Applied Deep Learning

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Overview of Session-3:

- Demo : Scene Understanding tool
- Exploration of required tools
- Open-source code
- Building an AI model in 10 lines of code

Scene Understanding : Walkthrough

Complex Deep Learning

Image Captioning

"man in black shirt is playing guitar."

"construction worker in orange safety vest is working on road."

"two young girls are playing with lego toy."

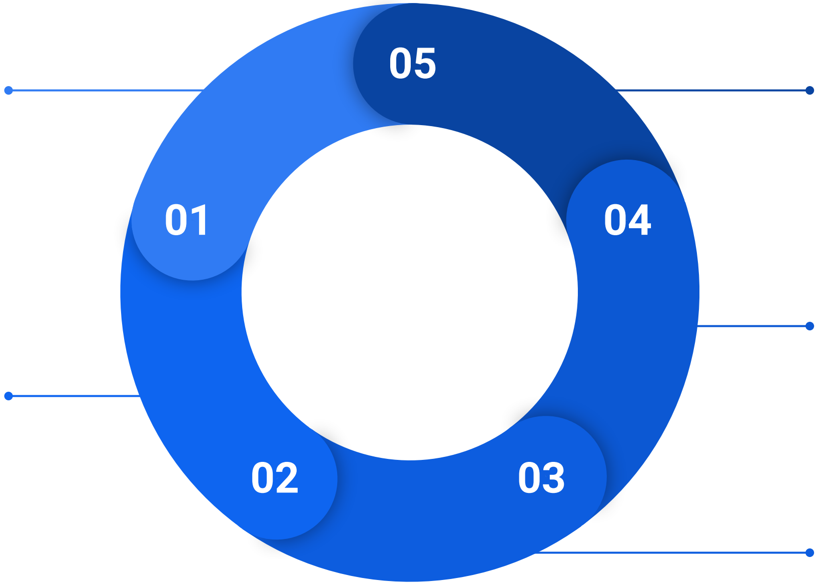
"boy is doing backflip on wakeboard."

Images

Text

http://places2.csail.mit.edu/demo.html

Exploration of Required Tools



Business Use-case :
Break into Problem Statements

AI R&D for each problem

Aggregate Results

Deployment

Rephrase / Recycle

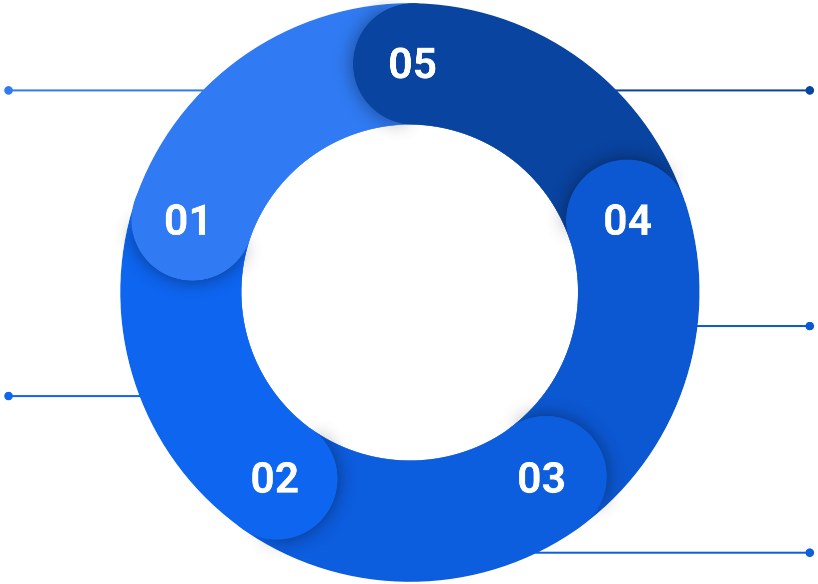
Example : Smart Retail Store

Smart Retail Store :

- Smart Basket
- Chatbot for Assistant
- ……..

AI R&D for each problem

- Computer Vision
- Natural Language Processing
- ………

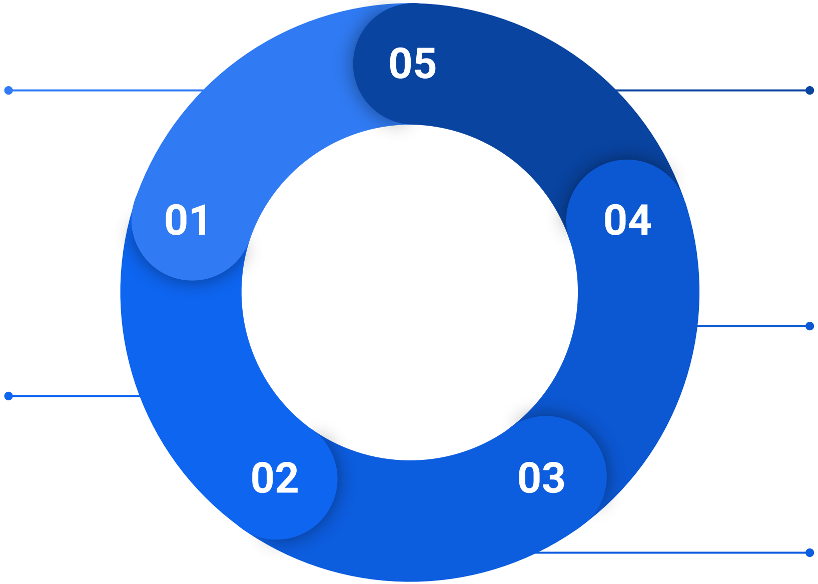


Rephrase / Recycle

Deployment

Aggregate Results

Example : Smart Retail Store



Data Science

Applied Deep Learning

Applied Data Learning

Software Development

Data Science

Open-Source Code

Using Pre-trained Models

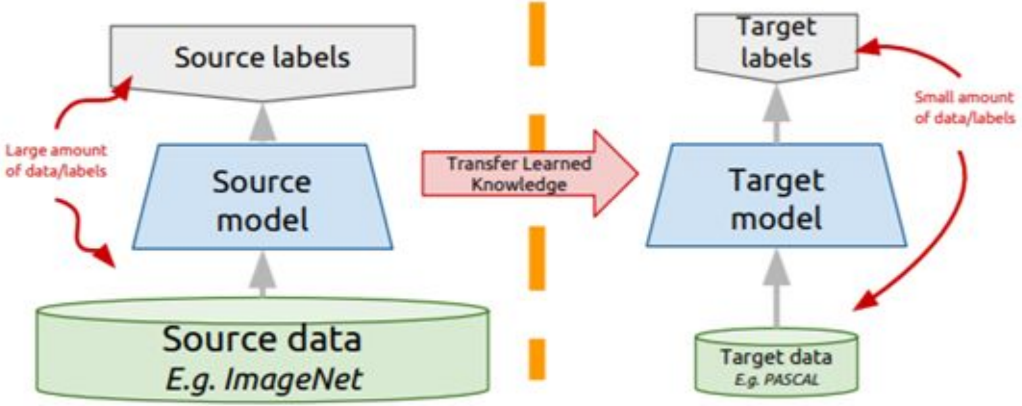
Transfer learning: idea

Instead of training a deep network from scratch for your task:

- Take a network trained on a different domain for a different **source task**
- Adapt it for your domain and your **target task**

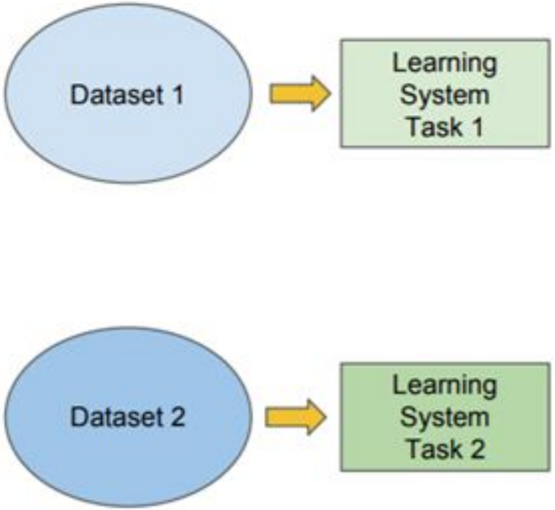
Variations:

- Same domain, different task
- Different domain, same task

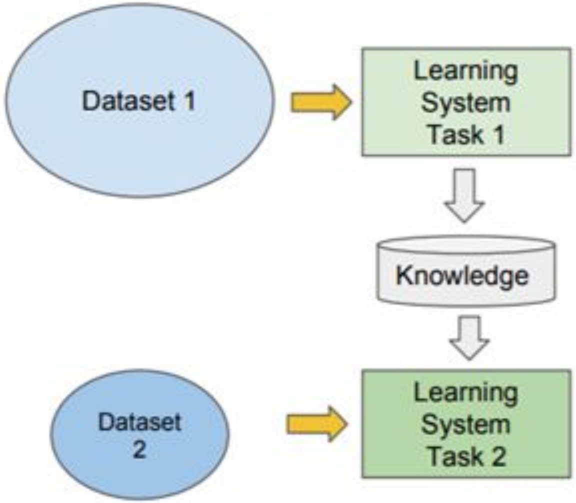


Traditional ML vs Transfer Learning

- Isolated, single task learning:
    - Knowledge is not retained or accumulated. Learning is performed w.o. considering past learned knowledge in other tasks



- Learning of a new tasks relies on the previous learned tasks:
    - Learning process can be faster, more accurate and/or need less training data



TensorFlow

Building AI Models in 10 lines of code

Reusing Pretrained models :
Transfer Learning

PyTorch

Transfer Learning Approaches

- Method 1 : *Using online repository of the trained model*
- Method 2 : *Using models defined in the model in the framework*
- Method 3 : *Downloading the model in your local and using it*

Method 1 : *Using online repository of the trained model*

- Using tensorflow hub
  - Online pre-trained models
  - https://www.tensorflow.org/tutorials/images/transfer_learning_with_hub
  - https://github.com/tensorflow/hub/blob/master/examples/colab/object_detection.ipynb

- Using pytorch hub
  - https://pytorch.org/hub/research-models
  - https://pytorch.org/hub/nvidia_deeplearningexamples_ssd/

  -
    ```
    import torch
    ```

  -
    ```
    precision = 'fp32'
    ```

  -
    ```
    ssd_model = torch.hub.load('NVIDIA/DeepLearningExamples:torchhub', 'nvidia_ssd',
    model_math=precision)
    ```

Method 2 : *Using models defined in the model in the framework*

- Using tensorflow trained models defined in library as application
    - https://www.tensorflow.org/tutorials/images/transfer_learning#create_the_base_model_from_the_pre-trained_convnets

    ```
    # Create the base model from the pre-trained model MobileNet V2
    base_model = tf.keras.applications.MobileNetV2(input_shape=IMG_SHAPE, include_top=False,
                                                   weights='imagenet')
    ```

- Using pytorch trained models defined in library
    - https://pytorch.org/docs/stable/torchvision/models.html

    ```
    import torchvision.models as models
    resnet18 = models.resnet18(pretrained=True)
    ```

Method 3 : *Downloading the model in your local and using it*

- Keras Model : .h5
- Pytorch model : .pt, .pth, .onnx
- Tf Model : .ckpt, .pb

- Tensorflow :
  - Exporting a model : https://www.tensorflow.org/api_docs/python/tf/saved_model/save
  - Re-using the exported model : https://www.tensorflow.org/guide/saved_model
- Pytorch:
  - Approach 1: https://pytorch.org/tutorials/advanced/super_resolution_with_onnxruntime.html
  - Approach 2: https://pytorch.org/tutorials/beginner/saving_loading_models.html

References

- https://pytorch.org/tutorials/beginner/deep_learning_60min_blitz.html
- https://keras.io/examples/
- https://www.tensorflow.org/learn
- https://www.youtube.com/watch?v=CU6bTEClzlw
- https://www.youtube.com/c/K%C3%A1rolyZsolnai/videos
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Thank you!

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