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Continuous Training with Transfer Learning

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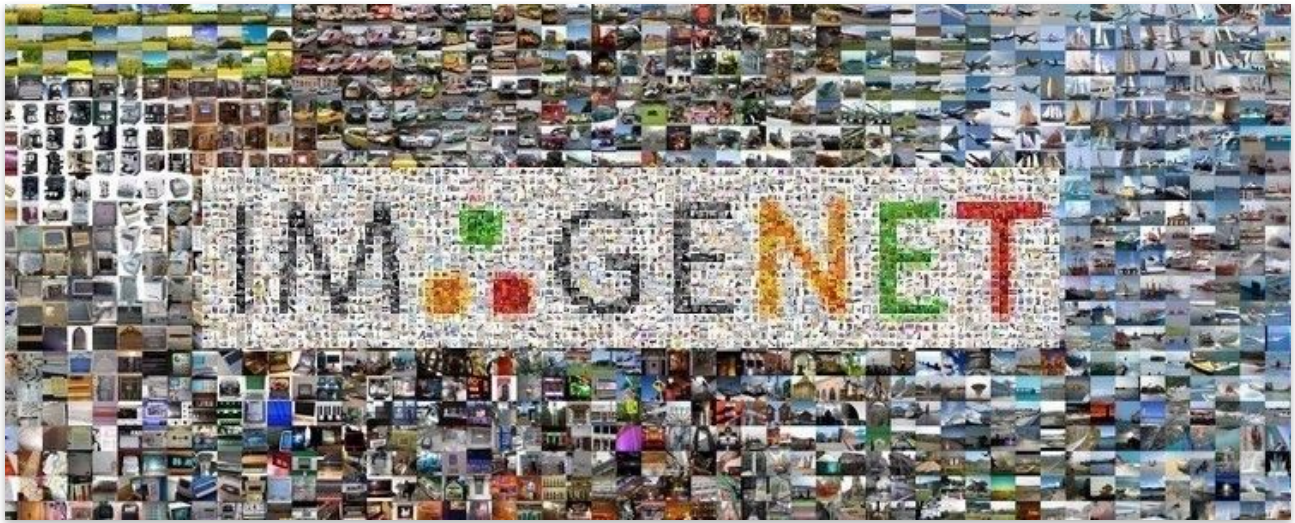
Training Pipeline: **Need Lots of Data**



1000 Classes

1000 Images / Class

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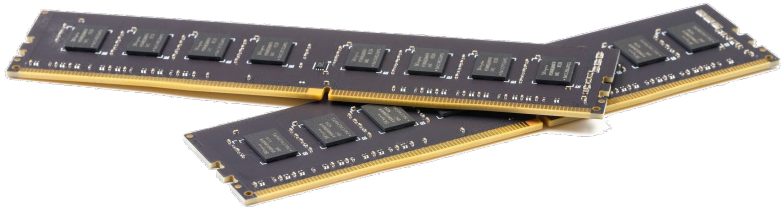
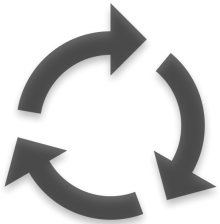
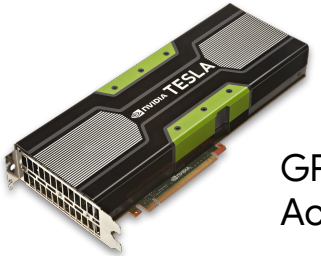
Training Pipeline: **Need Compute Resources**

Compute



Memory





GPU and
Accelerators

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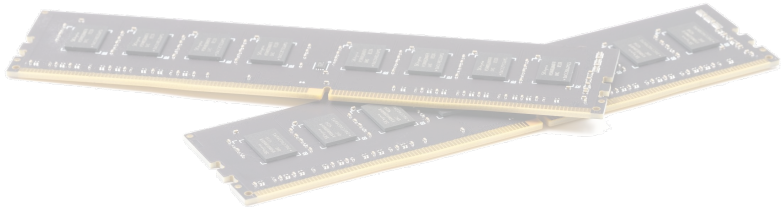
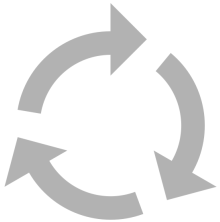
Training Pipeline: **Need Compute Resources**

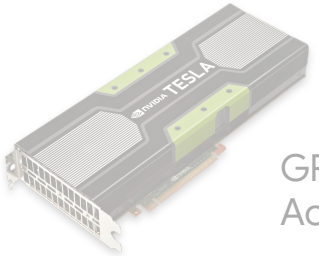
Computationally Intensive
Repeated Many Times (Epochs)



Memory



Compute



GPU and
Accelerators

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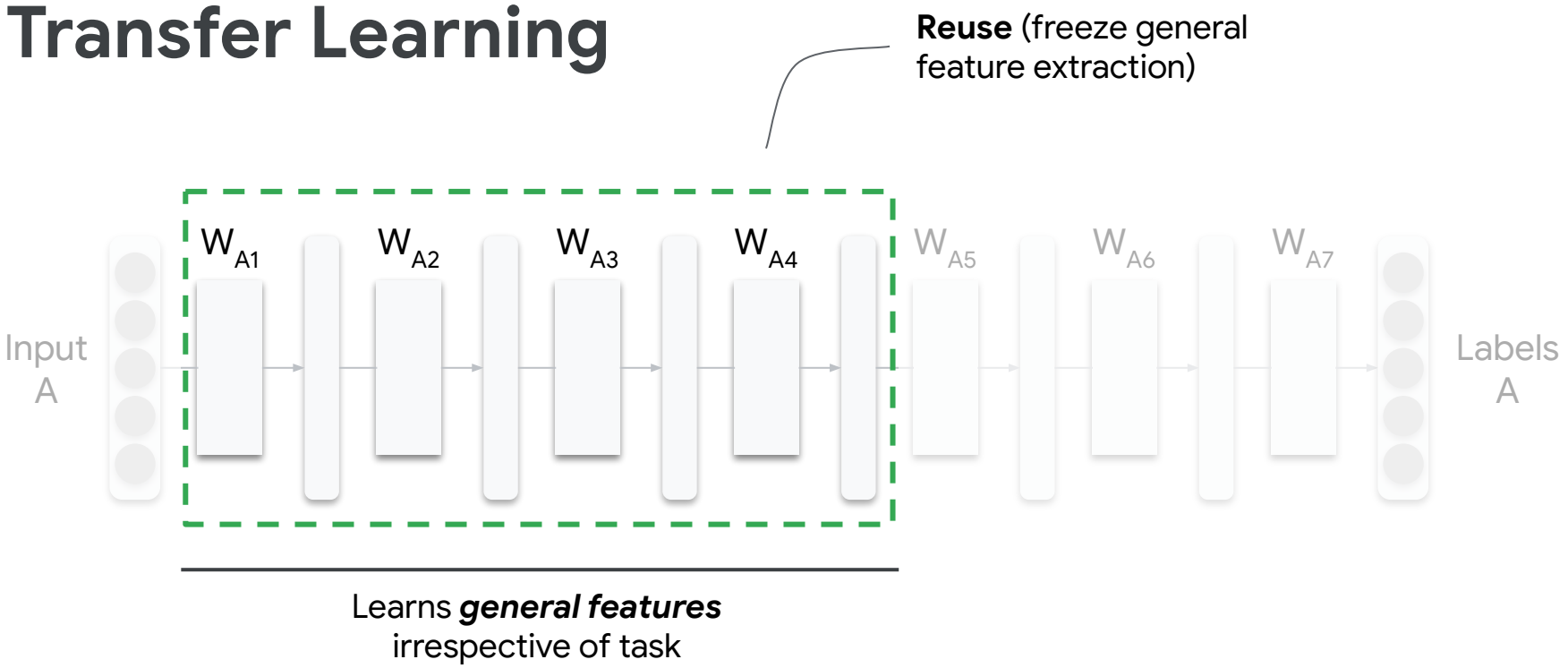
Transfer Learning



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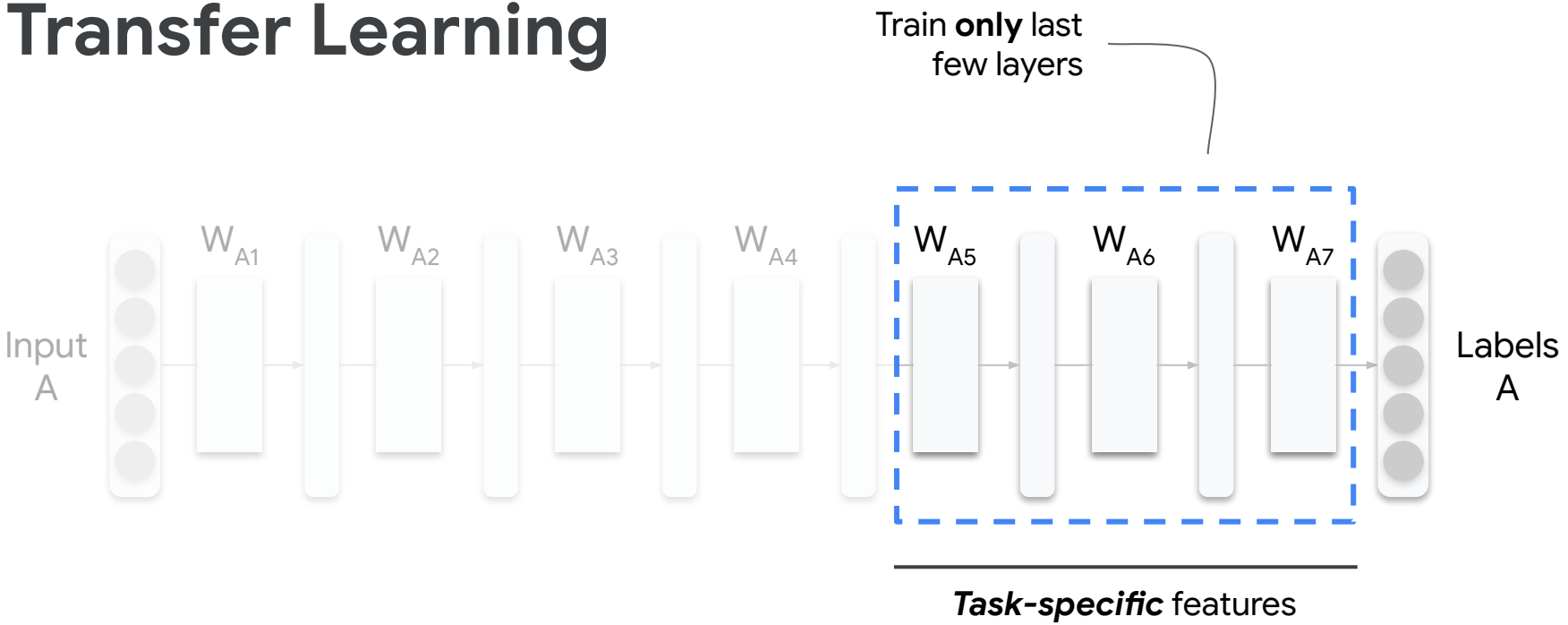
Transfer Learning



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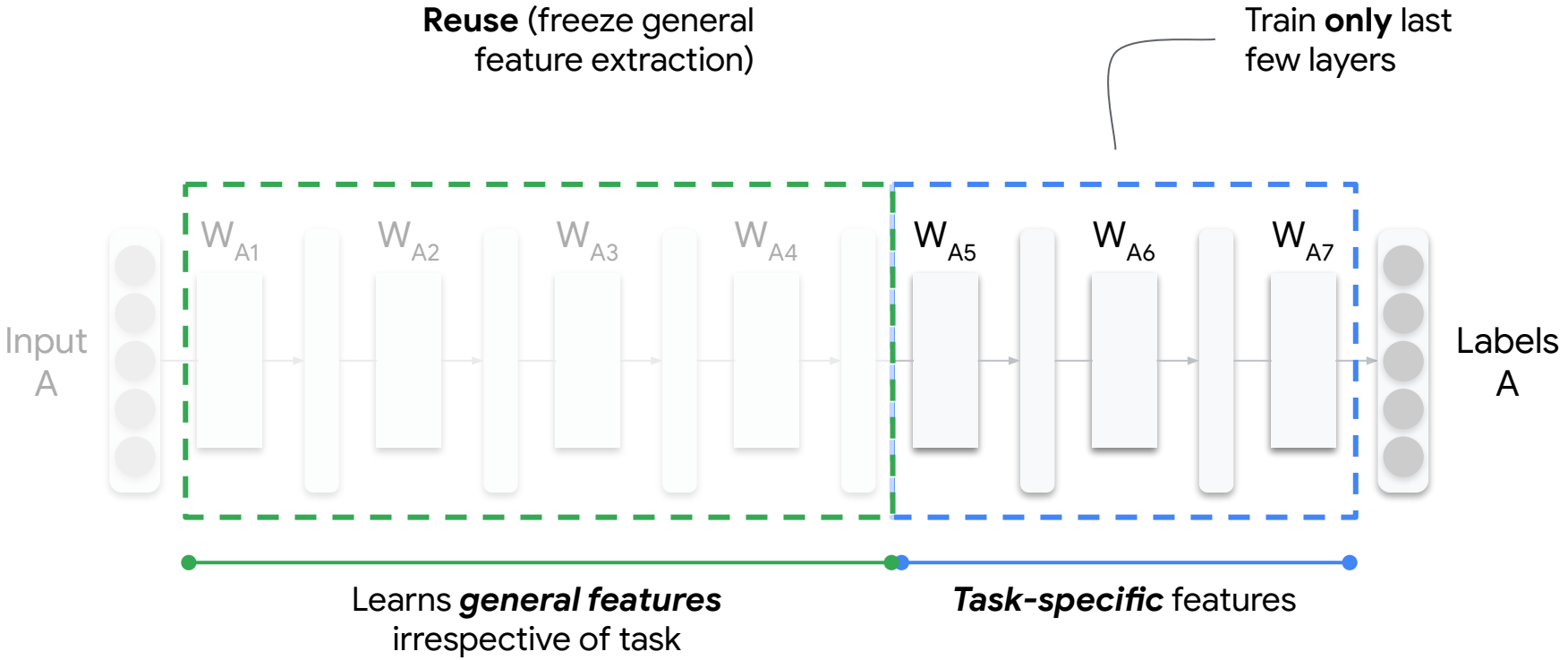

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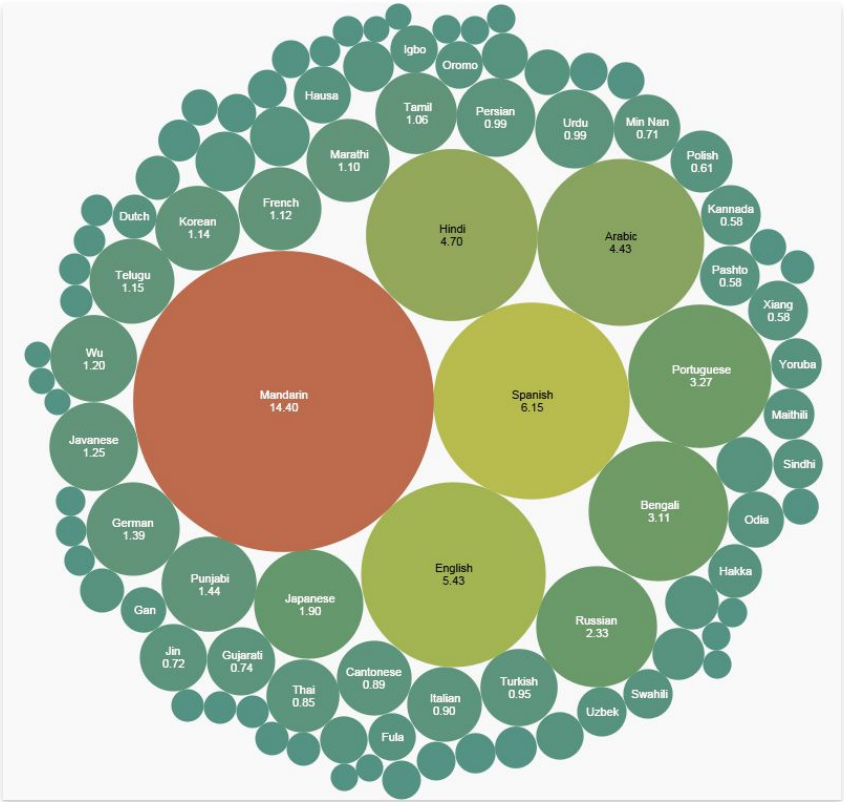

- Speech commands for the **whole planet**?
- For **more than** just voice assistants

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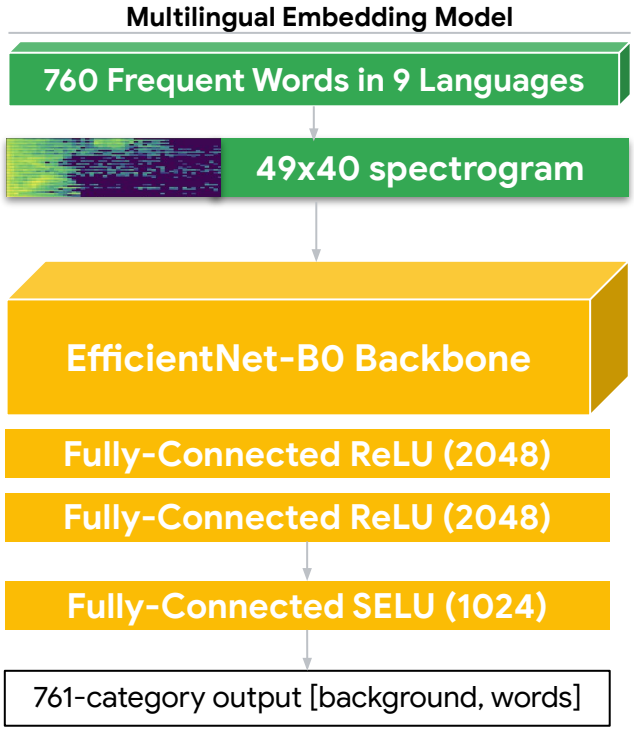
Multilingual Embedding Model



Simple classifier for 760 frequent words in 9 languages

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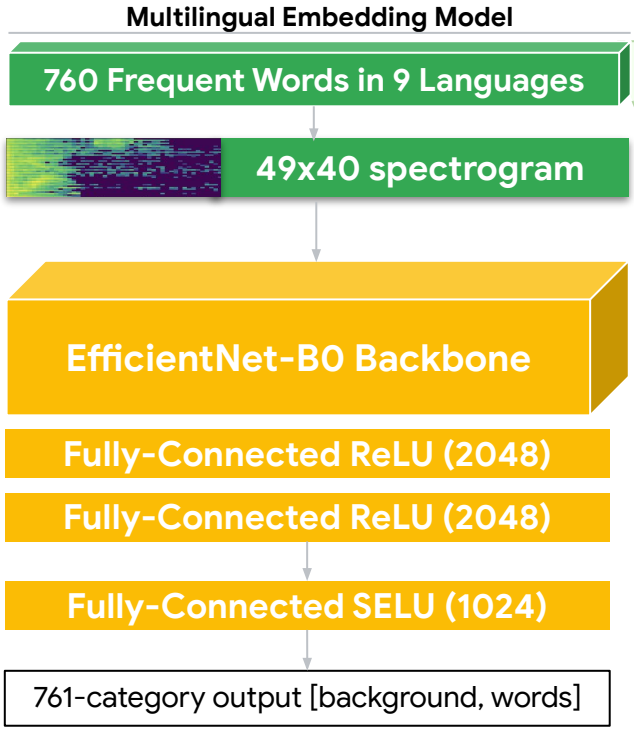
Multilingual Embedding Model



Language	# words	# train
English	265	518760
German	152	287100
French	105	205920
Kinyarwanda	68	134640
Catalan	80	132660
Persian	35	69300
Spanish	31	61380
Italian	17	31680
Dutch	7	13860
Model	760	1455300

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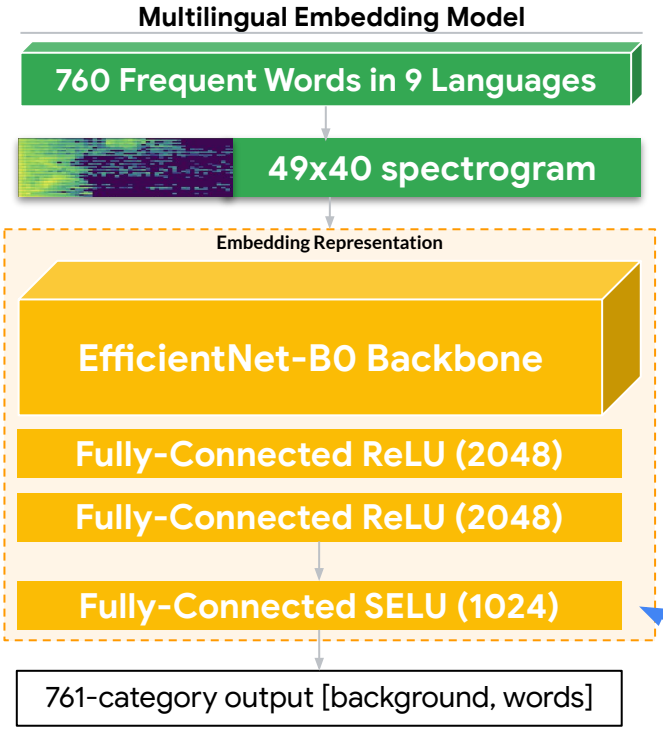
Few-Shot Keyword Spotting



Use **penultimate layer** for embedding representation in **keyword-spotting model**

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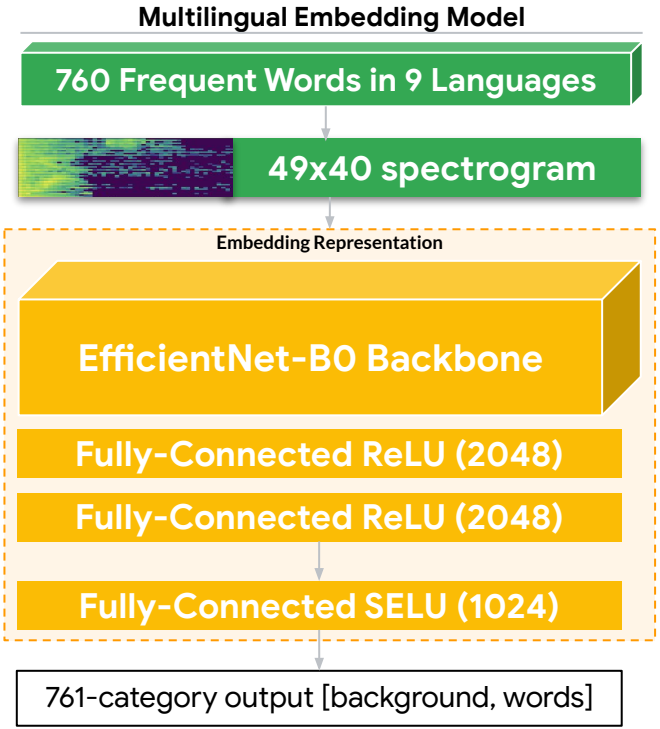
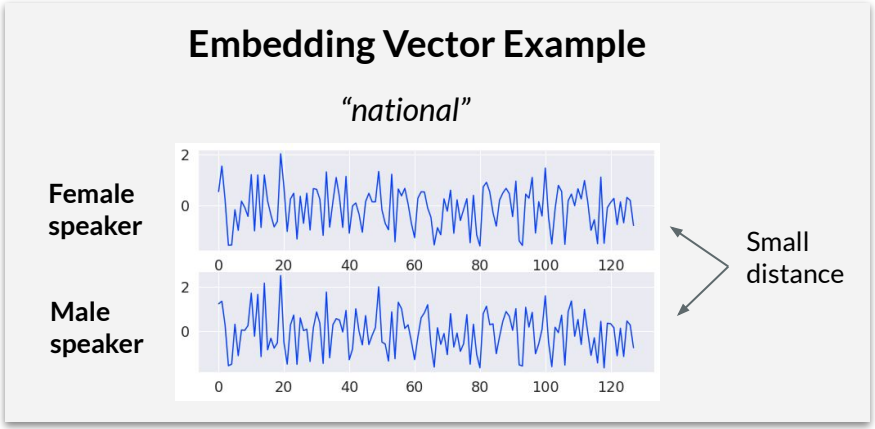
Multilingual Embedding Model



Penultimate layer **output** as embedding vector



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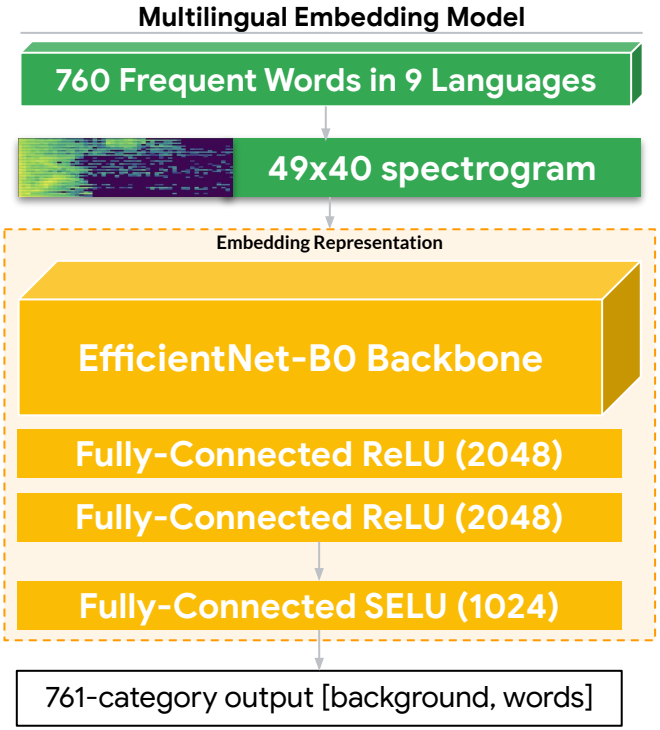
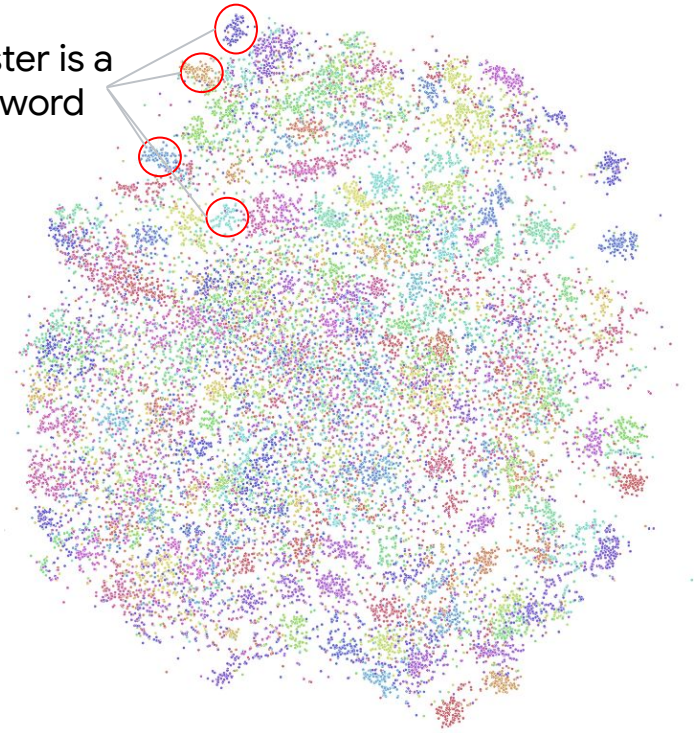
Multilingual Embedding Model



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

Each cluster is a different word



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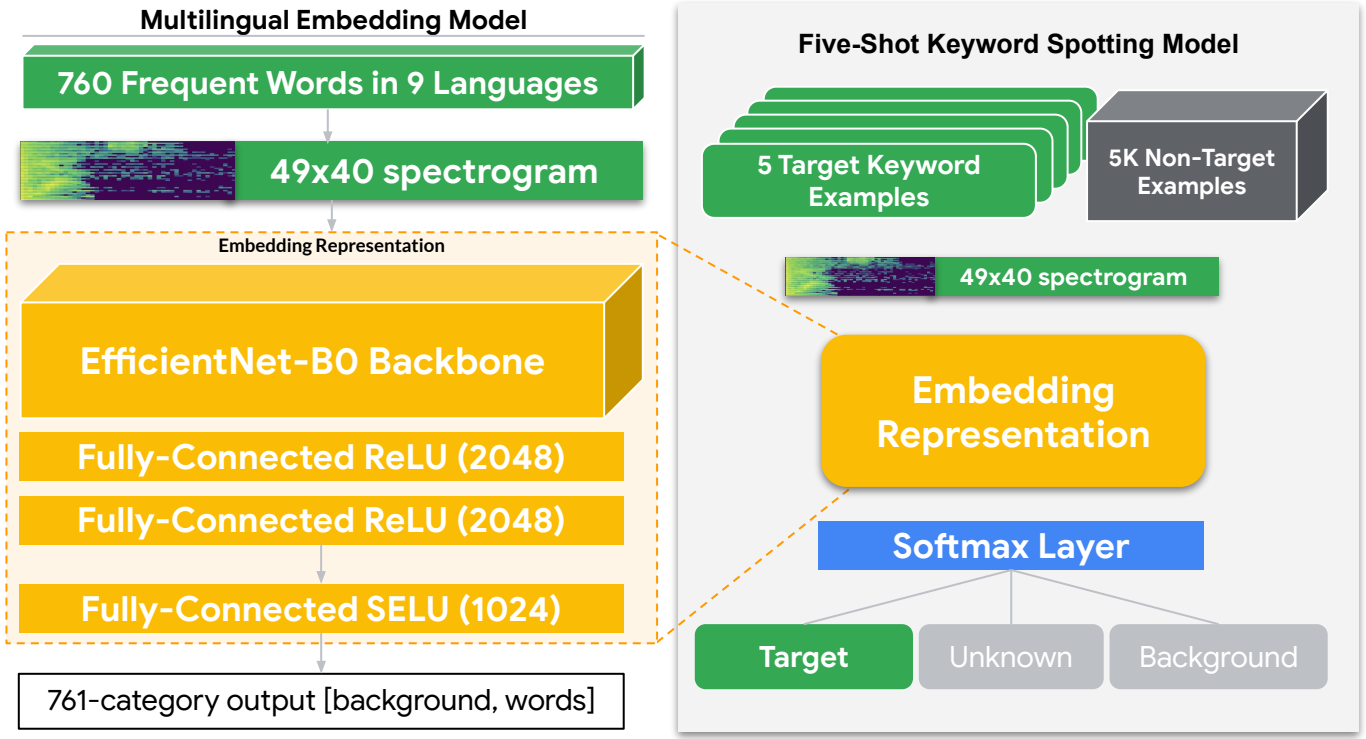
Few-Shot Keyword Spotting



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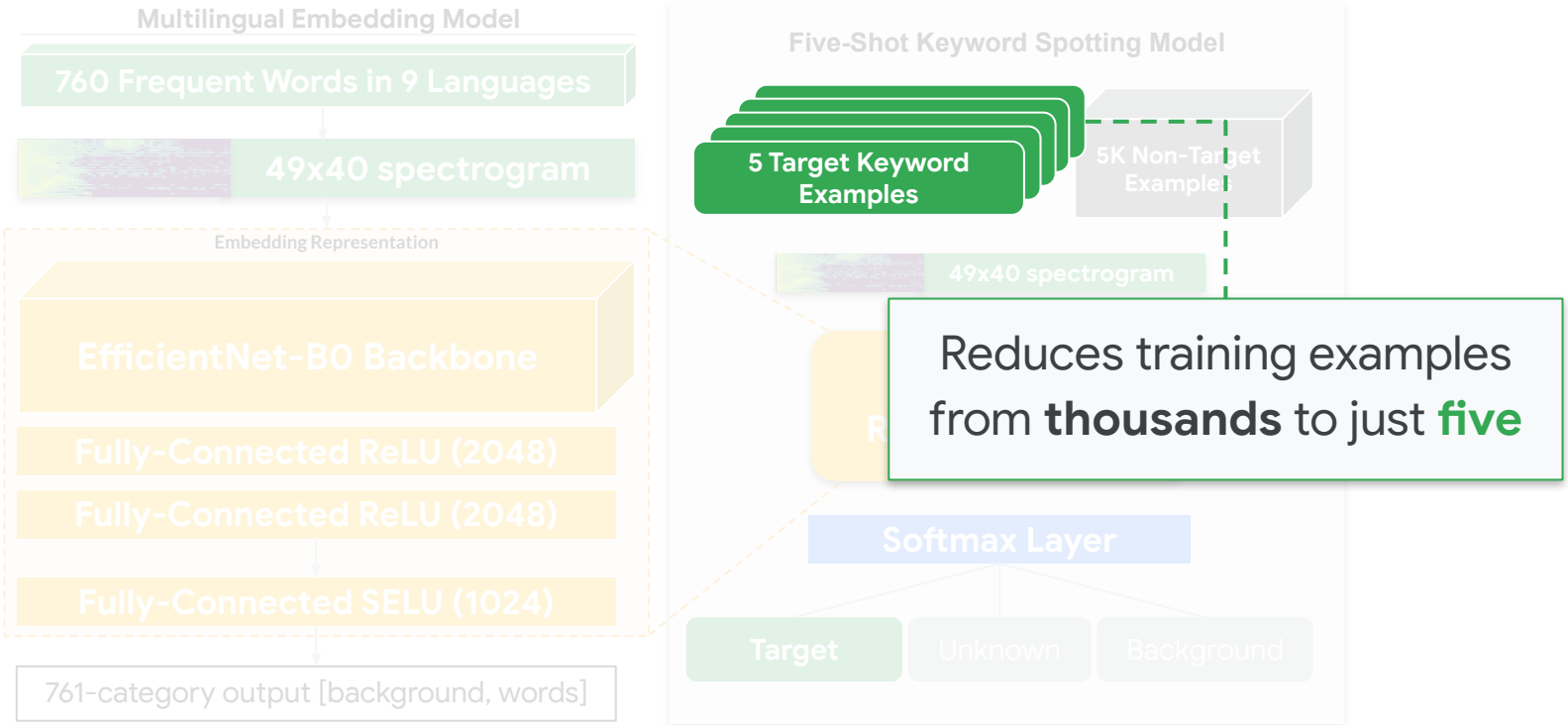
Few-Shot Keyword Spotting



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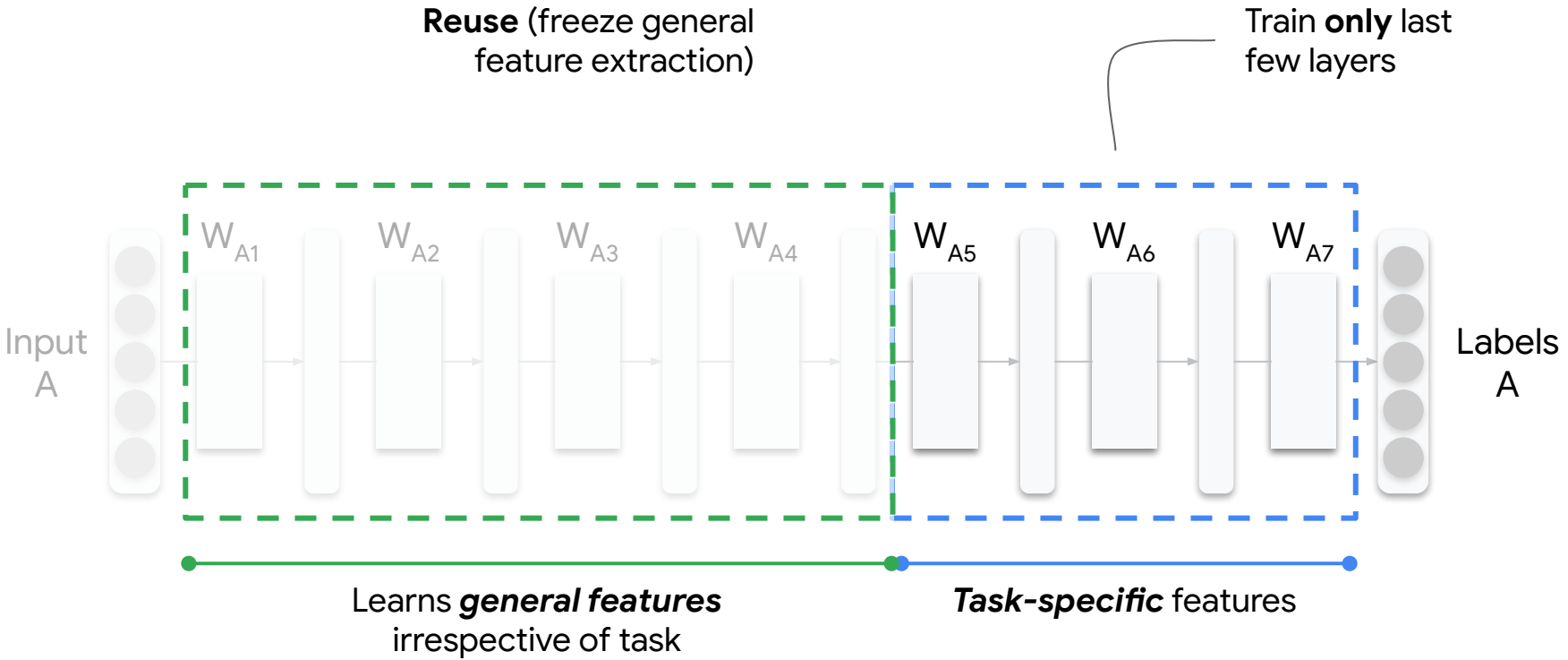
Transfer Learning