

# TensorFlow

## Introduction

# Agenda

- What is tensorflow?
- Why we are using tensorflow?
- TensorFlow 2.x
- TensorFlow 2.x - features and changes
- Changes with respect to TensorFlow 1.x
- Keras and it's advantages
- Keras vs tf.keras
- Tutorials and guides
- Notes

# TensorFlow

- TensorFlow is a machine learning library by Google
- It is open sourced
- It is mainly used for implementing neural networks
- It is an end-to-end platform, which means you can use it for building your models from scratch to deploying them into a production environment

# Why TensorFlow for this course?

- Most used library for deep learning
- Easy transition from research to production
- Extensive industry support
- Easy deployment around servers, mobile devices, web platforms etc
- You can easily sort out the issues using GitHub, StackOverflow etc
- Used by world's top AI companies
- Consistently updated with cutting edge changes

# Some technical reasons

- Easy and readable syntax
- Being a low-level library it provide more flexibility to developers to implement their own functionalities and services
- Provides high level API for implementing advanced neural net architectures
- Distributed training

# OS Support

TensorFlow is supported on following 64 -bit systems:

- Ubuntu 16.04 or later
- macOS 10.12.6 (Sierra) or later (no GPU support)
- Windows 7 or later
- Raspbian 9.0 or later

# Language support

- Python
- C++
- JavaScript
- Java
- Go
- Swift

# New version - TensorFlow 2.x

- Much easier development
- Tight integration with Keras
- More familiar for Python developers
- Deploy anywhere across servers, mobile and edge devices, browser and Node.js with TensorFlow Extended, TensorFlow Lite and TensorFlow .JS
- Multi GPU support



# What's new in TF2?

- `tf.function()`: Creates a callable TensorFlow graph from a Python function
- `tf.GradientTape()`: Records operations for automatic differentiation
- `tf.data()`: helps in building complex input pipelines from simple, and reusable pieces

# Changes with respect to TensorFlow 1.x

- Cleaning up of APIs: many APIs are either gone or moved
- Eager execution (default): no need manually compile the abstract syntax tree
- No more globals: no need to track variables
- Introduction of function and elimination of session

# Model building: from simple to flexible

- |  |         |                                  |
|--|---------|----------------------------------|
| 1. Sequential API + built in layers                                      | ----- > | New users                        |
| 2. Functional API + built in layers                                      | ----- > | Engineers with standard use case |
| 3. Functional API + custom layers<br>+ custom metrics<br>+ custom losses | ----- > | Engineers requiring control      |
| 4. Subclassing: write everything<br>yourself from<br>scratch             | ----- > | Researchers                      |

# Keras

# Keras

- Keras is a high-level neural network API
- Written and implemented in Python
- Can run on top of TensorFlow
- It was designed keeping fast experimentation in mind.

# Keras advantages

- User-friendly
  - Simple and user friendly interface. Actionable feedbacks are also provided.
- Modular and composable
  - Modules are there for every step, you can combine them to build solutions.
- Easy to extend
  - Gives freedom to add custom blocks to build on new ideas.
  - Custom layers, metrics, loss functions etc. can be defined easily.

# Keras vs tf.keras

- In TF2 instead of writing “import keras” you will write “from tensorflow import keras”
- In colab, if you see the message “Using TensorFlow Backend”, you are not using tensorflow 2.x implementation of keras
- tf.keras is the TensorFlow’s implementation of keras so it supports all the latest changes in the TensorFlow version
- tf.keras is also better in support and maintenance

# Latest tutorials and guides

- <https://www.tensorflow.org/tutorials>
- <https://www.tensorflow.org/guide>



# Notes

- TensorFlow 2.0 announcement video:  
<https://www.youtube.com/watch?v=EqWsPO8DVX k>
- Guide to convert your code from TF 1 to TF 2:  
<https://www.tensorflow.org/guide/migrate>
- Detailed introduction video:  
<https://www.youtube.com/watch?v=5ECD8J3dvDQ>

# Thank you!

Happy Learning :)