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.

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.

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. The system according to any of claims 1-4, 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. A system according to any of claims 1 - 5, wherein the synthetic training engine is operable to automatically annotate the real images.

7. The system according to claim 6, 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. A system according to any of claims 1 - 7, wherein the synthetic training engine is operable to replay a mission and annotate the real images.

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

10. A system according to any of claims 1 – 9, 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. The system of claim 10, 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. 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 navigation interface configured to display a graphical user interface, the navigation interface comprising at least one networked monitor.

13. The system according to claim 12, wherein the simulator module has access to the video dataset, the telemetry dataset, the 3D model dataset, and the synthetic dataset.

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

15. A system according to any of claims 12 - 14, 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.

16. The system according to any of claims 12-15, 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. A system according to any of claims 12 - 16, wherein the synthetic training engine is operable to automatically annotate the real images.

18. 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. 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.