User Guide
Neural Network Trainer by HP Tuners

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What Does a Neural Network Trainer Do?

Neural networks are a set of advanced algorithms designed to recognize patterns. They "learn" by processing examples that include a known input and result. As modern vehicles become ever more complex, some manufacturers have begun to implement neural networks to optimize vehicle performance.

Neural Networks accept inputs like engine RPM, intake and exhaust camshaft positions and more, perform several calculations and produce an output which models estimated volumetric efficiency (VE). These vehicles have too many inputs to reasonably handle using traditional methods, which has led to the usage of neural networks.

Aftermarket calibration tools have not been able to deal with OEM neural networks, and the solution in most cases has been to disable them. The downside of doing this is losing the ability to accommodate adjustable intake and exhaust camshafts, potential fuel economy losses and emissions impact.

The newly introduced Neural Network Trainer by HP Tuners brings industry-exclusive control over your vehicle's neural networks. This new tool allows for direct editing of your vehicle VE tables and simplifies the complex process of neural network training.

How to use the Neural Network Trainer

1.0 Read the current tune

    1.1 Read your current tune with VCM Editor

    1.2 After the read is complete, the current tune will open in VCM Editor. If the vehicle supports Neural Network Training, the Neural Network Trainer will be available in the Edit menu.

    Note: Currently only select 2010+ FCA and 2019+ GM vehicles are eligible for neural network training.

2.0 Create a new file training file

    2.1 Click the box highlighted in red below to create a new training from from the current tune values.
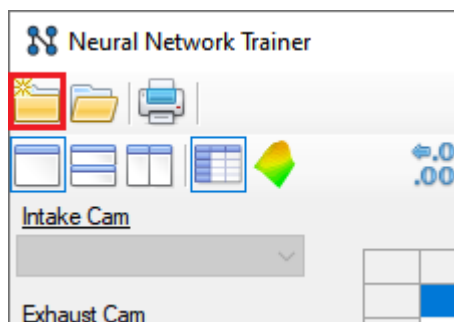
    2.2 VCM Editor will prompt you to create and save one file per supported Neural Network found in the current tune. Some vehicle calibrations may support multiple Neural Networks. If you wish to train all the supported Neural Networks, you will need to create and edit an individual file for each.

3.0 Generate your VE tables

    3.1 Navigate to tunertools.hptuners.com and login to your account

    3.2 Go to Neural Network Training and upload all files created in step 2.0 for processing.

    3.3 Once the files have been processed, you will see a download button available. Download all files.
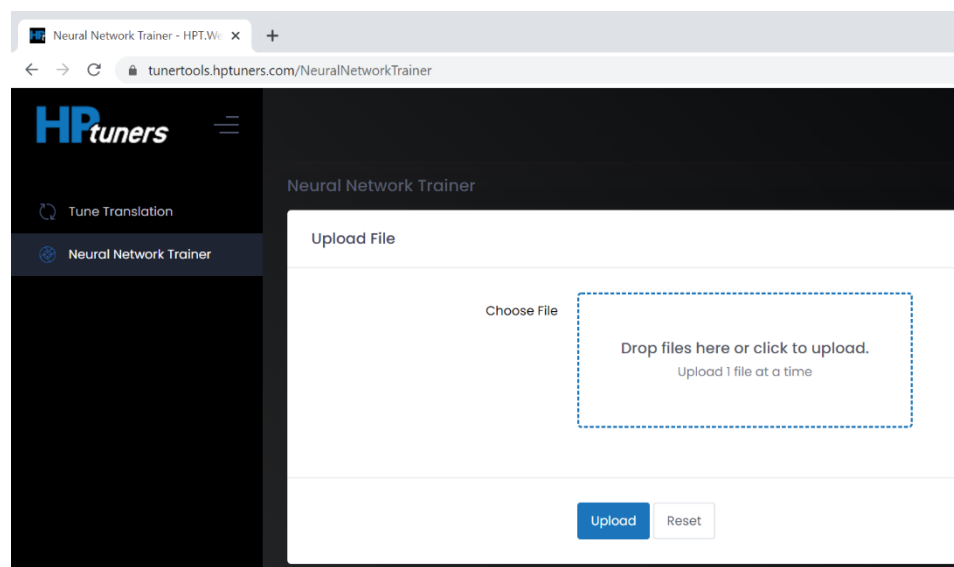
4.0 Load VE Tables for editing

4.1 In the VCM Suite Neural Network Trainer window, open the processed file that was downloaded in step 3.0. Loading this file allows you to view and edit the VE tables generated from the initial tune values.
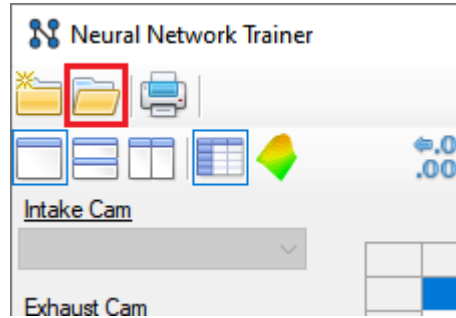
5.0 Modify the VE Tables

5.1 Modify the generated VE tables as desired. Keep in mind that there is one VE table per camshaft angle combination, which could result in 25 or more VE tables.

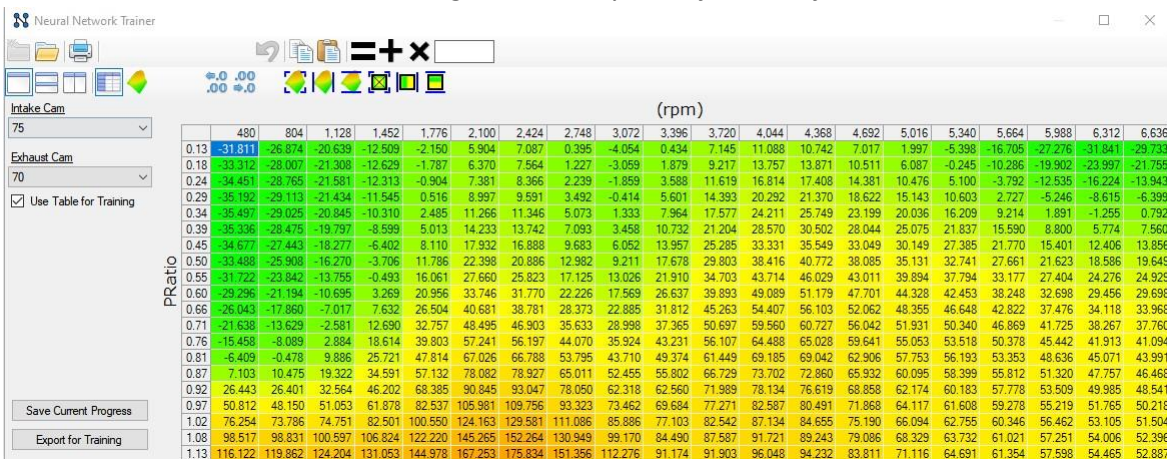5.2 Use the checkbox "Use Table for Training" to select a table for training. To accelerate the tuning process, you can edit and select fewer tables to train, but this will reduce the training accuracy. You can also use this feature to disable unused VE Tables.
*Ex: Some vehicles like the Dodge Hellcat only use a fraction of the available 25 VE Tables.*

(rpm)

PRatio	480	804	1,128	1,452	1,776	2,100	2,424	2,748	3,072	3,396	3,720	4,044	4,368	4,692	5,016	5,340	5,664	5,988	6,312	6,636
0.13	-31.811	-26.874	-20.639	-12.509	-2.150	5.904	7.087	0.395	-4.054	0.434	7.145	11.088	10.742	7.017	1.997	-5.398	-16.705	-27.276	-31.841	-29.733
0.18	-33.312	-28.007	-21.308	-12.629	-1.787	6.370	7.564	1.227	-3.059	1.879	9.217	13.757	13.871	10.511	6.087	-0.245	-10.286	-19.902	-23.997	-21.755
0.24	-34.451	-28.765	-21.581	-12.313	-0.904	7.381	8.366	2.239	-1.859	3.588	11.619	16.814	17.408	14.381	10.476	5.100	-3.792	-12.535	-16.224	-13.943
0.29	-35.192	-29.113	-21.434	-11.545	0.516	8.997	9.591	3.492	-0.414	5.601	14.393	20.292	21.370	18.622	15.143	10.603	2.727	-5.246	-8.615	-6.399
0.34	-35.497	-29.025	-20.845	-10.310	2.485	11.266	11.346	5.073	1.333	7.964	17.577	24.211	25.749	23.199	20.036	16.209	9.214	1.891	-1.255	0.792
0.39	-35.336	-28.475	-19.797	-8.599	5.013	14.233	13.742	7.093	3.458	10.732	21.204	28.570	30.502	28.044	25.075	21.837	15.590	8.800	5.774	7.560
0.45	-34.677	-27.443	-18.277	-6.402	8.110	17.932	16.888	9.683	6.052	13.957	25.285	33.331	35.549	33.049	30.149	27.385	21.770	15.401	12.406	13.856
0.50	-33.488	-25.908	-16.270	-3.706	11.786	22.398	20.886	12.982	9.211	17.678	29.803	38.416	40.772	38.085	35.131	32.741	27.661	21.623	18.586	19.649
0.55	-31.722	-23.842	-13.755	-0.493	16.061	27.660	25.823	17.125	13.026	21.910	34.703	43.714	46.029	43.011	39.894	37.794	33.177	27.404	24.276	24.929
0.60	-29.296	-21.194	-10.695	3.269	20.956	33.746	31.770	22.226	17.569	26.637	39.893	49.089	51.179	47.701	44.328	42.453	38.248	32.698	29.456	29.698
0.66	-26.043	-17.860	-7.017	7.632	26.504	40.681	38.781	28.373	22.885	31.812	45.263	54.407	56.103	52.062	48.355	46.648	42.822	37.476	34.118	33.968
0.71	-21.638	-13.629	-2.581	12.690	32.757	48.495	46.903	35.633	28.998	37.365	50.697	59.560	60.727	56.042	51.931	50.340	46.869	41.725	38.267	37.760
0.76	-15.458	-8.089	2.884	18.614	39.803	57.241	56.197	44.070	35.924	43.231	56.107	64.488	65.028	59.641	55.053	53.518	50.378	45.442	41.913	41.094
0.81	-6.409	-0.478	9.886	25.721	47.814	67.026	66.788	53.795	43.710	49.374	61.449	69.185	69.042	62.906	57.753	56.193	53.353	48.636	45.071	43.991
0.87	7.103	10.475	19.322	34.591	57.132	78.082	78.927	65.011	52.455	55.802	66.729	73.702	72.860	65.932	60.095	58.399	55.812	51.320	47.757	46.468
0.92	26.443	26.401	32.564	46.202	68.385	90.845	93.047	78.050	62.318	62.560	71.989	78.134	76.619	68.858	62.174	60.183	57.778	53.509	49.985	48.541
0.97	50.812	48.150	51.053	61.878	82.537	105.981	109.756	93.323	73.462	69.684	77.271	82.587	80.491	71.868	64.117	61.608	59.278	55.219	51.765	50.218
1.02	76.254	73.786	74.751	82.501	100.550	124.163	129.581	111.086	85.886	77.103	82.542	87.134	84.655	75.190	66.094	62.755	60.346	56.462	53.105	51.504
1.08	98.517	98.831	100.597	106.824	122.220	145.265	152.264	130.949	99.170	84.490	87.587	91.721	89.243	79.086	68.329	63.732	61.021	57.251	54.006	52.396
1.13	116.122	119.862	124.204	131.053	144.978	167.253	175.834	151.356	112.276	91.174	91.903	96.048	94.232	83.811	71.116	64.691	61.354	57.598	54.465	52.887

Intake Cam: 75
Exhaust Cam: 70
☑ Use Table for Training

Save Current Progress
Export for Training

Note: You can save your current tables for future editing by pressing the "Save Current Progress" button.

6.0 Export Modified VE Tables for Training

6.1 Once all the VE Tables that are selected for training have been modified, export the file by pressing the button "Export for Training"
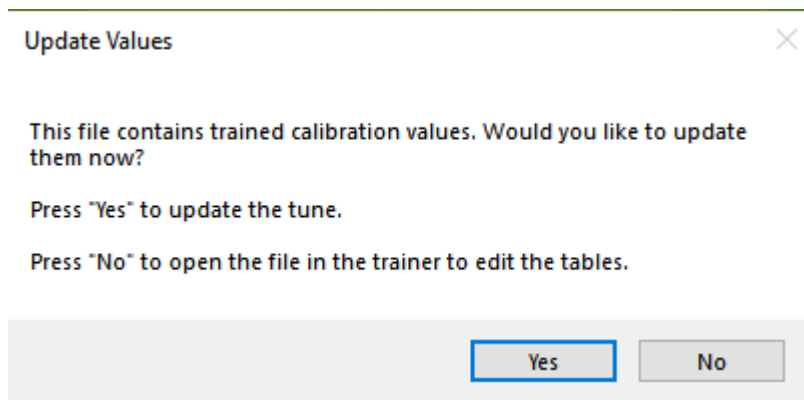
Save Current Progress
Export for Training

| 0.87 |
| 0.92 |
| 0.97 |
| 1.02 |
| 1.08 |
| 1.13 |
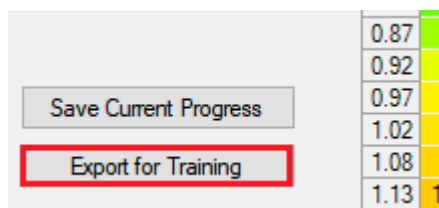
7.0 Upload Exported file to Tuner Tools for Training
- 7.1 Navigate back to tunertools.hptuners.com and make sure you are still logged in.
- 7.2 Go to Neural Network Trainer again and upload the file exported in step 6.0 for training.
- 7.3 Once uploaded, the file will be trained. Please note that this may take several minutes.
- 7.4 Download the trained file once available

8.0 Update Vehicle Tune with Trained File
- 8.1 Go back to the VCM Suite Neural Network Trainer and open the trained file from step 7.0
- 8.2 You will now be prompted to update the tune file with the new calibration values.

Update Values   ✕

This file contains trained calibration values. Would you like to update
them now?

Press "Yes" to update the tune.

Press "No" to open the file in the trainer to edit the tables.

Yes   No

Press "Yes" to update the tune with the new trained values. This will close the VE Neural
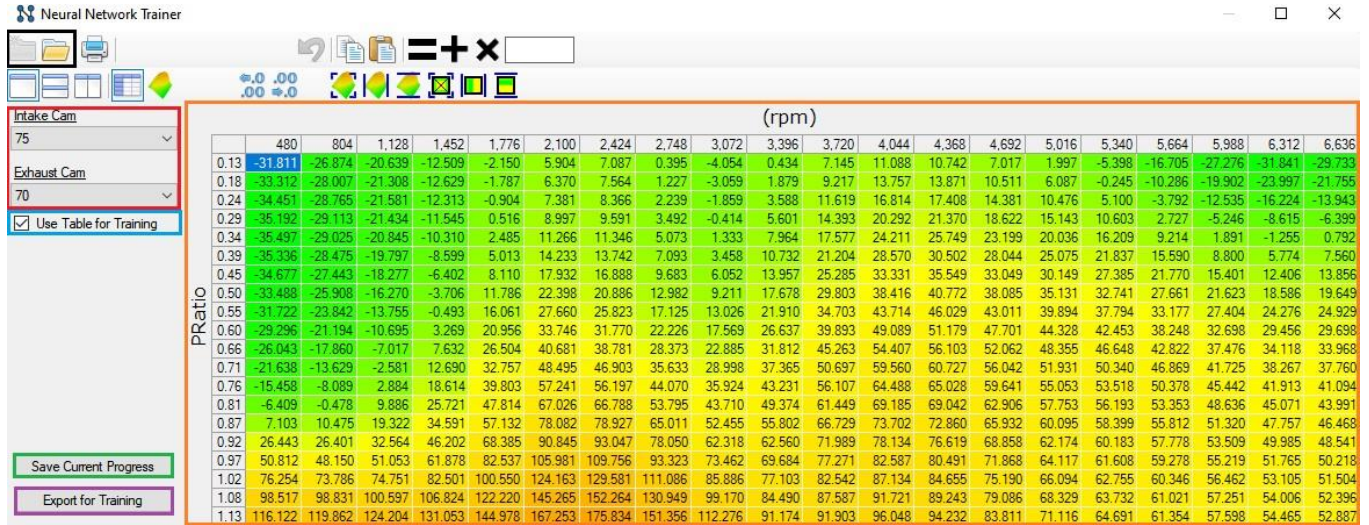Network Trainer so you can flash the vehicle with the updated values.

Press "No" to open this file in the VE Neural Network Trainer to edit the VE tables again.

9.0 Flash the Tune
- 9.1 Write the tune with the new values to the vehicle via VCM Editor
- 9.2 If further adjustments are needed, open the last trained file and repeat steps 5.0-9.0.

Note: 25 tokens will license your vehicle for one month of Neural Network training. During this month you can retrain as many times as required under the same license. Certain vehicles may require multiple iterations of Neural Network training to achieve desired results.

Neural Network Trainer VCM Suite Layout

- **Main toolbar** - Left to right: Create New, Open Trained file.

- **Cam Angle Selectors** - Changing these will provide the VE table for a given combination.

- **Use Table for Training Checkbox** - By checking this box, the displayed VE table will be included when training. (Right-click here and you can check or uncheck all for training).

- **Save Current Progress** - Saves all tables in their current state. You will be able to reopen a saved file for future editing. A saved file is not the file you will upload to tunertools.hptuners.com for training.

- **Export for Training** - Exports all tables that are selected for training only. This is the file you will upload to tunertools.hptuners.com for training. You cannot reopen a file that has been exported for future editing.

- **Table Editor** - This is where you edit the VE values for the selected cam angles.