

# Professional TensorFlow Developer

This entry-level Professional TensorFlow Developer training prepares learners to design, deploy, and optimize advanced machine learning models using TensorFlow, gaining practical familiarity with AI/ML principles and job expectations.

[CBT Nuggets course material](#) →

## WEEK 1

### Set Up a TensorFlow Development Environment 154 min.

|                    |    |
|--------------------|----|
| Google Colab       | 5  |
| Anaconda/Conda     | 6  |
| Jupyter notebook   | 4  |
| PyCharm            | 5  |
| Visual Studio Code | 13 |
| CHALLENGE ☒        | 6  |

### Explore Biological and Artificial Neural Networks

|                                      |    |
|--------------------------------------|----|
| A Brief History of Machine Learning  | 7  |
| Lumber Prices: Demand Predictions    | 5  |
| Neural Network Layers                | 4  |
| Numpy and Python Forward Propagation | 11 |
| CHALLENGE ☒                          | 12 |

### Explore TensorFlow Deep Learning Foundations

|                                    |    |
|------------------------------------|----|
| Explore TensorFlow Tensors         | 7  |
| Create TensorFlow Tensors          | 11 |
| Creating Random Tensors            | 9  |
| Creating Tensors from Numpy Arrays | 6  |
| CHALLENGE ☒                        | 8  |

### Explore Basic TensorFlow Operations and Attributes

|   |    |
|---|----|
| TensorFlow Seeds                          | 9  |
| Tensor Attributes, Indexing and Expansion | 14 |
| Tensor Aggregation and Type Casting       | 12 |

## WEEK 2

159 min.

CHALLENGE ☒ 11

### Apply TensorFlow Matrix Multiplication Operations

Basic Tensor Operations 9

Matrix Multiplication 8

MatMul's Fruit Stand Use Case 12

The Golden Rule 11

CHALLENGE ☒ 4

Bonus Challenge 1

Solution Video 2

### Transpose and Manipulate TensorFlow Tensors

Review: Matrix Multiplication 9

Reshape & Transpose Tensors 10

Transpose VS Reshape 10

Manipulate Tensors 7

CHALLENGE ☒ 5

### Explore TensorFlow Neural Network Architecture

Create Development Environment 13

Machine Learning Quickstart 6

Build, Compile, and Train Model 19

CHALLENGE ☒ 12

### Build a Regression Model to Predict Housing Price

What is Regression Analysis? 10

## WEEK 3

151 min.

Load Data and Explore Neural Network Architecture 10

Build a Baseline Regression Model 11

Build a Neural Network Regression Model 11

CHALLENGE ☒ 8

### Explore Neural Network Classifiers with TensorFlow

What is Classification? 5

Binary Classification? 14

Multi-Class Classification? 11

Explore Neural Network Classification in a Browser 3

CHALLENGE ☒ 13

### Visualize and Improve Performance with TensorFlow

Generate Linear Data 9

Evaluation Metrics 8

Visualize Activation Functions 15

CHALLENGE ☒ 18

### Integrate GitHub TensorFlow Development Workflows

From Cloud Colab to Local Jupyter 4

Setting Up a GitHub SSH Key 11

## WEEK 4

155 min.

Creating a repository 9

Starting, Forking, and Cloning Repos 7

CHALLENGE ☒ 23

## Explore Computer Vision Concepts with TensorFlow

|                                   |    |
|-----------------------------------|----|
| What is Computer Vision (CV)?     | 8  |
| Explore the fashion MNIST dataset | 13 |
| Explore How SoftMax works         | 8  |
| What is Feature Scaling?          | 7  |
| Challenge ☒                       | 11 |

## Code Convolutional Neural Networks with TensorFlow

|                                  |    |
|----------------------------------|----|
| Perform EDA                      | 16 |
| Explore Callbacks                | 14 |
| Illuminate Convolution & Pooling | 8  |
| Challenge                        | 6  |

## Design Computer Vision Models with TensorFlow

|  |    |
|--|----|
| Explore the Food 101 dataset on Kaggle   | 4  |
| Explore the modified ramen sushi dataset | 8  |
| Load dataset using ImageDataGenerator    | 13 |

## WEEK 5

152 min.

|   |   |
|---|---|
| Visualize random images with the labels | 7 |
| Challenge                               | 9 |

## Compare Deep and Convolutional NN Architectures

|                                      |    |
|--------------------------------------|----|
| Explore CNNs in a Browser            | 8  |
| What is a baseline model?            | 12 |
| Deep Neural Networks (DNNs)          | 8  |
| Convolutional Neural Networks (CNNs) | 13 |
| Challenge                            | 3  |

## Work with Real-world Image Datasets and TensorFlow

|                                     |    |
|-------------------------------------|----|
| Part 1: Teachable Machine prototype | 8  |
| Part 2: Acquire and upload images   | 19 |
| Challenge                           | 18 |

## Improve Convolutional Neural Network Performance

|                |    |
|----------------|----|
| Baseline Model | 22 |
| CNN Model      | 7  |
| Improvements   | 6  |
| Challenge      | 12 |

## WEEK 6

## Avoid Overfitting by Visualizing Model Performance 154 min.

|                                      |    |
|--------------------------------------|----|
| Load Dataset and Explore Overfitting | 16 |
| Baseline Model from Pseudocode       | 11 |
| Plot Training Curves                 | 7  |
| Challenge                            | 6  |

## Build a Multi-Class Classifier for 10 Food Classes

|                                    |    |
|------------------------------------|----|
| Explore Classification Types       | 4  |
| Food 10: Exploratory Data Analysis | 19 |
| Challenge                          | 22 |

## Participate in a Kaggle Prediction Competition

|   |    |
|---|----|
| Explore Kaggle's Prediction Competition | 7  |
| Manipulate Dataset for Model Building   | 6  |
| Load Dataset using ImageDataGenerator   | 12 |
| Challenge                               | 16 |

## Explore Transfer Learning Using Pre-Trained Models

|                                    |    |
|------------------------------------|----|
| What is Transfer Learning?         | 4  |
| Feature Extractions Vs Fine-Tuning | 9  |
| What is ImageNet?                  | 4  |
| Reduce and Load Dataset            | 11 |

### WEEK 7

157 min.

|           |   |
|-----------|---|
| Challenge | 7 |
|-----------|---|

## Improve Transfer Learning Models with Callbacks

|                            |    |
|----------------------------|----|
| Load Reduced Dataset       | 13 |
| Custom Callbacks           | 5  |
| TensorBoard Callbacks      | 5  |
| Model Checkpoint Callbacks | 4  |
| Early Stopping Callbacks   | 5  |
| Challenge                  | 5  |

## Reuse Pre-Trained TensorFlow Hub Models

|   |    |
|---|----|
| Review Transfer Learning, Feature Extraction, and Fine-Tuning | 8  |
| Load Reduced Food 10 Dataset                                  | 9  |
| Explore TensorFlow Hub Pre-Trained Models                     | 6  |
| Review Feature Extraction, and Fine-Tuning Code Examples      | 5  |
| Challenge   | 12 |

## Create a Pre-Trained Feature Extraction Model

|  |    |
|--|----|
| Load Reduced Food_10 Dataset           | 5  |
| Apply Data Augmentation                | 11 |
| Build Keras models simply using URLs ☒ | 7  |

|   |    |
|---|----|
| Explore TensorFlow Hub and Build a Model From a URL | 10 |
|---|----|

|           |   |
|-----------|---|
| Challenge | 6 |
|-----------|---|

## Fine-Tune a Pre-Trained TensorFlow Hub Model

|   |    |
|---|----|
| Compare Feature Extraction to Fine-Tuning     | 5  |
| Explore and Load Data with ImageDataGenerator | 11 |
| Create ResNet50 Model                         | 8  |
| Train the Fine-Tuning layers of the model     | 10 |

### WEEK 8

152 min.

|           |   |
|-----------|---|
| CHALLENGE | 6 |
|-----------|---|

## Fine-Tune a ResNet50 Model on Varied Dataset Sizes

|  |   |
|--|---|
| Explore Fine-TuningCompare Feature Extraction to Fine-Tuning                               | 1 |
| Explore Food_10 Dataset in Three Sizes☒  | 1 |
| Explore a new TensorFlow methods:image_dataset_from_directory data.AUTOTUNE (not T-Pain ☒) | 1 |
| Explore Keras Applications Vs TensorFlow Hub   | 1 |
| Fine-Tune the Top 10 Unfrozen Layers   | 1 |
| CHALLENGE  | 1 |

## Transition from Images to Text with TensorFlow

|  |   |
|--|---|
| Images, Sound, and Text as Numerical Representations | 9 |
| DevEnv: Jupyter Notebook, Conda and Anaconda         | 9 |
| Implement Tokenization with TensorFlow               | 9 |
| Large Language Models, NLP Tasks, and Classification | 5 |

|                |   |
|----------------|---|
| CHALLENGE      | 7 |
| Bonus Resource | 3 |

### Investigate How Machines Learn to Read Text

|                                   |    |
|-----------------------------------|----|
| Explore NLP Concepts              | 5  |
| Setup Our Development Environment | 7  |
| Out of Vocabulary Tokens          | 4  |
| Padding                           | 10 |
| TextVectorization                 | 7  |
| CHALLENGE                         | 9  |

### Expand Model Vocabulary with News Headlines

|  |    |
|--|----|
| News Category Dataset                                | 6  |
| Setup Development Environment and Load Data          | 6  |
| Token Sequences, OOV, and Padding: Tokenizer         | 5  |
| Token Sequences, OOV, and Padding: TextVectorization | 5  |
| CHALLENGE  | 18 |

### Classify IMDb Review Sentiment with Embeddings

|  |   |
|--|---|
| The Development Environment & Load Dataset | 9 |
| EDA and Tokenizer Hyperparameters          | 7 |

## WEEK 9

**151 min.**

|                         |    |
|-------------------------|----|
| Tokenizer Model         | 4  |
| TextVectorization Model | 7  |
| CHALLENGE               | 11 |

### Classify Text with Subwords and Sentiment Analysis

|  |    |
|--|----|
| Setup Development Environment                                | 3  |
| Tokenization Granularity Context: How Many Rs in Strawberry? | 4  |
| IMDb Subwords  | 6  |
| YELP: Tokenization   | 7  |
| YELP: Model Building   | 9  |
| Challenge  | 10 |

### Compare Tokens and Sequences for Deeper Meaning

|   |    |
|---|----|
| Compare Tokens and Sequences for Deeper Meaning       | 2  |
| Compare Tokens and Sequences                          | 10 |
| Setting Up The Development Environment                | 4  |
| Explore Recurrent Neural Network Python Code Examples | 7  |
| Comparing RNNs to LSTMs                               | 4  |
| Exploring Sequence Problems to Solve (Seq2Seq)        | 7  |
| CHALLENGE   | 2  |
| SOLUTION  | 6  |

### Build a Generative Shakespearean Sequence Model

|   |    |
|---|----|
| Skill Introduction                              | 4  |
| Build a Generative Shakespearean Sequence Model | 5  |
| Setup Your Development Environment              | 3  |
| Define and Tokenize Corpus Text                 | 3  |
| Create and Pad Sequence of Numbers              | 7  |
| Create X and y Datasets for Training            | 4  |
| One-Hot Encode Categorical Labels               | 3  |
| Build, Compile, and Train Model                 | 5  |
| CHALLENGE                                       | 4  |
| Solution  | 10 |

**WEEK 10****Explore RNNs, LSTMs, and GRUs****151 min.**

|  |    |
|--|----|
| Introduction                             | 3  |
| Exploring RNNs: Equation and Memory      | 12 |
| Setup The Conda Development Environment  | 3  |
| Explore RNN, Bidirectional RNN, and LSTM | 4  |
| Bidirectional RNN Model Architecture     | 6  |
| LSTM Model Architecture                  | 6  |
| Challenge                                | 11 |

**Explore RNN Generative Text Models**

|  |    |
|--|----|
| Skill Introduction                                       | 3  |
| Set Up Dev Environment                                   | 4  |
| Single Layer RNN Model                                   | 7  |
| Bidirectional RNN Model                                  | 3  |
| Single Layer LSTM Model                                  | 4  |
| Bidirectional LSTM Model                                 | 4  |
| Single Layer GRU Model                                   | 3  |
| Bidirectional GRU Model                                  | 3  |
| Review Calculus Concepts: Gradients and Gradient Descent | 7  |
| Challenge  | 4  |
| Solution   | 10 |

**Build a Bidirectional LSTM Model**

|                                  |   |
|----------------------------------|---|
| Skill Introduction               | 5 |
| Select a Development Environment | 5 |
| Build a Baseline Model           | 8 |
| Data Preprocessing               | 9 |
| Define, Compile, and Train Model | 4 |

|           |    |
|-----------|----|
| Challenge | 13 |
|-----------|----|

**Build a Multiple Layered Bidirectional LSTM Model**

|   |   |
|---|---|
| Skill Introduction                                      | 3 |
| Setup Development Environment                           | 3 |
| Explore LSTM, GRU, and LSTM/Convolutional Architectures | 4 |

**WEEK 11****167 min.**

|  |    |
|--|----|
| Conv/LSTM Equations and CNNs Explained | 5  |
| Perform Data Preprocessing             | 4  |
| Perform EDA on Disaster Tweets         | 5  |
| Continue EDA                           | 5  |
| Challenge ☒                            | 15 |

**Build GRU and Convolutional LSTM Networks**

|  |    |
|--|----|
| Skill Introduction   | 4  |
| Set Up the Development Environment                           | 4  |
| Improve Model Performance for the Disaster Tweets Classifier | 11 |
| Model Performance Experiment                                 | 11 |
| Challenge ☒  | 5  |
| Solution Video   | 10 |

**Participate in NLP Kaggle Competitions**

|                                   |   |
|-----------------------------------|---|
| Skill Introduction                | 4 |
| Set Up Development Environment    | 6 |
| Load Dataset and Import Libraries | 6 |
| What is Lemma?                    | 4 |

|                             |    |
|-----------------------------|----|
| Preprocess Disaster Dataset | 10 |
| TensorFlow Vector Projector | 3  |
| Challenge ☒                 | 3  |
| Solution                    | 5  |

### Explore Fine-Tuning with TensorFlow Hub Models

|                                |    |
|--------------------------------|----|
| Skill Introduction             | 5  |
| What is Fine-Tuning?           | 6  |
| What is TensorFlow Hub?        | 3  |
| Set Up Development Environment | 2  |
| Build the Custom UseLayer      | 10 |
| Challenge ☒                    | 4  |
| Solution Videos                | 17 |

## WEEK 12 **Examine Time-Series and Temporal Patterns** 152 min.

|   |   |
|---|---|
| Set Up Development Environment                | 2 |
| Visualization with Matplotlib                 | 6 |
| Univariate Time Series                        | 6 |
| Multivariate Time Series                      | 4 |
| Trends Visualized                             | 5 |
| Seasonality & Trends + Seasonality Visualized | 4 |
| Math Concepts Review                          | 7 |
| Challenge ☒                                   | 1 |

### Build Time-Series Forecasting Models with DNN

|  |   |
|--|---|
| Skill Introduction                                 | 5 |
| Set Up Development Environment                     | 3 |
| What is a Sine Wave, Series, and Why Is It Useful? | 8 |

|   |    |
|---|----|
| Build a Synthetic Dataset   Dirty Sine Wave   | 6  |
| What is Split Time?                           | 5  |
| Code a Data Windowing Helper Function         | 12 |
| What is the Model Seeing? (Behind the Scenes) | 4  |
| Challenge ☒                                   | 2  |
| Solution Video                                | 8  |

### Build Time-Series Forecasting Models with RNN

|   |   |
|---|---|
| Skill Introduction                      | 5 |
| Set Up Development Environment          | 4 |
| Explore Linear Combination Concepts     | 5 |
| Inside Linear Combinations of DNN & RNN | 7 |
| Why Are We Running Out of Samples?      | 4 |
| CHALLENGE ☒                             | 1 |
| Solution 1: DNN                         | 8 |
| Solution 2: RNN                         | 5 |

### Compare RNN and LSTM Forecasting Models

|                                |    |
|--------------------------------|----|
| Skill Introduction             | 3  |
| Set Up Development Environment | 3  |
| Challenge #1                   | 5  |
| Solution #1                    | 14 |

## WEEK 13 65 min.

|              |    |
|--------------|----|
| Challenge #2 | 1  |
| Solution #2  | 11 |
| Challenge #3 | 1  |
| Solution #3  | 9  |

## Build DNN, LSTM, and CNN Forecasting Models

|   |   |
|---|---|
| Skill Introduction  | 4 |
| Set Up Development Environment                                  | 3 |
| Explore the Sunspots Dataset on Kaggle and Wikipedia            | 5 |
| Considering Model Architecture and the 11 or 22 Year Cycles?    | 4 |
| Why Bidirectional LSTMs are a Poor Fit for Sunspots Predictions | 9 |
| Compare LSTM and Bidirectional Model Architecture               | 5 |
| Best of Both Worlds: LSTM $\times$ CNN                          | 4 |
| Challenge   | 9 |