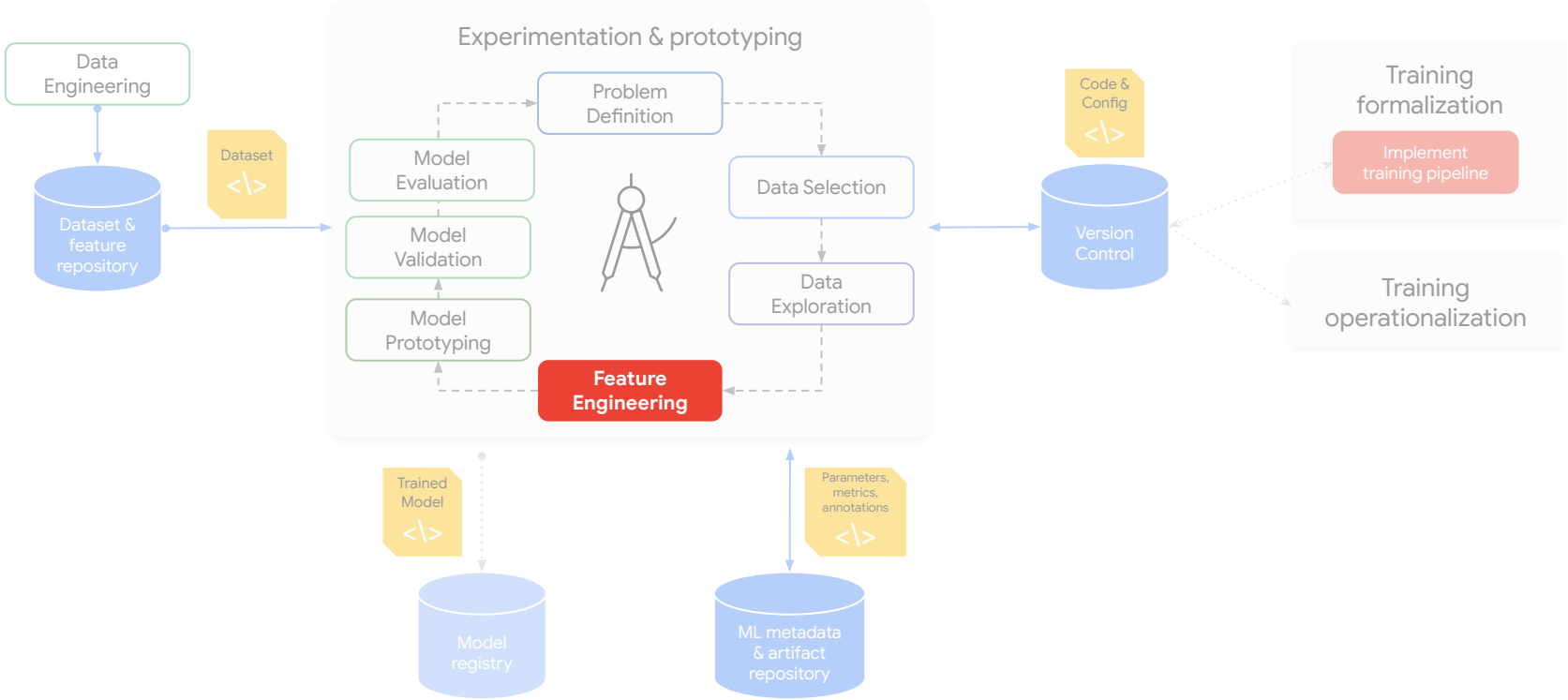
ML Development: Feature Engineering

MLOps: ML Development



The MLOps **Personas**

ML Engineer

ML Researcher

Data Scientist

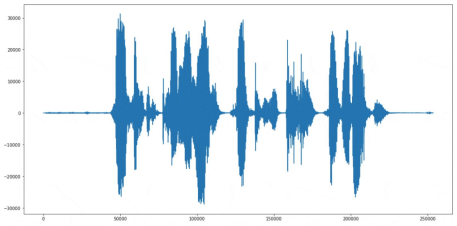
Data Engineer

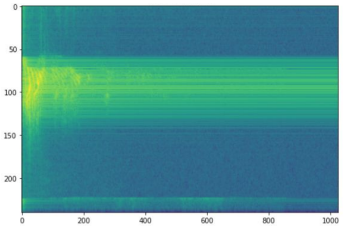
Software Engineer

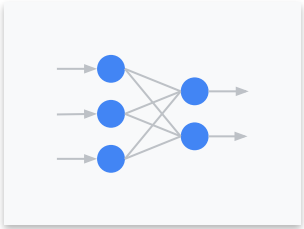
DevOps

Business Analyst

Keyword Spotting **Workflow**



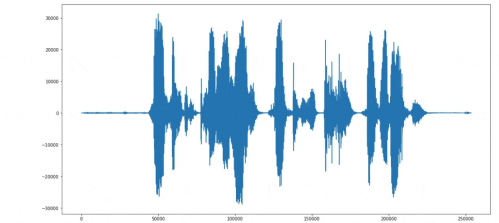




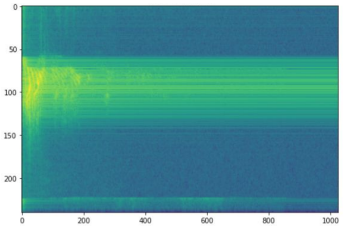
“Yes” - 0.91
“No” - 0.09

Keyword Spotting **Workflow**

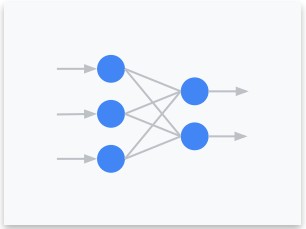
Input



Preprocessing



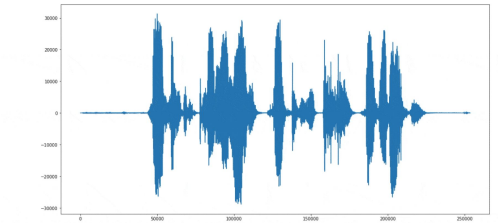
Output



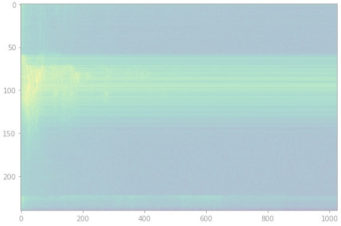
“Yes” - 0.91
“No” - 0.09

Role of the **Input Signal**

Input



Preprocessing

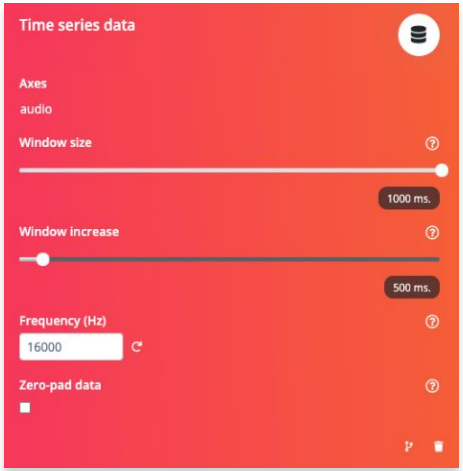


Output

“Yes” - 0.91
“No” - 0.09

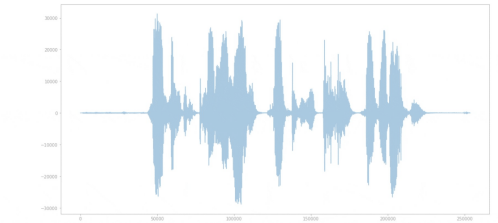
Role of the **Input Signal**

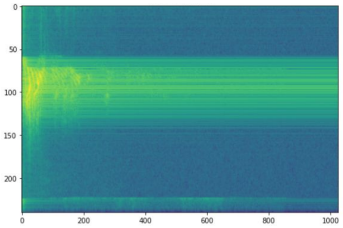
Window length, window step, downsample?



Keyword Spotting **Workflow**

Input | Preprocessing | Output





“Yes” - 0.91
“No” - 0.09

Spectrograms

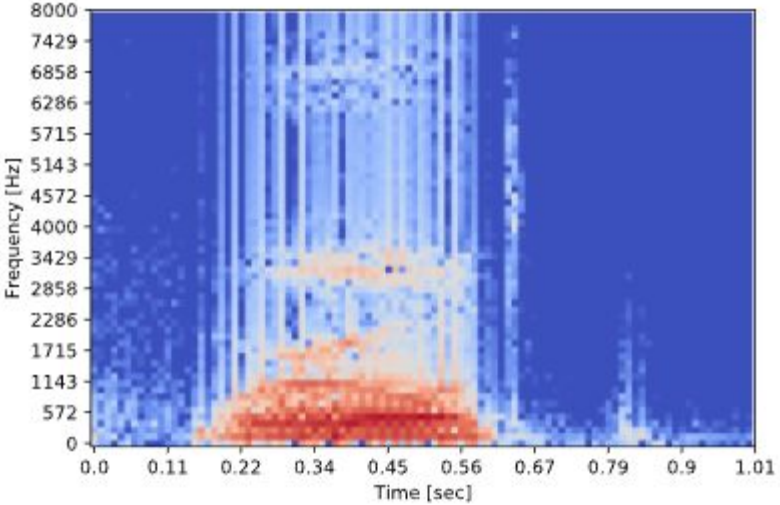
Parameters

Spectrogram

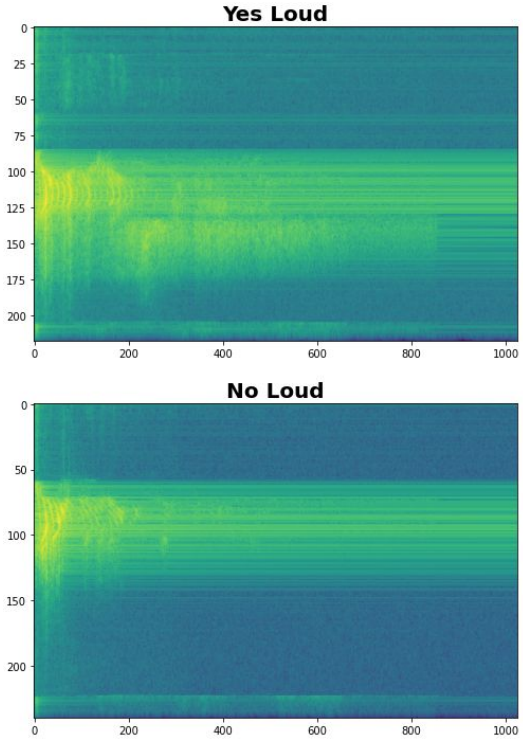
Frame length	0.02
Frame stride	0.01
Frequency bands	128

Normalization

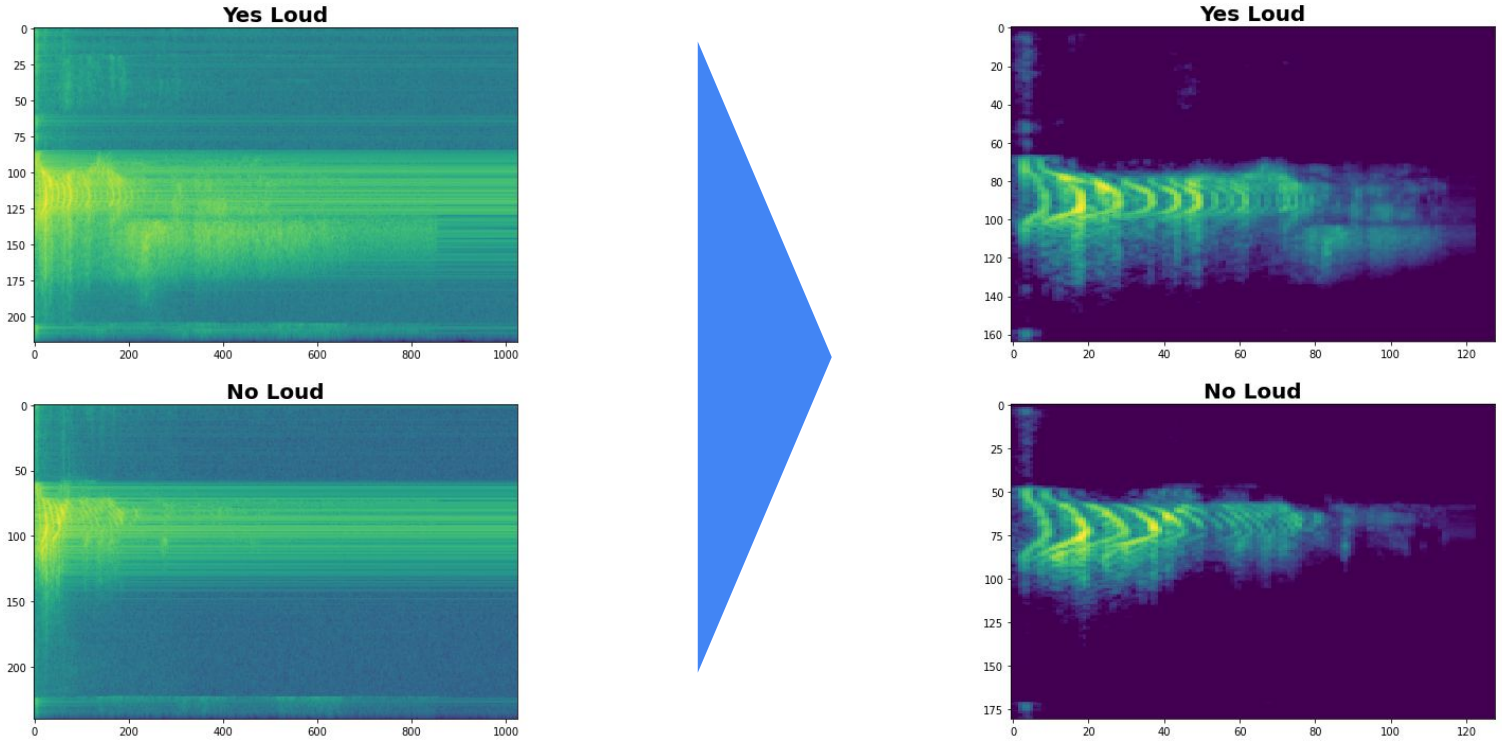
Noise floor (dB)	-52



Spectrograms v. MFCCs



Spectrograms v. MFCCs



MFCC Parameters

Parameters

Mel Frequency Cepstral Coefficients

Number of coefficients

Frame length

Frame stride

Filter number

FFT length

Normalization window size

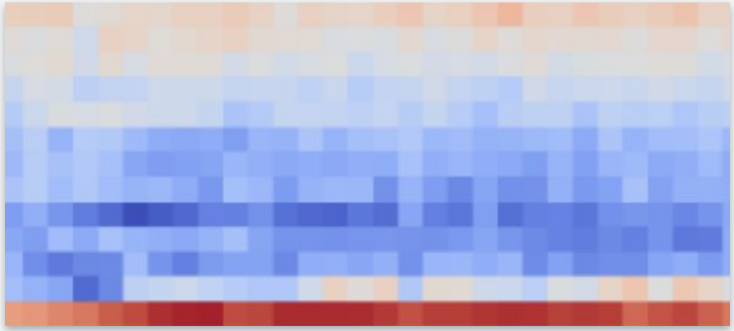
Low frequency

High frequency

Pre-emphasis

Coefficient

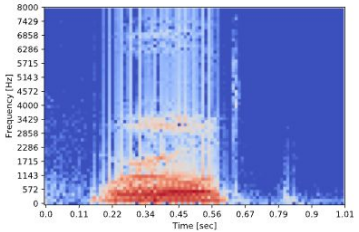
Shift



Spectrograms v. MFCCs

DSP result

Spectrogram



Processed features

0.3688, 0.4828, 0.2290, 0.3349, 0.3003, 0.2865, 0.2555,…

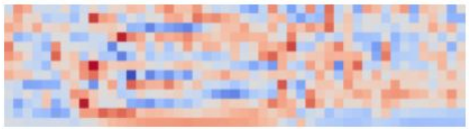
On-device performance

PROCESSING TIME
123 ms.

PEAK RAM USAGE
28 KB

DSP result

Cepstral Coefficients



Processed features

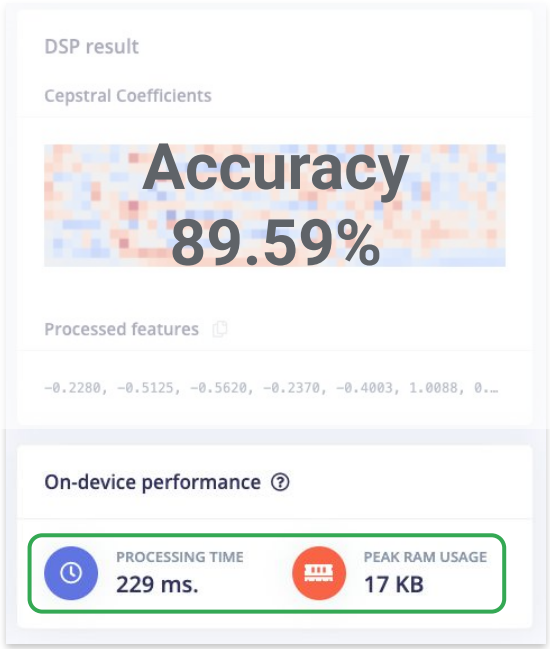
-0.2280, -0.5125, -0.5620, -0.2370, -0.4003, 1.0088, 0.…

On-device performance

PROCESSING TIME
229 ms.

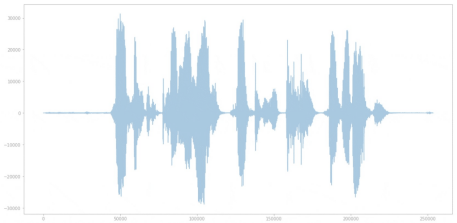
PEAK RAM USAGE
17 KB

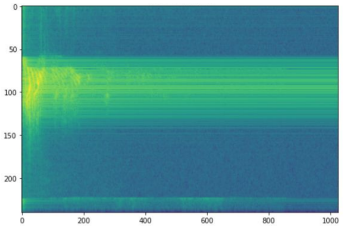
Spectrograms v. MFCCs



Pre-processing **Methods**

Input | Preprocessing | Output

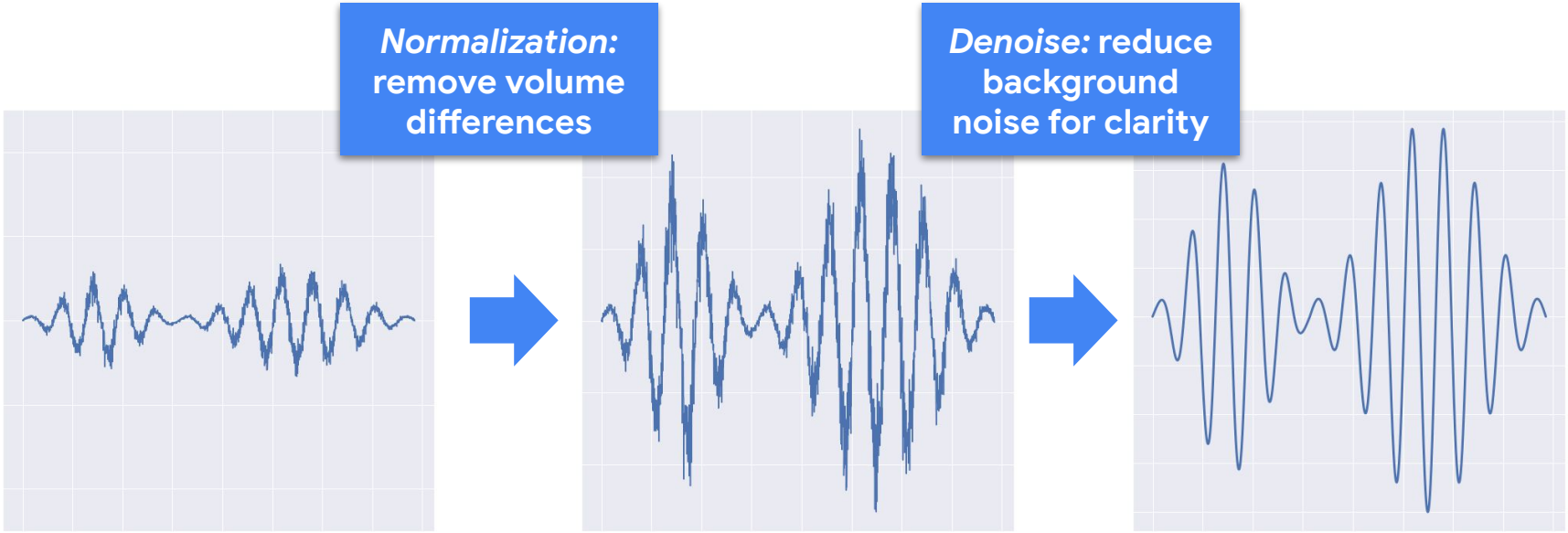


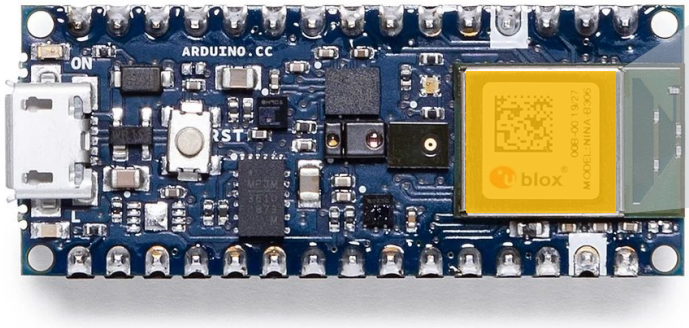


“Yes” - 0.91
“No” - 0.09

MFCC, MFE, Flatten, Image, Spectral Analysis, Spectrogram, Audio (Syntiant), Raw Data

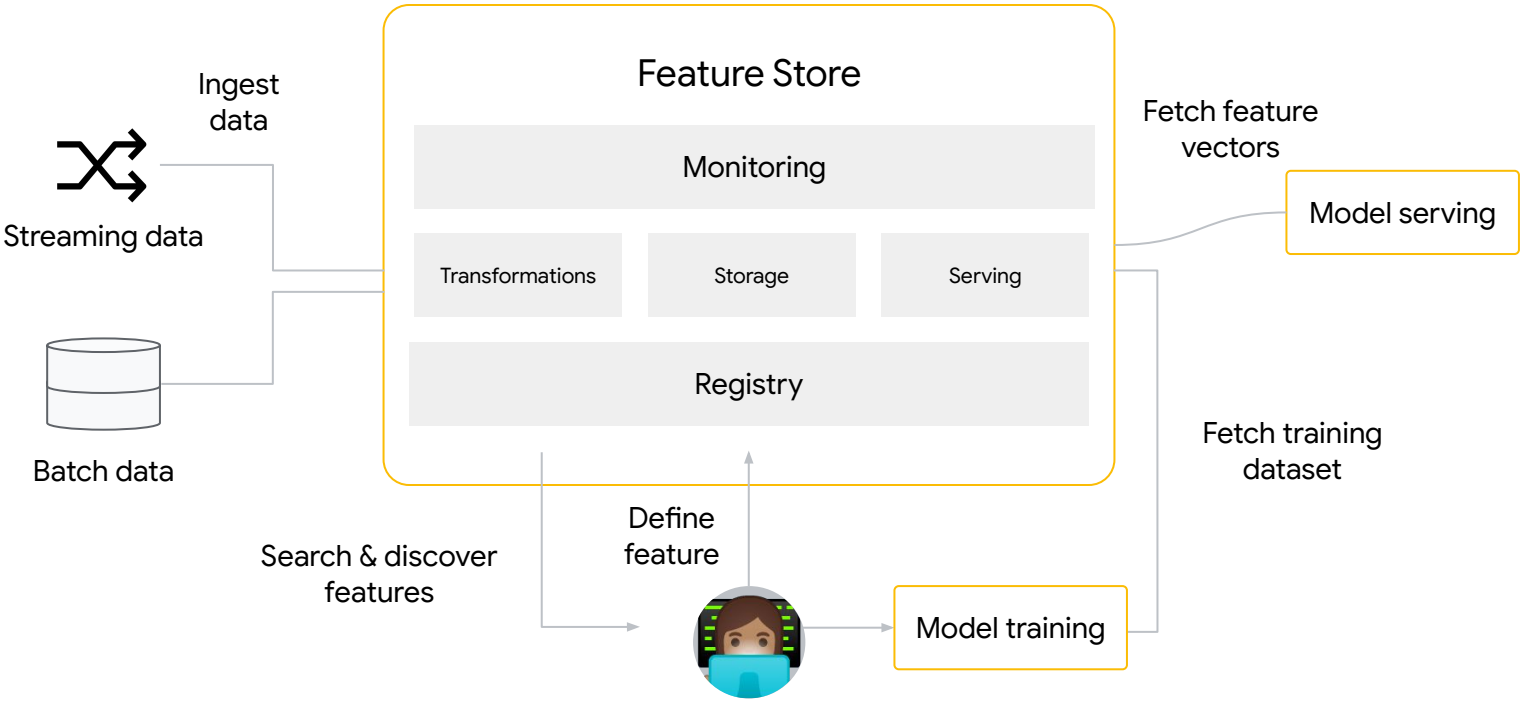
Additional **Feature Engineering**





64MHz
1MB Flash
256kB SRAM

Feature **Stores**



Feature **Stores**