TensorFlow for .NET by Lost Tech allows you to create, train, and use machine learning models with the full power of TensorFlow API on C#, F# or any other .NET language.

```csharp
// Code sample.
var input = tf.placeholder(tf.float32, new TensorShape(null, 1), name: "x");
var output = tf.placeholder(tf.float32, new TensorShape(null, 1), name: "y");

var hiddenLayer = tf.layers.dense(input, hiddenSize,
    activation: tf.sigmoid_fn,
    kernel_initializer: new ones_initializer(),
    bias_initializer: new random_uniform_initializer(minval: -1.0, maxval: -0.0),
    name: "hidden");

var model = tf.layers.dense(hiddenLayer, units: 1, name: "output");

var cost = tf.losses.mean_squared_error(output, model);

var training = new GradientDescentOptimizer(learning_rate: learningRate).minimize(cost);
```
Features

- **Access the full set of TensorFlow APIs**
  - Build computation graphs, and run them in sessions
  - Use Keras-style high-level APIs
  - Build fast data pipelines, keep logs and model checkpoints
  - Use estimators and the full power of tf.contrib
  - Use eager mode to transform data interactively
  - Many more

- **Train and run models on any hardware platform: CPUs, GPUs, TPUs**

- **Use distributed training features**

- **Track your training progress with Tensorboard**

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### TensorBoard

- Show data download links
- Ignore outliers in chart scaling
- Tooltip sorting method: default
- Smoothing: 0.6

**Horizontal Axis**
- STEP RELATIVE WALL

**Runs**

Write a regex to filter runs

- train
- eval

**TOGGLE ALL RUNS**

/tmp/mnist-logs

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<table>
<thead>
<tr>
<th>Name</th>
<th>Smoothed</th>
<th>Value</th>
<th>Step</th>
<th>Time</th>
<th>Relative</th>
</tr>
</thead>
<tbody>
<tr>
<td>eval test</td>
<td>0.0259</td>
<td>1.00</td>
<td>170.0</td>
<td>Mon Sep 12, 15:40:41</td>
<td>88</td>
</tr>
<tr>
<td>train max</td>
<td>0.02851</td>
<td>0.03362</td>
<td>166.0</td>
<td>Mon Sep 12, 15:40:40</td>
<td>75</td>
</tr>
</tbody>
</table>

**Cross Entropy**

- Mean: 0.03362
- **Easily port numerous existing TensorFlow examples**
  from simple numerical computation samples to state-of-art models like AlphaZero – the new world’s Go champion by DeepMind

- **Get started quickly with a collection of samples**

- **Seek help with the growing community**

- **Use C# for machine learning**
  - Static typing when possible, fallback to dynamic in corner cases
  - IDE support: code completion, documentation hints for classes, functions, and parameters
  - Experimental support for upcoming C# 8.0 features, such as ranges
  - Can be used from C# interactive, and C# kernel for Jupyter

- **Use F# Jupyter notebook to train deep learning models (provided by Azure for free)**

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**Comparison with TensorFlowSharp**

<table>
<thead>
<tr>
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<th>TensorFlowSharp</th>
<th>Our TensorFlow</th>
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<tr>
<td>Load TensorFlow models</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Train existing models</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Feature</td>
<td>TF</td>
<td>TF + Python</td>
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<tr>
<td>----------------------------------------------</td>
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<td>-------------</td>
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<tr>
<td>Create new models with low-level API</td>
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<td>✓</td>
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<tr>
<td>Create new models with high-level API</td>
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<td>✓</td>
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<td>Dataset manipulation via tf.data</td>
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<td>✓</td>
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<td>tf.contrib</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Commercial support</td>
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</tr>
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**Documentation & Tutorials**

- **Our Machine Learning Blog**: cool samples, LostTech.TensorFlow news, etc
- See **What's New** in the latest version
- **Getting started**
- **Reinforcement learning** with Unity ML Agents
- **Writing billion songs with C# and Deep Learning + Demo**
- **C# or NOT**: train deep convolutional network to classify programming language from a code fragment
- **.NET, TensorFlow, and the windmills of Kaggle**

**Get started** with an early tech preview, or **sign up** for LostTech.TensorFlow News and Releases.

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