator module, operable to replay a mission in a pilot training simulator of the ROV and generate the synthetic data set;

a machine learning trainer module, operable to use at least the synthetic data set and real videos to train machine learning models; and

~~a model module; and~~

a navigation interface configured to display a graphical user interface, the navigation interface comprising at least one networked monitor.

13~~14~~. The system according to claim 12~~13~~, wherein the simulator module has access to the video dataset, the telemetry dataset, the 3D model dataset, and the synthetic dataset ~~and the simulator module includes a ROV's piloting simulator~~.

14~~15~~. A system according to any of claims 12~~13~~ - 13~~14~~, wherein the machine learning trainer module has access to the video dataset and the synthetic dataset.

15~~16~~. A system according to any of claims 12~~13~~ - 14~~15~~, wherein the system further comprises a model module that includes an application using a model trained in the machine learning trainer module and the model module is connected to at least one ROV.

~~17. A system according to any of claims 13 - 16, wherein the simulator module is operable to replay a mission in a ROV's pilot training simulator.~~

16~~18~~. The system according to any of claims 12-15~~claim 17~~, wherein the simulator module replays the mission by retrieving ROV telemetry from the telemetry dataset and 3D model data from the 3D model dataset, denoises the telemetry data, and generates a synthetic video of the mission.

17~~19~~. A system according to any of claims 12~~13~~ - 16~~18~~, wherein the synthetic training engine is operable to automatically annotate the real images.

18~~20~~. A method of leveraging synthetic data to train machine learning models for remotely operated vehicles (ROV) comprising:

obtaining 3D data from scenes where an ROV is operating;

storing 3D elements in a database module, the 3D elements representing objects disposed in the ROV's operation environment and comprising the 3D data;

receiving telemetry data and video data from a ROV;

replaying a ROV mission;

generating synthetic images from different views in the video data or from synthetic scenes generated by the pilot training simulator of the ROV that is operable to replay a mission and generate the synthetic images;

pairing synthetic images and real images;

training a machine learning model.

19~~21~~. A computer program product comprising instructions which, when the program is executed by a computer, cause the computer to carry out the steps of the

method of claim 18.