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ML Development: Model Prototyping

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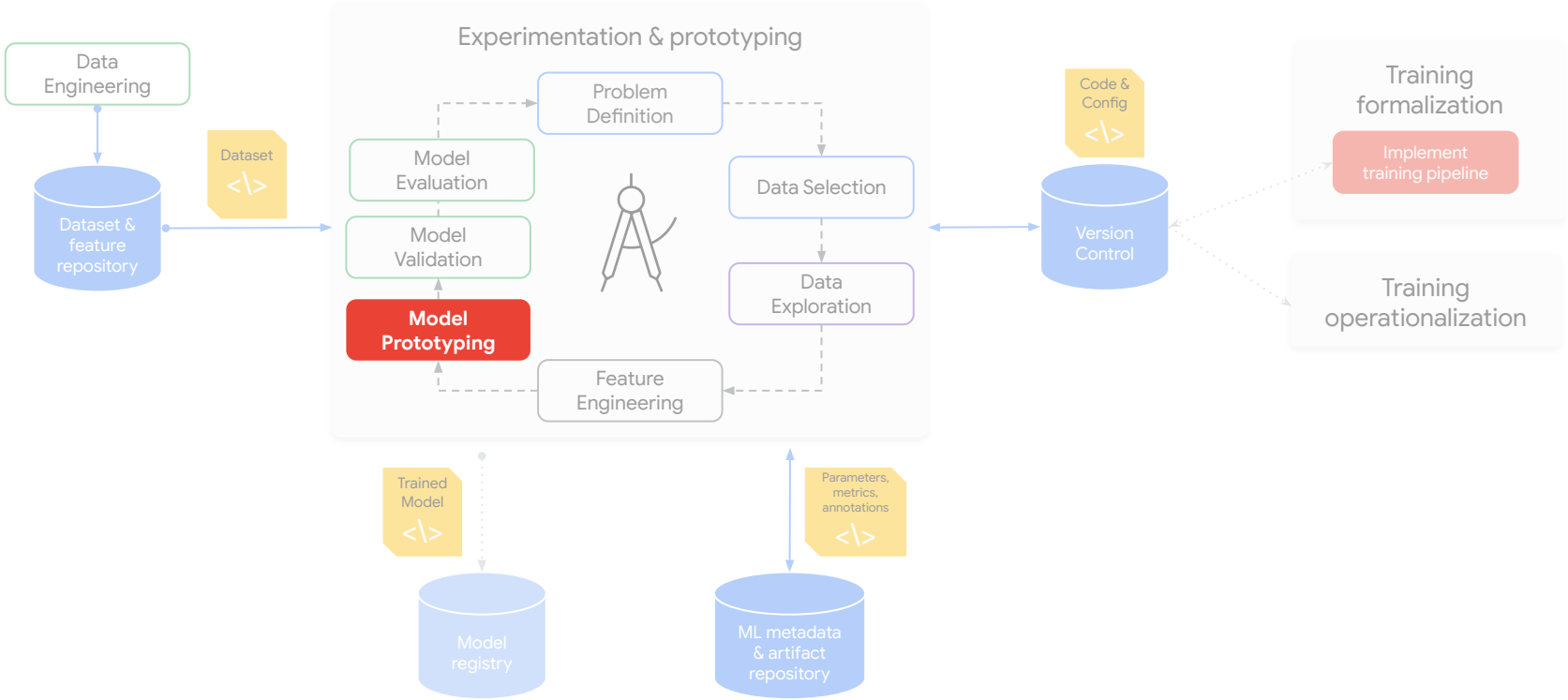
MLOps: ML Development



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The MLOps **Personas**

ML Engineer

ML Researcher

Data Scientist

Data Engineer

Software Engineer

DevOps

Business Analyst

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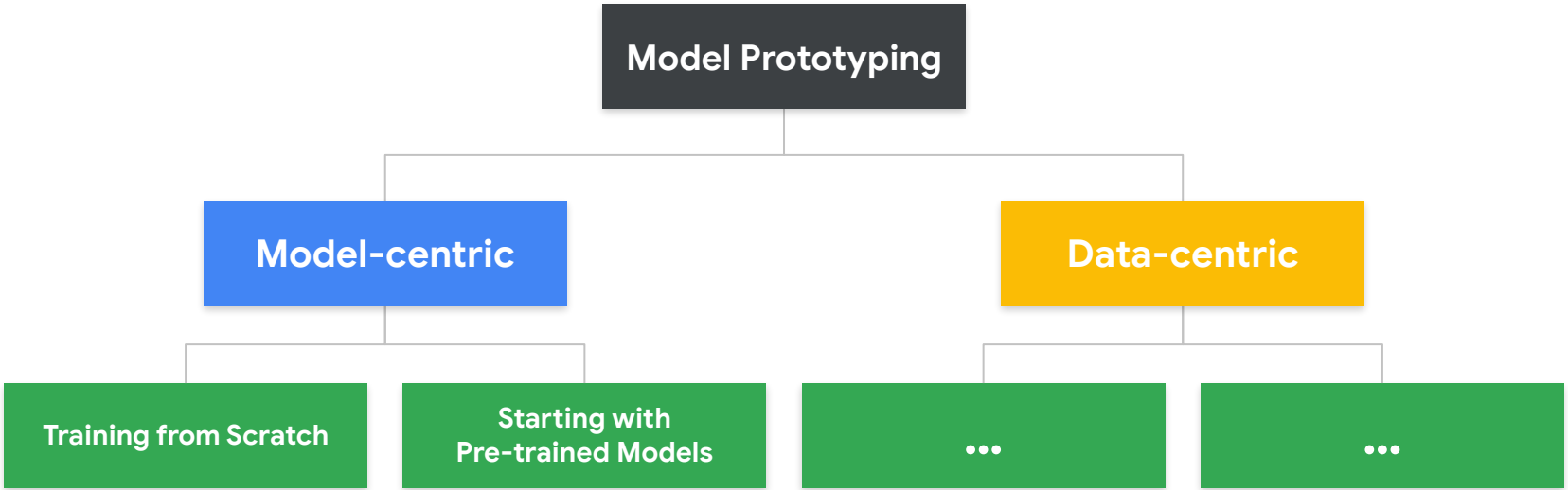

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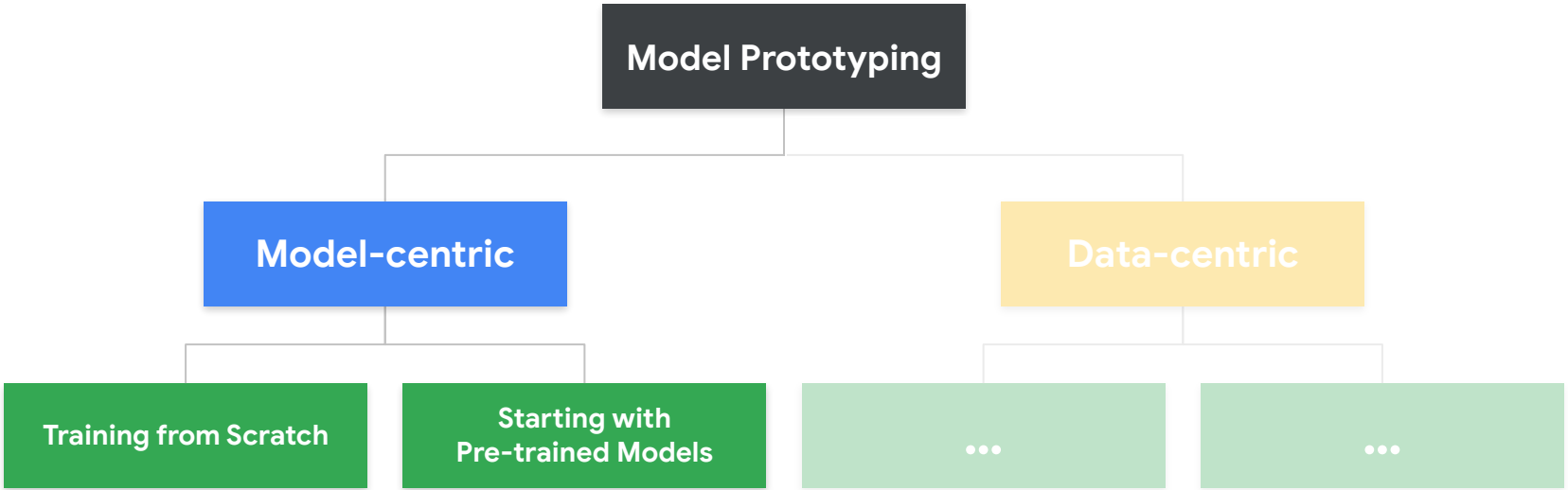

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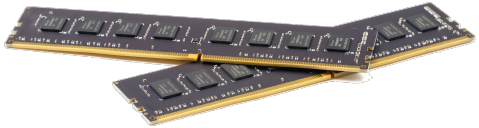
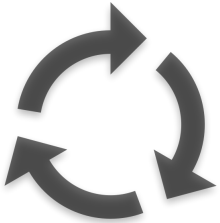
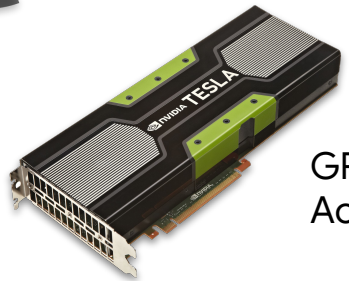
Training Pipeline: **Need Compute Resources**



Memory



Compute



GPU and
Accelerators

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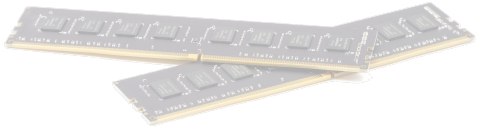
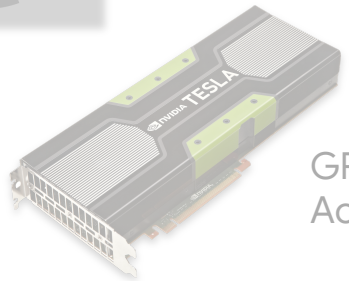
Training Pipeline: **Need Compute Resources**

Computationally Intensive
Repeated Many Times (Epochs)

Compute



Memory



GPU and
Accelerators

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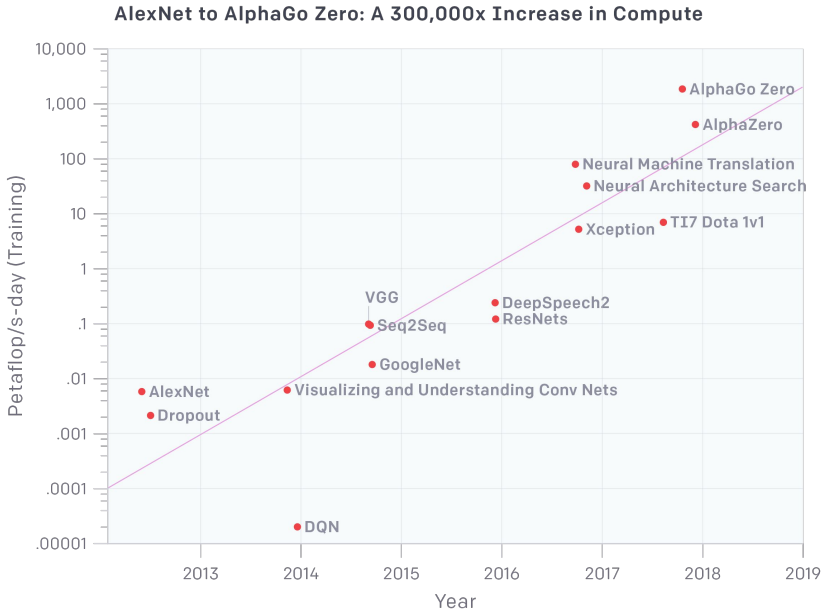
Compute Requirements are **Growing**

"… **since 2012 the amount of compute used in the largest AI training runs has been increasing exponentially with a 3.5 month-doubling time** (by comparison, Moore's Law had an 18-month doubling period). Since 2012, this metric has **grown by more than 300,000x (an 18-month [Moore's Law] doubling period would yield only a 12x increase)**. Improvements in compute have been a key component of AI progress, so as long as this trend continues, it's worth preparing for the implications of systems far outside today's capabilities."



Source: https://blog.openai.com/ai-and-compute/

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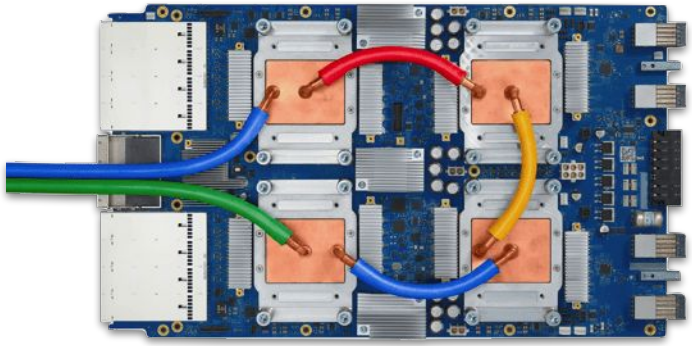
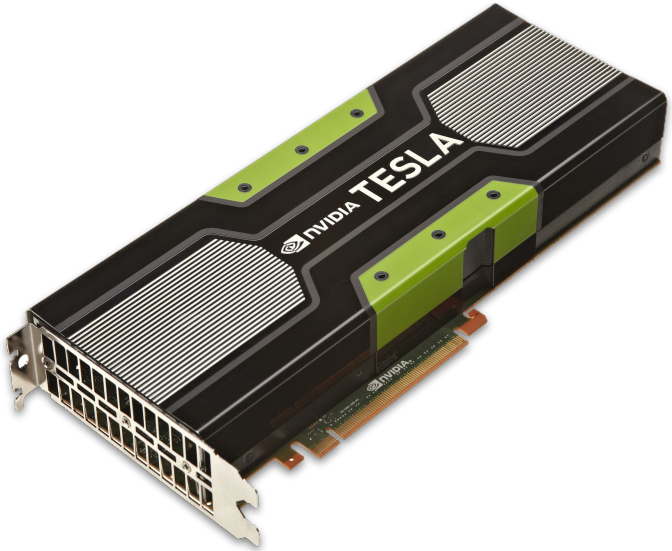
TPUs/GPUs





Elliot Turner
@eturner303

Holy crap: It costs $245,000 to train the XLNet model (the one that's beating BERT on NLP tasks..512 TPU v3 chips * 2.5 days * $8 a TPU) - arxiv.org/abs/1906.08237

XLNet: Generalized Autoregressive Pretraining for Language Understanding

Zhilin Yang*[1], Zihang Dai*[12], Yiming Yang[1], Jaime Carbonell[1], Ruslan Salakhutdinov[1], Quoc V. Le[2]
[1]Carnegie Mellon University, [2]Google Brain
{zhiliny,dzihang,yiming,jgc,rsalakhu}@cs.cmu.edu, qvl@google.com

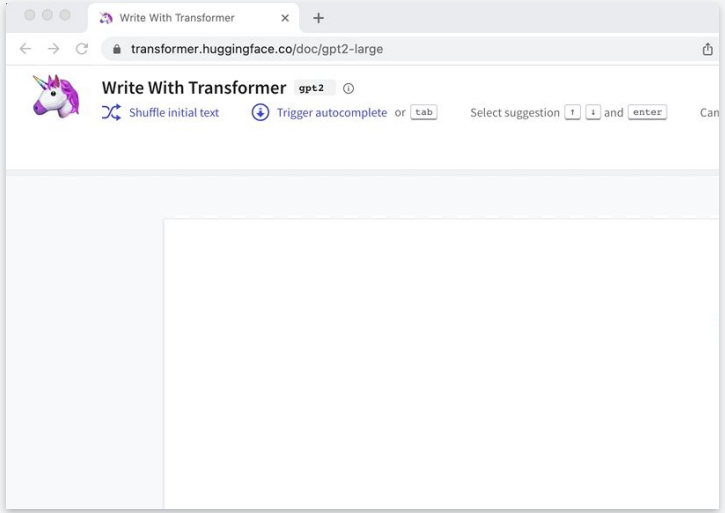
Abstract

With the capability of modeling bidirectional contexts, denoising autoencoding based pretraining like BERT achieves better performance than pretraining approaches based on autoregressive language modeling. However, relying on corrupting the input with masks, BERT neglects dependency between the masked positions and suffers from a pretrain-finetune discrepancy. In light of these pros and cons, we propose XLNet, a generalized autoregressive pretraining method that (1) enables learning bidirectional contexts by maximizing the expected likelihood over all permutations of the factorization order and (2) overcomes the limitations of BERT thanks to its autoregressive formulation. Furthermore, XLNet integrates ideas from Transformer-XL, the state-of-the-art autoregressive model, into pretraining. Empirically, XLNet outperforms BERT on 20 tasks, often by a large margin, and achieves state-of-the-art results on 18 tasks including question answering, natural language inference, sentiment analysis, and document ranking.[1].

Presenter HERE


GPT-2

US $256/hr


Write With Transformer
transformer.huggingface.co/doc/gpt2-large
Write With Transformer
gpt2
Shuffle initial text
Trigger autocomplete
or
tab
Select suggestion
and
enter

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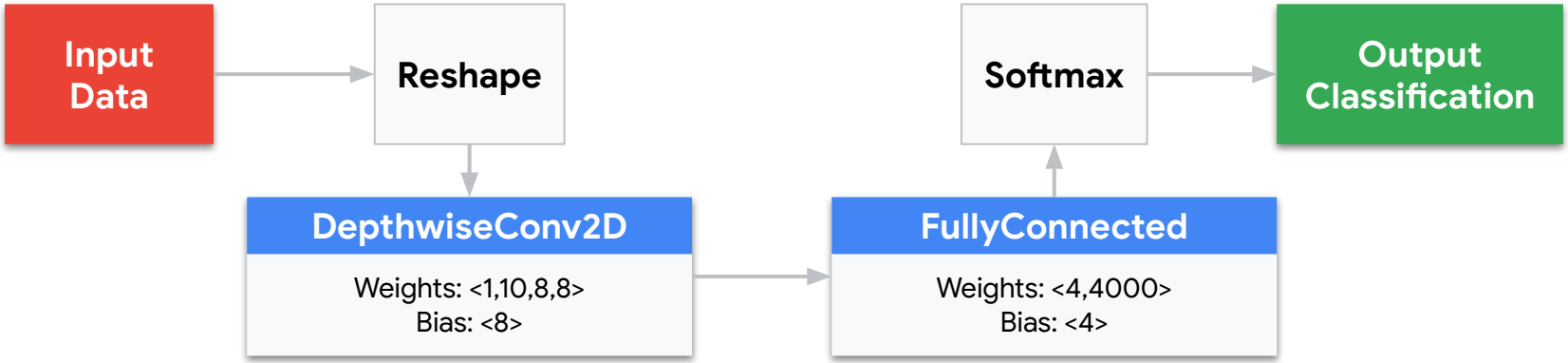
TinyML Also Takes Long

(okay, not that long...)



2 hours for a 5-word model

Pre-trained Models

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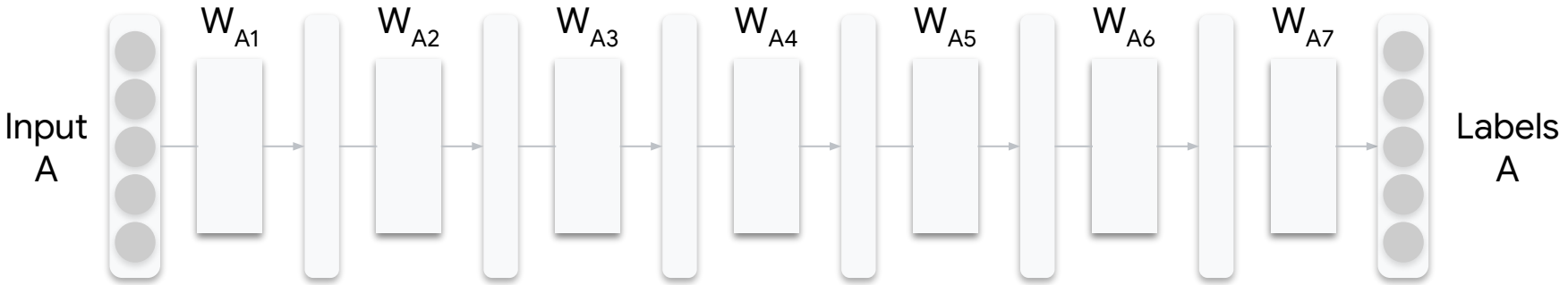
End Result of Training



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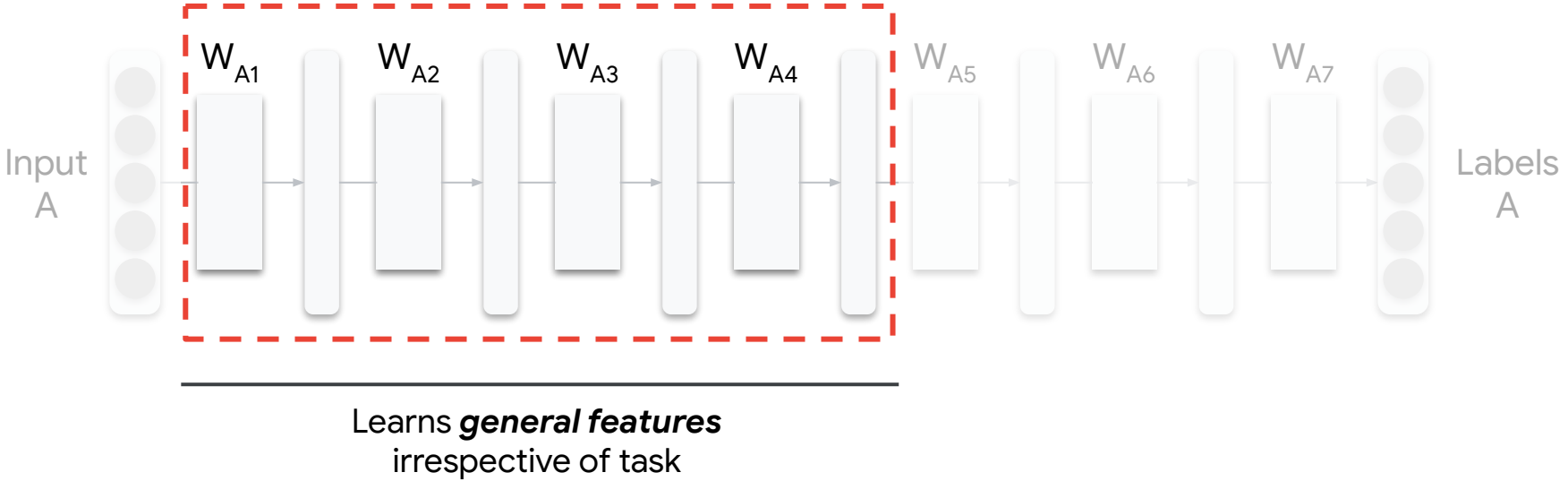

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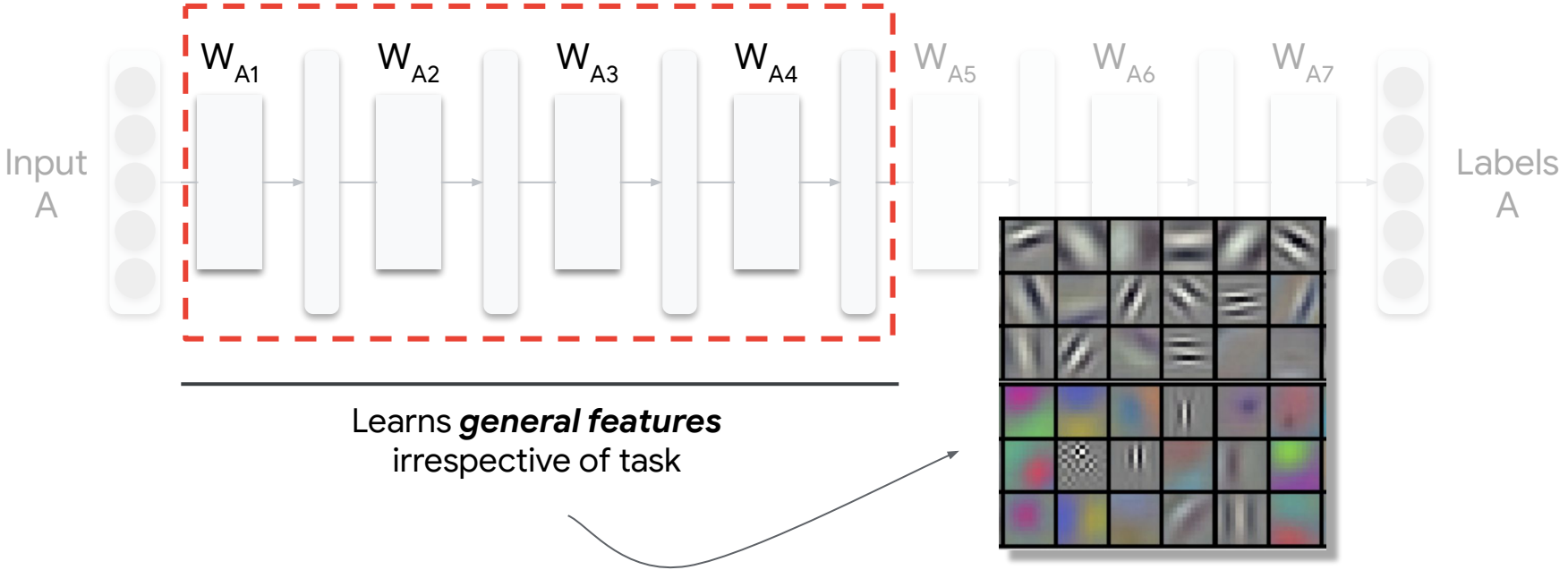
End Result of Training



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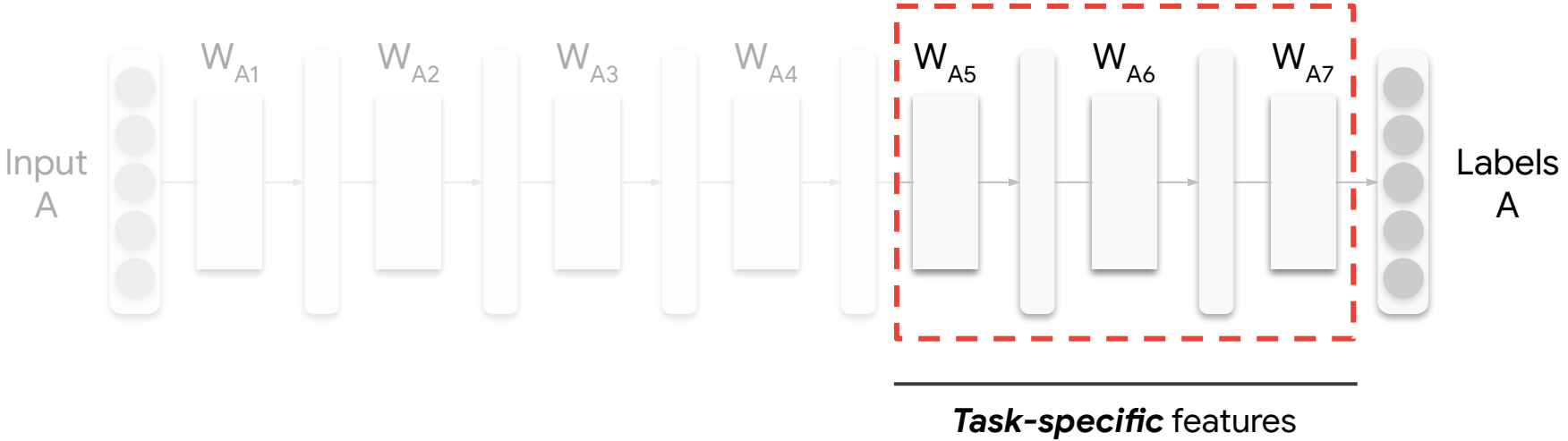
End Result of Training



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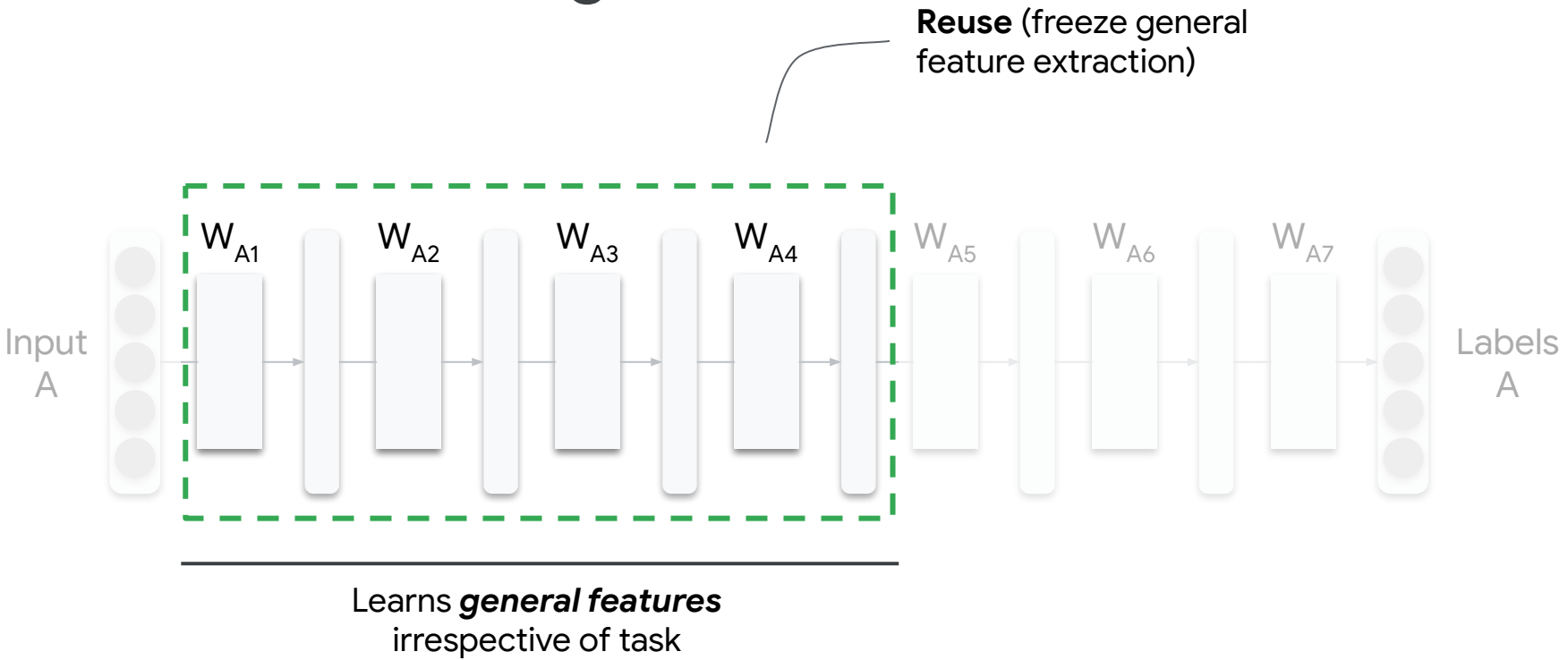
Transfer Learning



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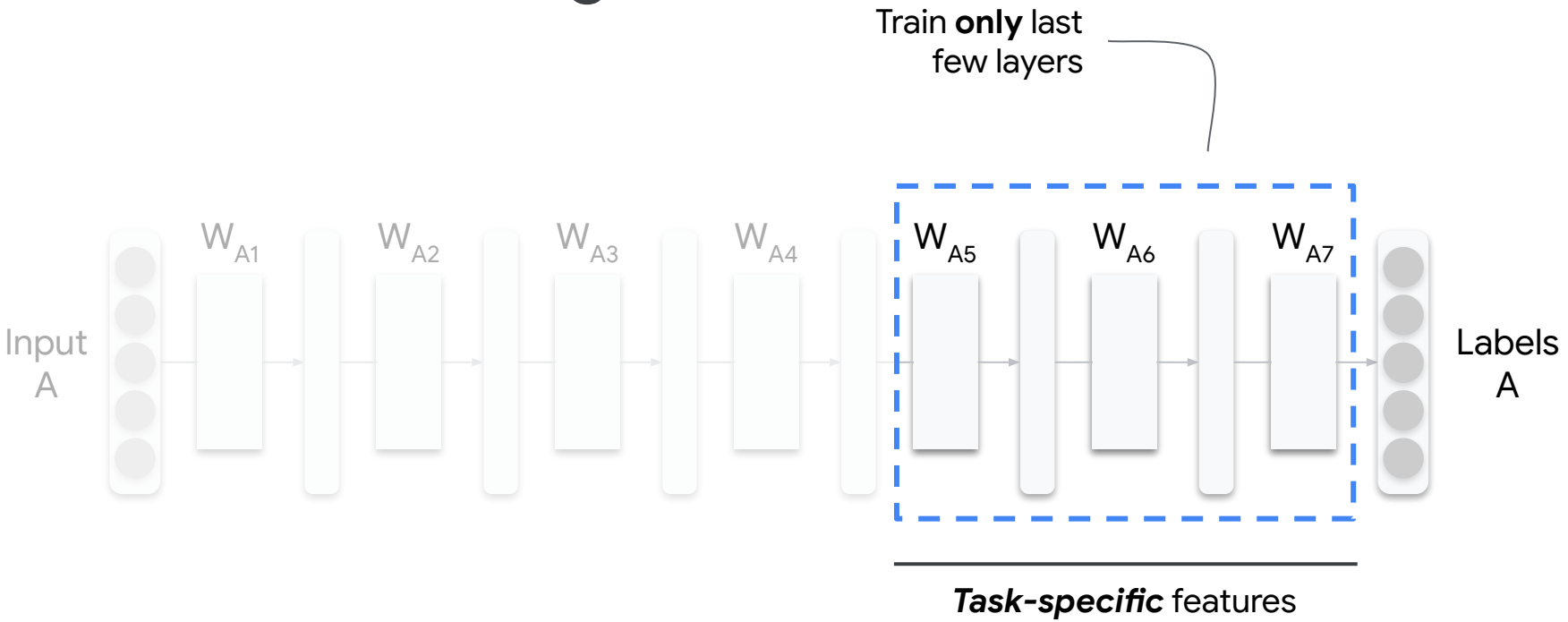
Transfer Learning



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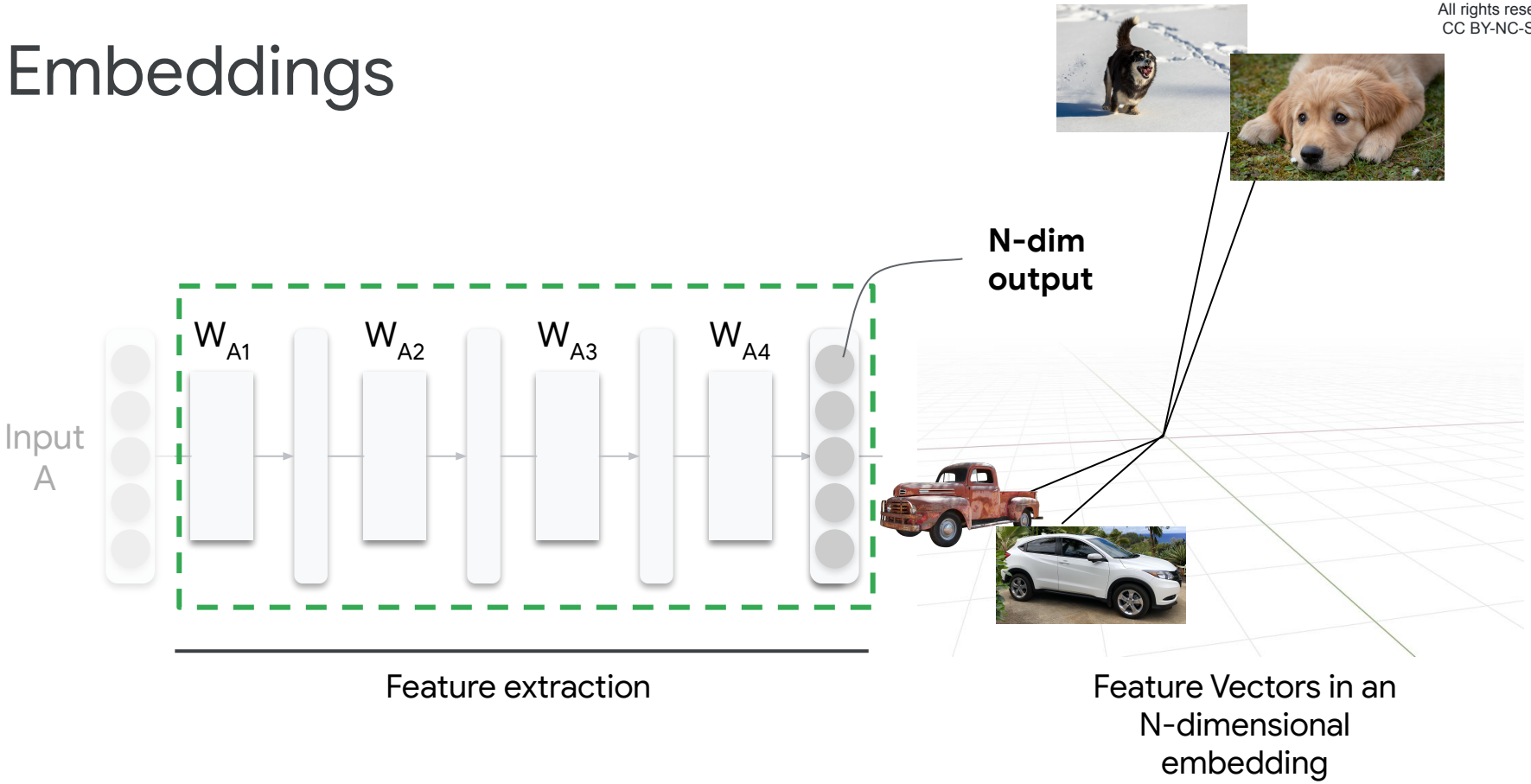
Embeddings



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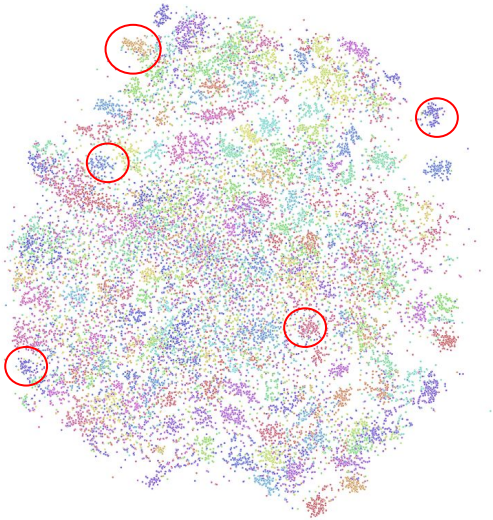
t-SNE view of 165 novel words (not used to train the classifier)



Each cluster is a different word (each point is a different recording from different speakers)

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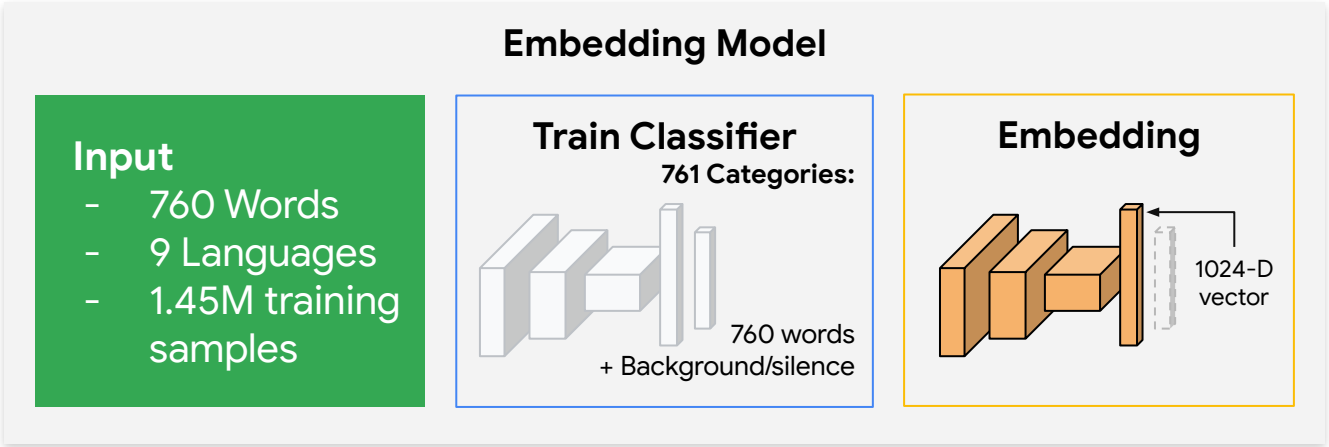
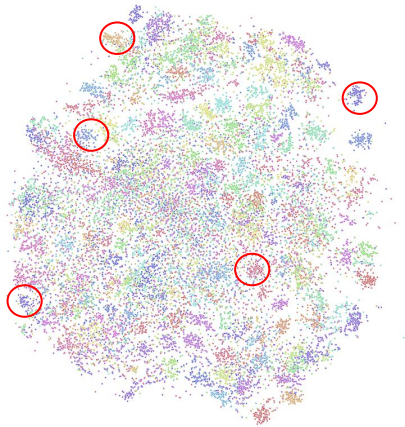
KWS Embeddings





- Minimize **intra**-class distance
- Maximize **inter**-class distance

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Few Shot Keyword Spotting in Any Language

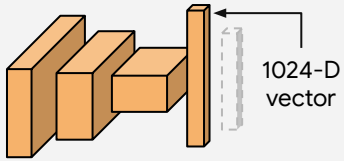
Embedding Model

Input
- 760 Words
- 9 Languages
- 1.45M training samples

Train Classifier
761 Categories:

760 words
+ Background/silence

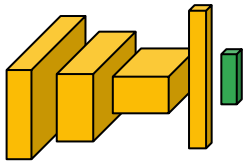
Embedding



Input: 5 words in any language

Finetune KWS Model

3 Categories
Target Keyword
Unknown Word
Background/silence



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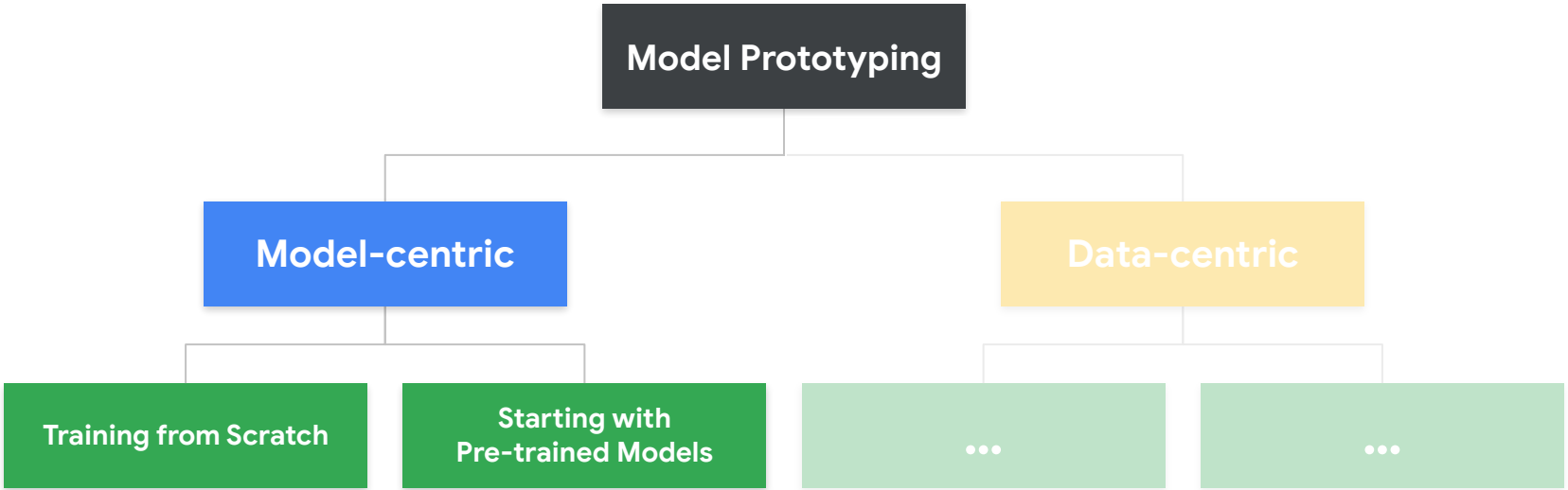

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