# Feature Extraction of Car Driving Sound Using Neural Network with Acoustic Multi-Parameters

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## Background

Growing need for **branding using sound features** in companies

Possibility of **commonality of sound** in automobiles

Demand **for finding commonalities** between manufacturer product sounds
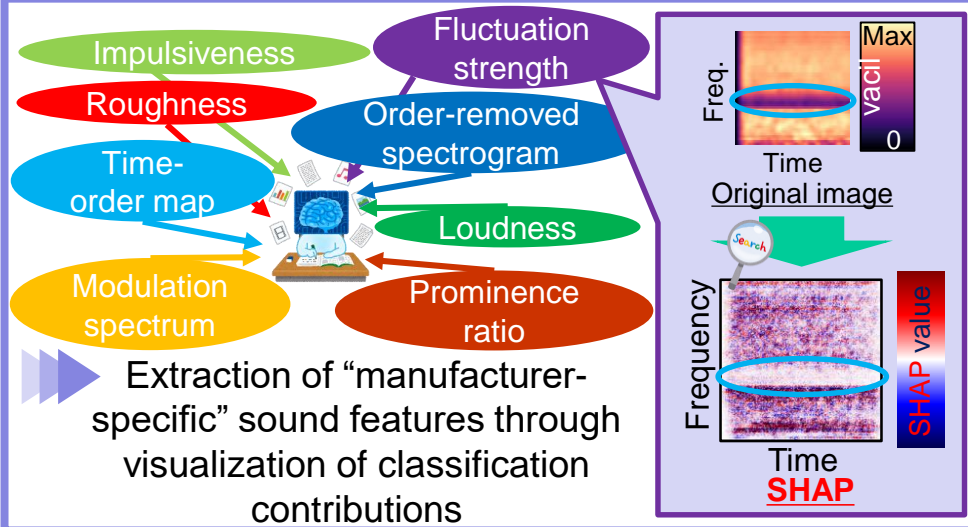
## Purpose

**Problem**

Difficulty in finding commonality among car models by only extracting sound features based on frequency characteristics

Freq.
Time
? ? ?

**Solution**

Applying image classification AI to sound feature extraction

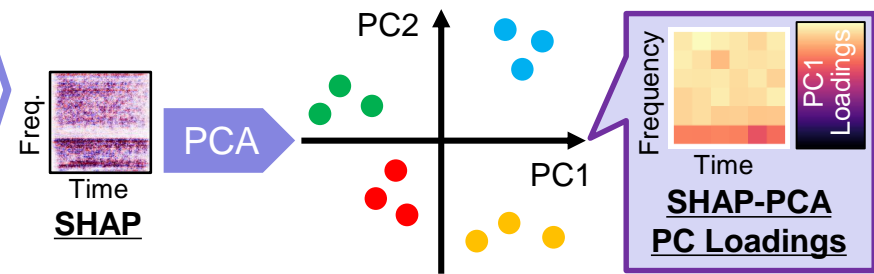**Establishment of a feature extraction method using acoustic multi-parameters**

## Contents

### ① Machine Learning and Feature Extraction

- Impulsiveness
- Roughness
- Time-order map
- Modulation spectrum
- Fluctuation strength
- Order-removed spectrogram
- Loudness
- Prominence ratio

Extraction of "manufacturer-specific" sound features through visualization of classification contributions

Freq.
Max
vacil
0
Time
Original image

Search

Frequency
Time
SHAP value
**SHAP**

### ② Creation of sound maps

Creating sound maps by principal component analysis based on the contribution of images obtained by ML

Freq.
Time
**SHAP**

PCA

PC2
PC1

Frequency
Time
PC1 Loadings
**SHAP-PCA PC Loadings**

Define "**manufacturer-specific sound**" characteristics