Performing Image Classification with Pre-trained Models

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Overview

Understanding transfer learning

Transfer learning for image classification

PyTorch support for pre-trained model architectures

Transfer Learning

The practice of re-using a trained neural network that solves a problem similar to yours, freezing the lower layers and only re-training the higher layers

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Avoid designing NN architecture from scratch

Also saves on time and effort of re-training from scratch

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Only makes sense for common, widely studied use-cases…

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...in which basic problem structure stays same, but details vary

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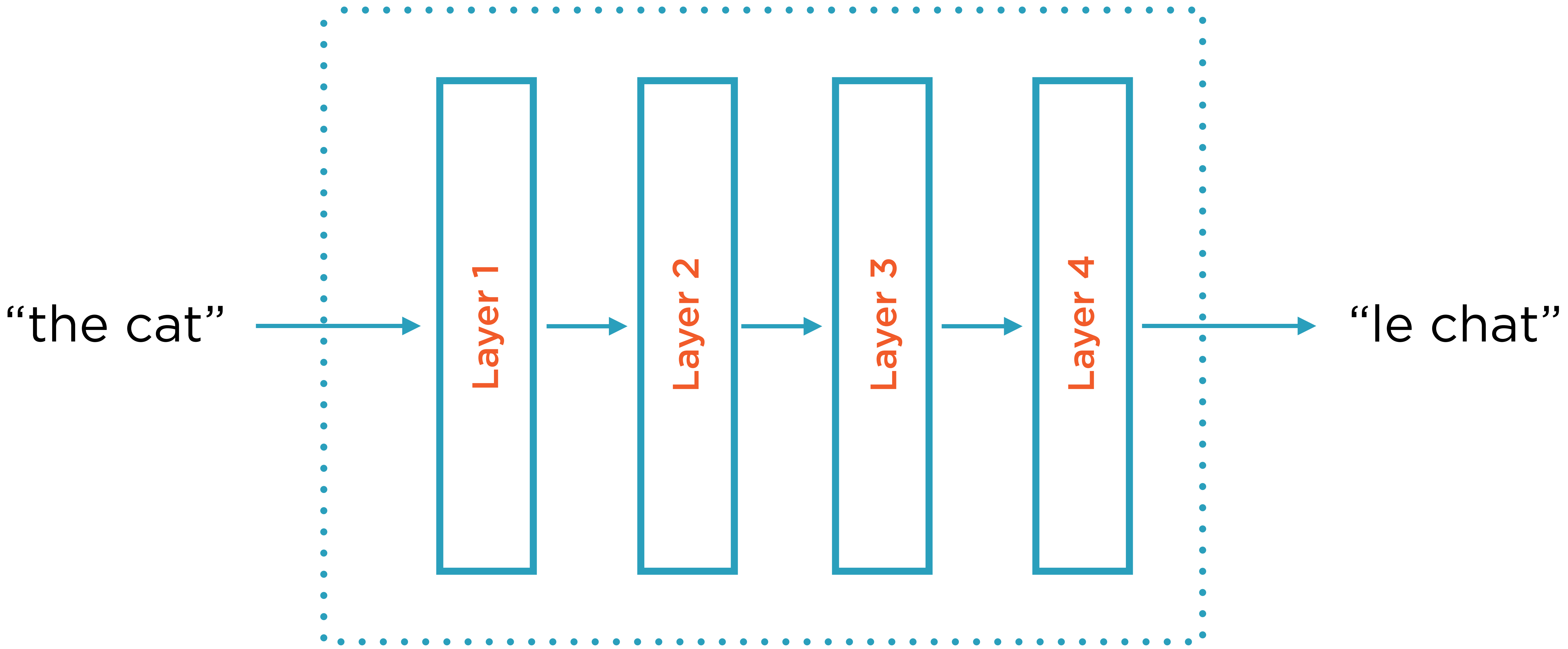
Image recognition, language translation are classic examples

Original Model: English to French

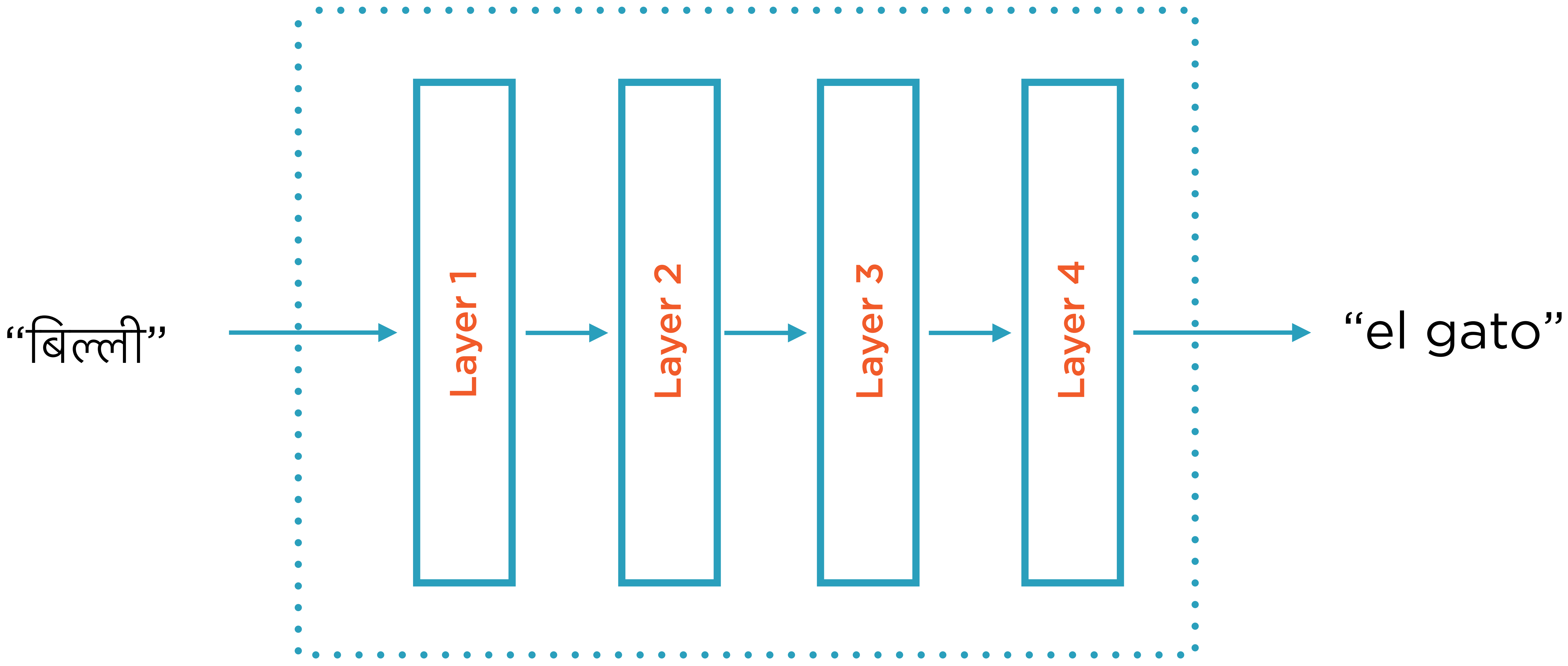


English Input

Highly Optimized NN Architecture

French Output

Transfer Learning: Hindi to Spanish



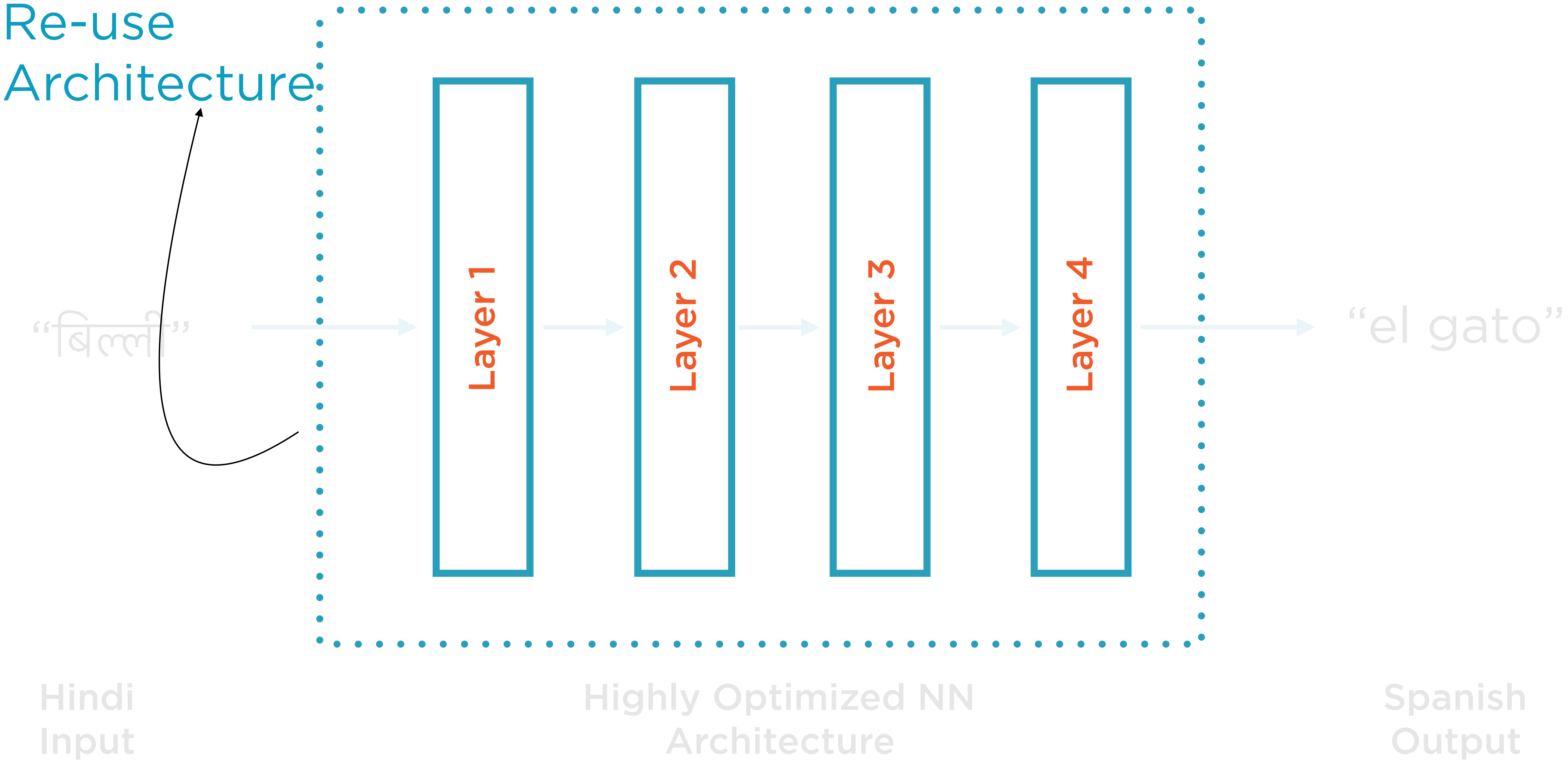
Hindi Input

Highly Optimized NN Architecture

Spanish Output

Transfer Learning: Hindi to Spanish

Re-use Architecture



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Lower layers mostly perform feature extraction

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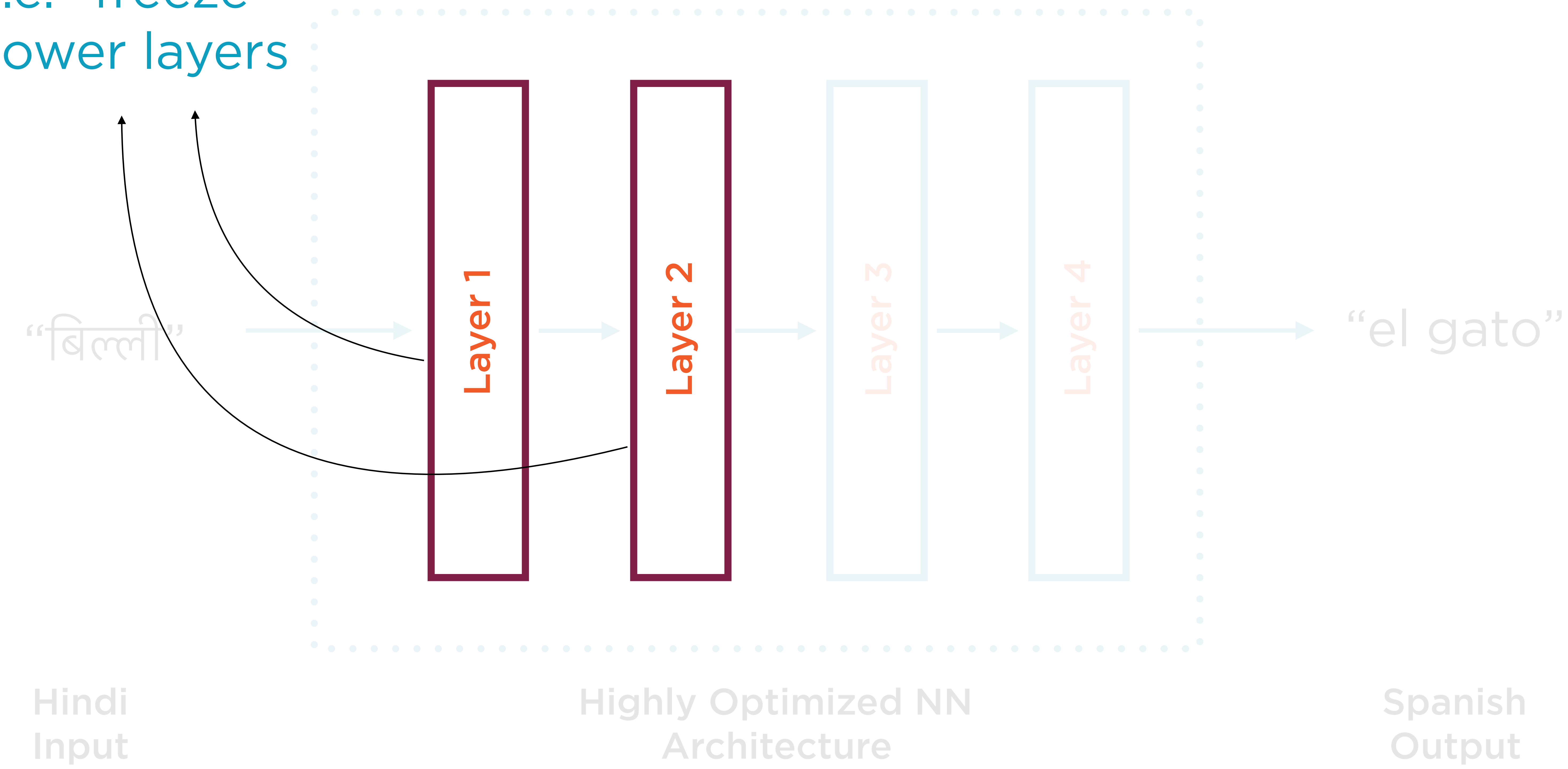
Re-use as-is without even changing parameter weights

Transfer Learning: Hindi to Spanish

i.e. “freeze” lower layers



Can’t avoid this - higher layers are more “high-level”

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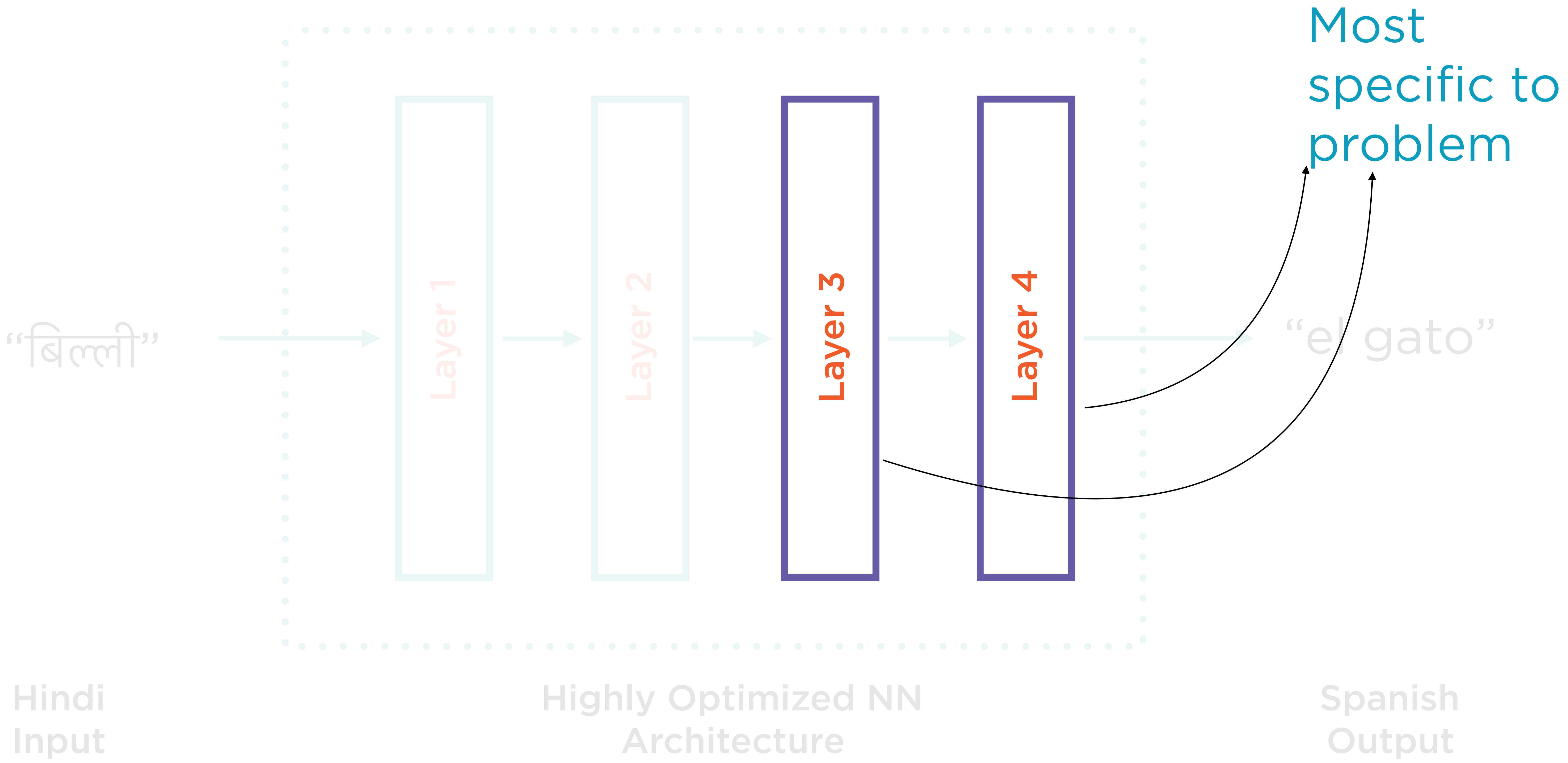
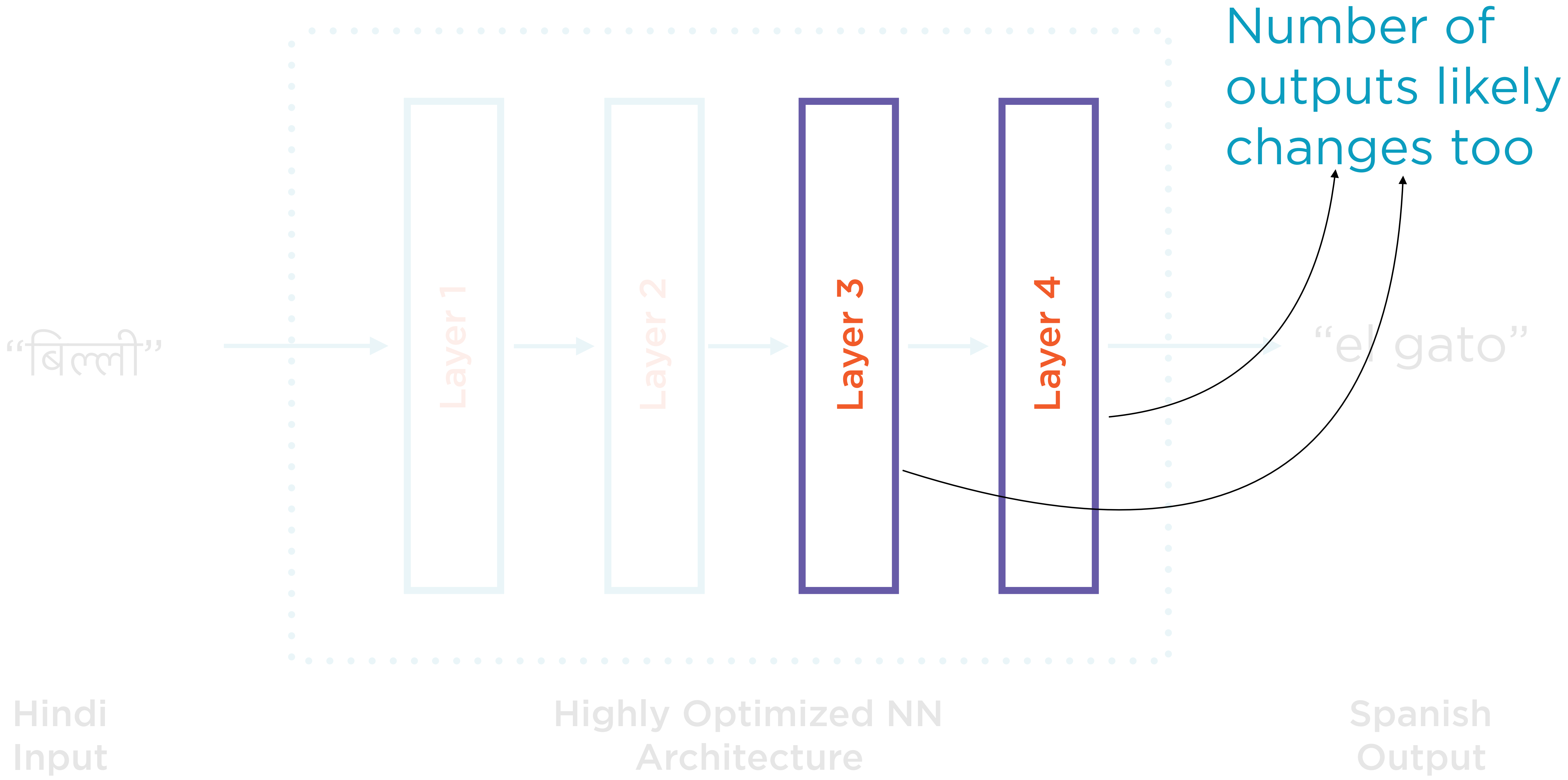
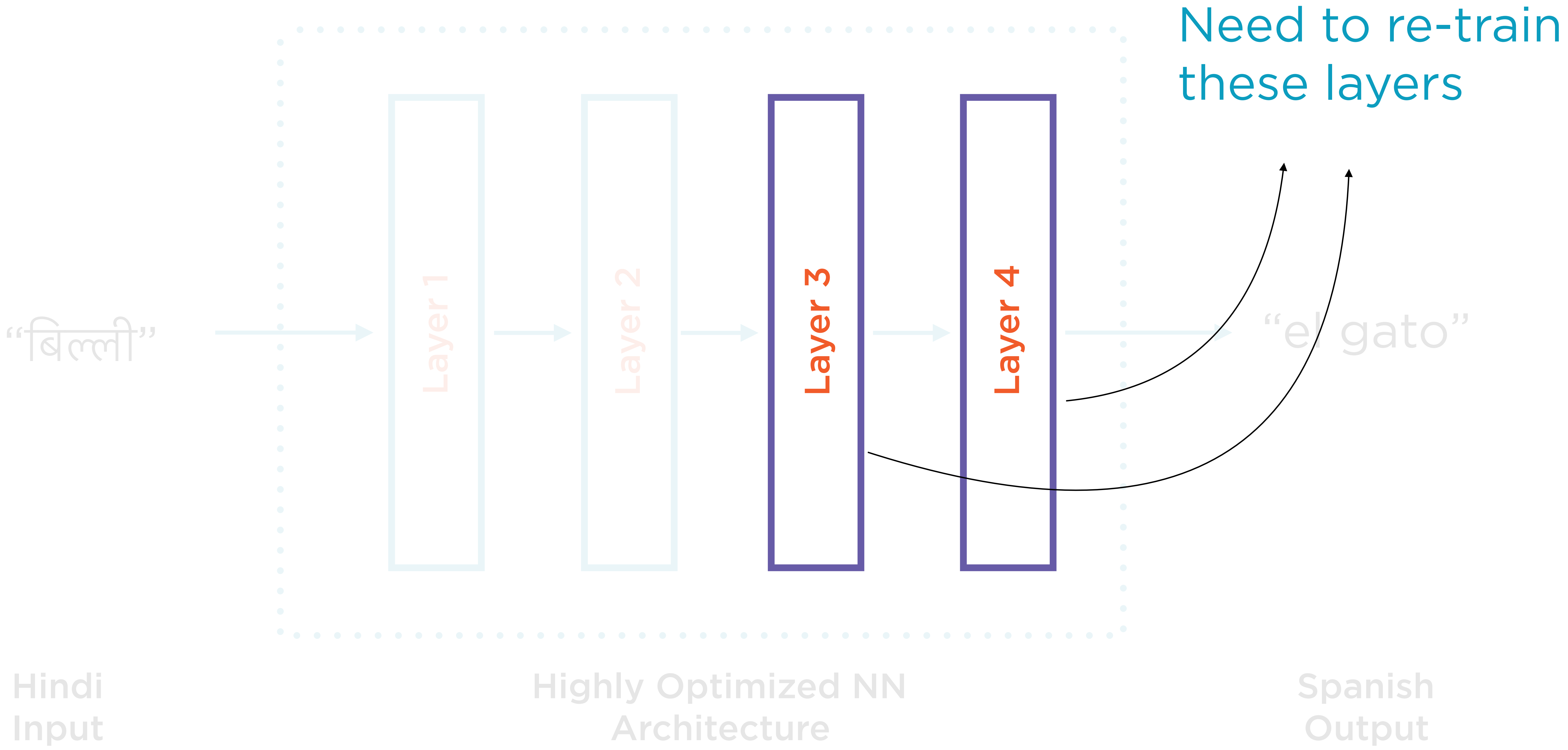
Transfer Learning: Hindi to Spanish



Transfer Learning: Hindi to Spanish



Transfer Learning: Hindi to Spanish



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Benefits of Transfer Learning

“Ride on the shoulders of giants”

- NN architecture
- Choice of initialization
- Activation functions
- Number and density of layers

Benefits of Transfer Learning

“Do more with less”

Make do with less training data

- English to French: Lots of training data
- Hindi to Spanish: Little or no training data

Benefits of Transfer Learning

“Faster, cheaper”

Training process is far faster, easier

- Smaller training data
- Only higher layers to train
- In a cloud-enabled world, less time => less money

Transfer Learning in PyTorch

Support for several famous NN architectures

torchvision.models

- Alexnet
- VGG
- ResNet
- Inception
- …

Demo

Apply transfer learning to image classification

Demo

Clean up the deep learning VM instance

Summary

Understanding transfer learning

Transfer learning for image classification

PyTorch support for pre-trained model architectures

Related Courses: Image Processing

Building Features from Image Data

Mining Data from Images

Related Courses: PyTorch

Natural Language Processing with PyTorch

Expediting Deep Learning with Transfer Learning: PyTorch Playbook