

INTRODUCTION

The frequent show-up of strong velocity pulses in ground motion recordings often cause significant damage to infrastructure and human-beings.

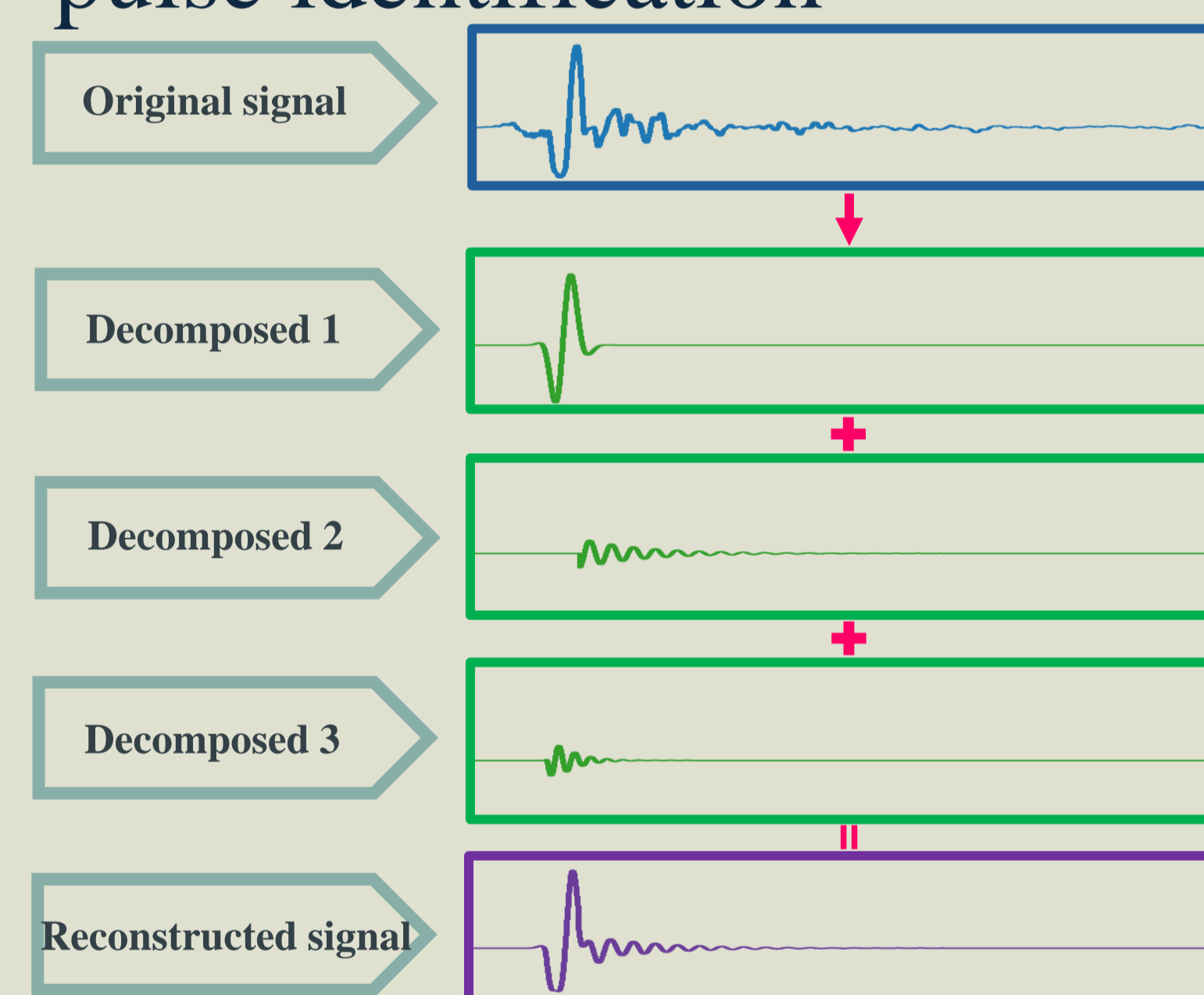
Accurate identification and extraction of strong-velocity pulses become essential for seismologists.

In addition to single strong pulse and its systematic classification, the identification of multi-pulses has become hot topics as they have greater impact on structures.

METHODOLOGY

SW METHOD

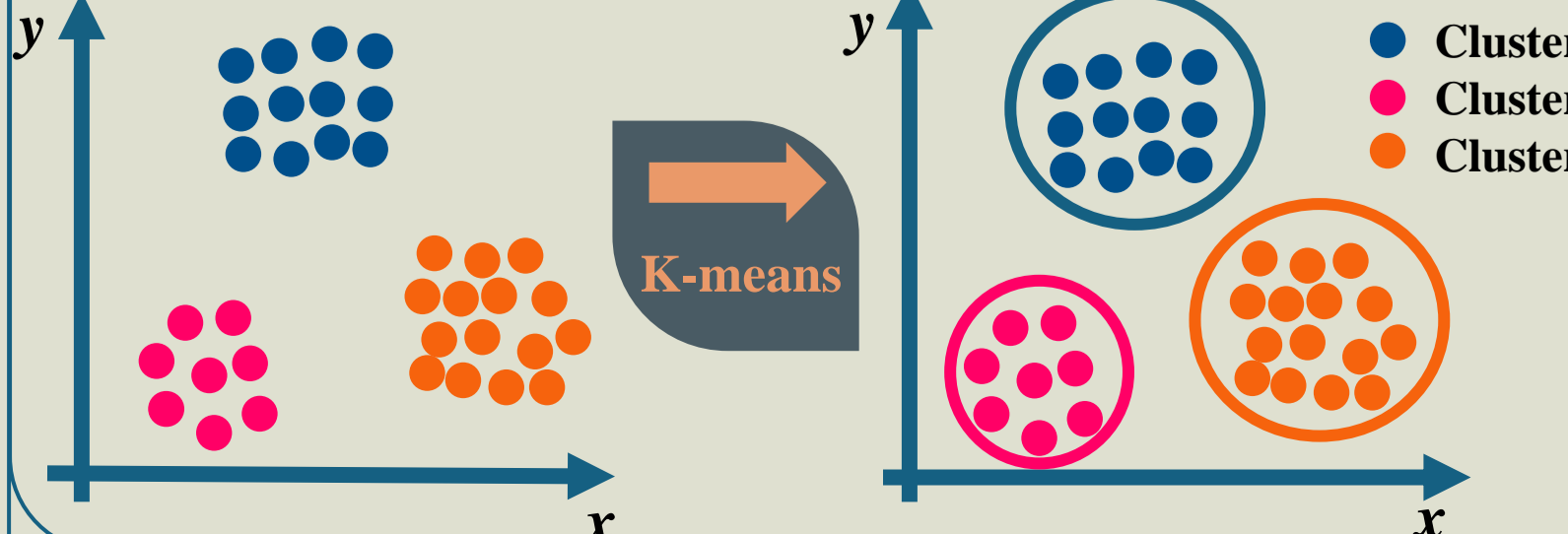
Shock-waveform (SW) method is the main tool for pulse identification



- SW Method Features:
- Adaptive
 - Simple expression
 - Energy-based
 - Physical meaning

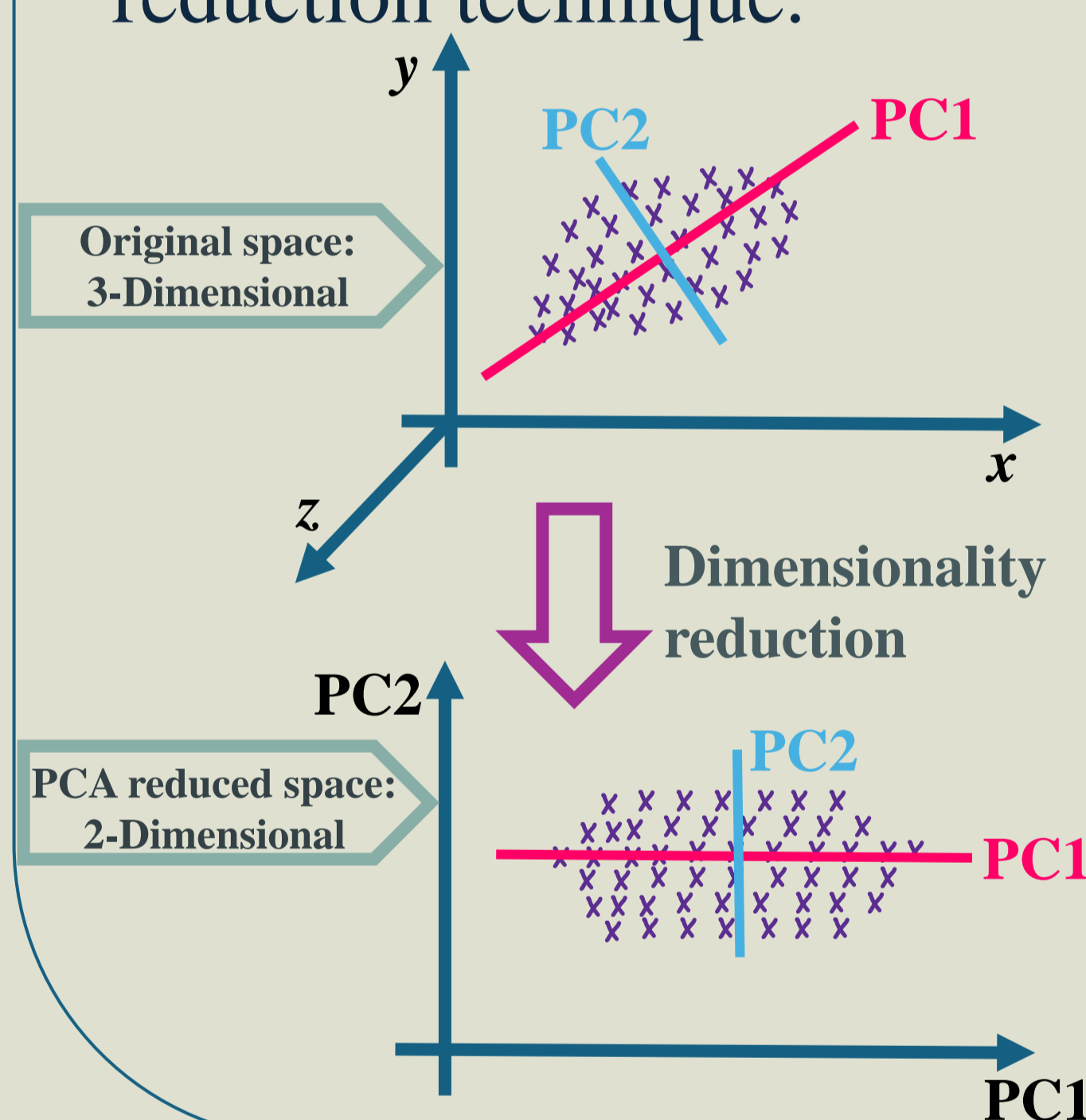
K-MEANS

K-means is an unsupervised machine learning clustering method.



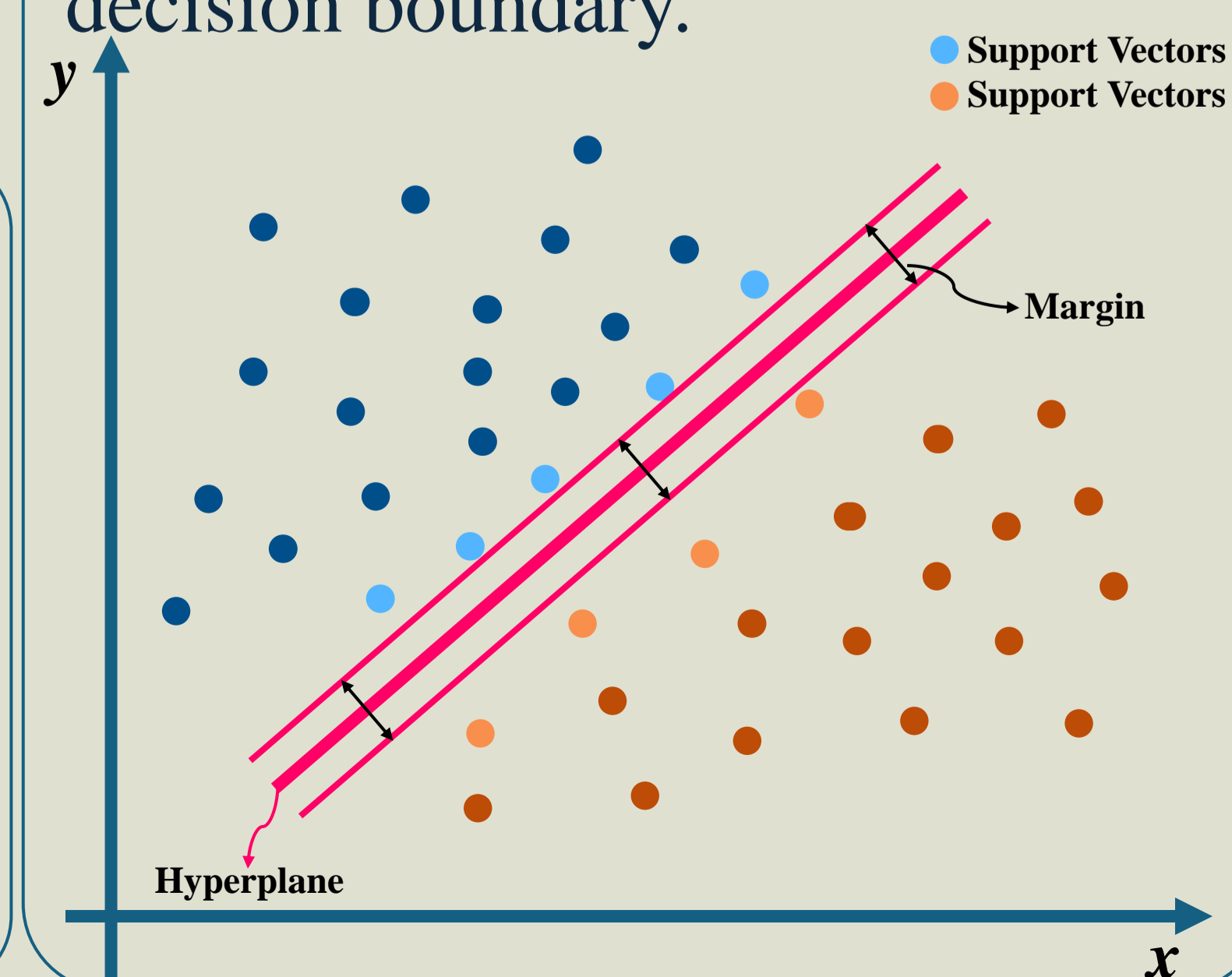
PCA

Principle component analysis (PCA) is a linear dimensionality reduction technique.

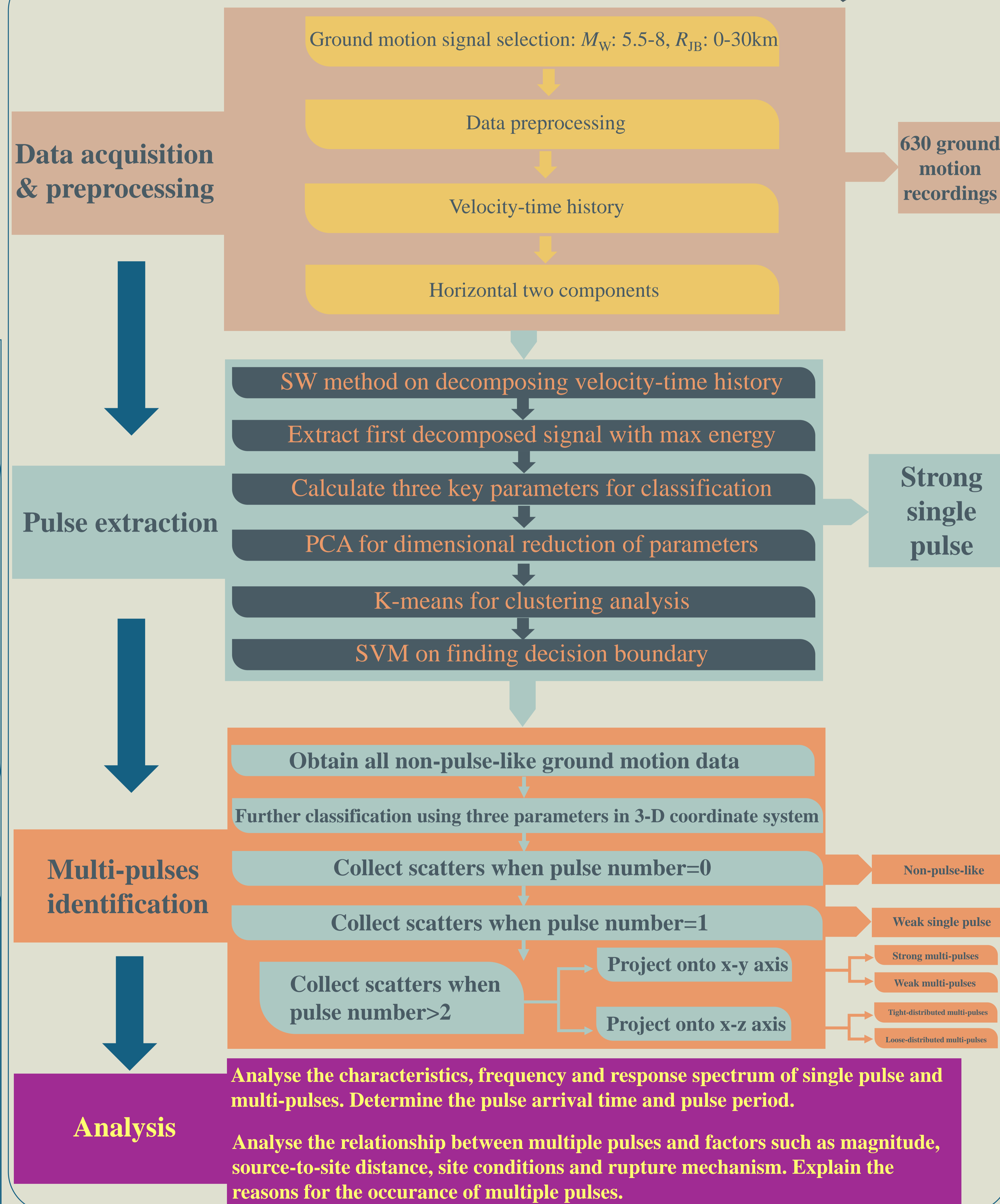


SVM

Support Vector Machine (SVM), a supervised machine learning model, aims to find the finest line or decision boundary.



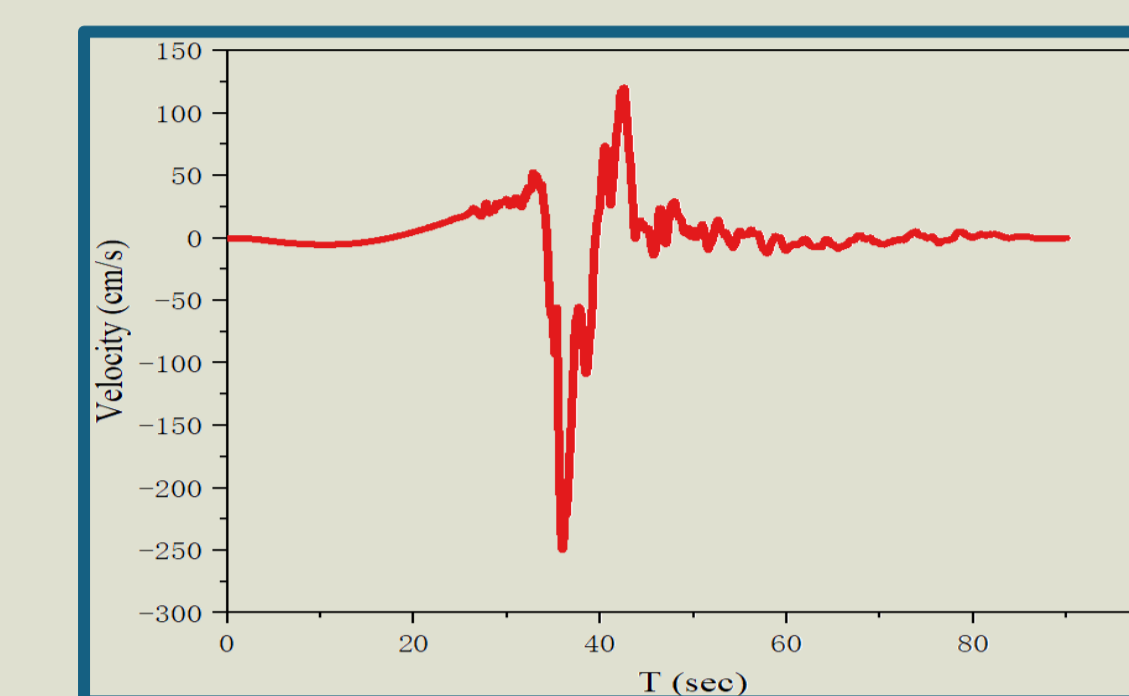
CLASSIFICATION FLOWCHART



REFERENCES

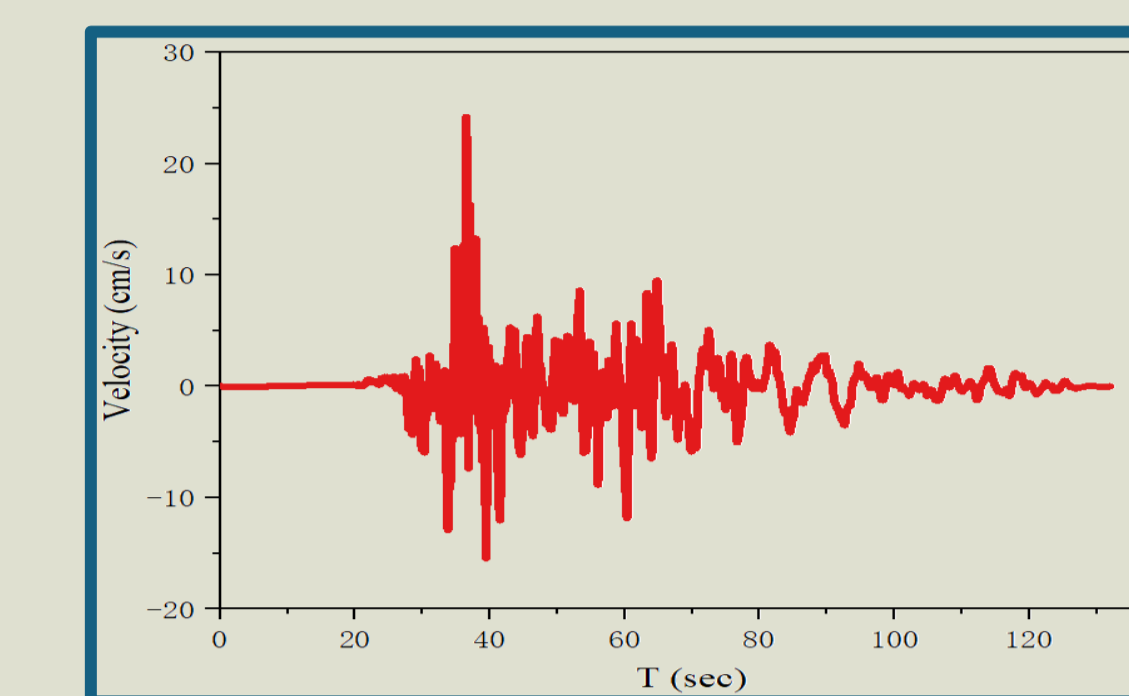
Y. Yan, Q.M. Li, A general shock waveform and characterisation method, Mech Syst Signal Process 136 (2020)

STRONG SINGLE PULSE



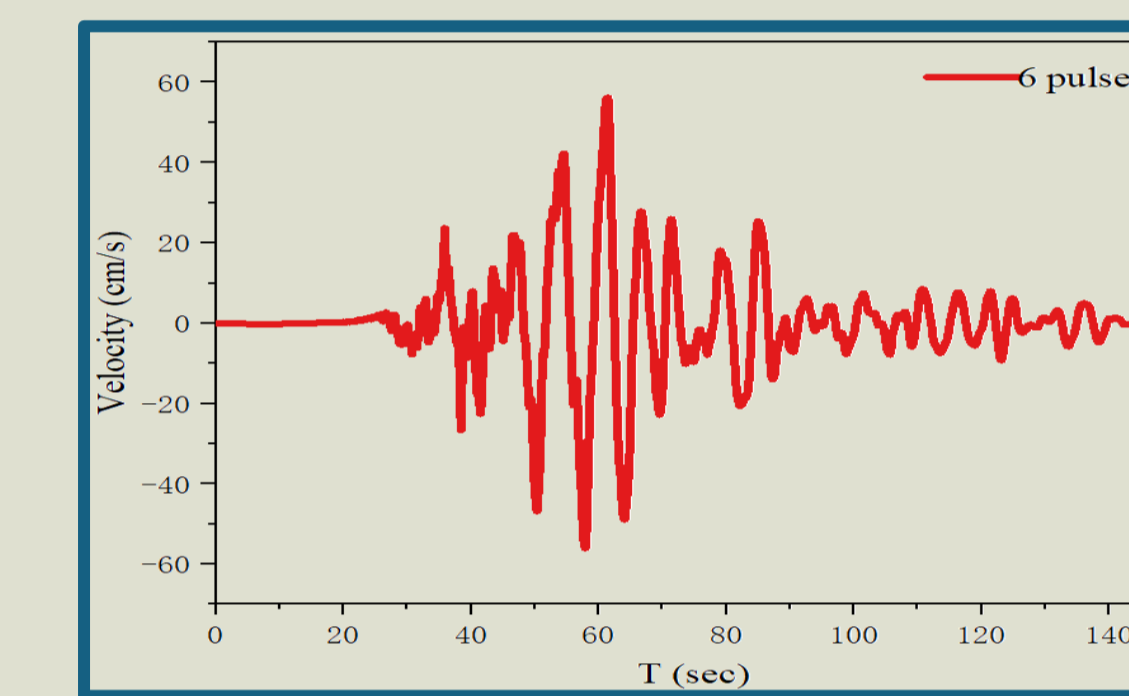
Apparent single strong velocity pulse

WEAK SINGLE PULSE



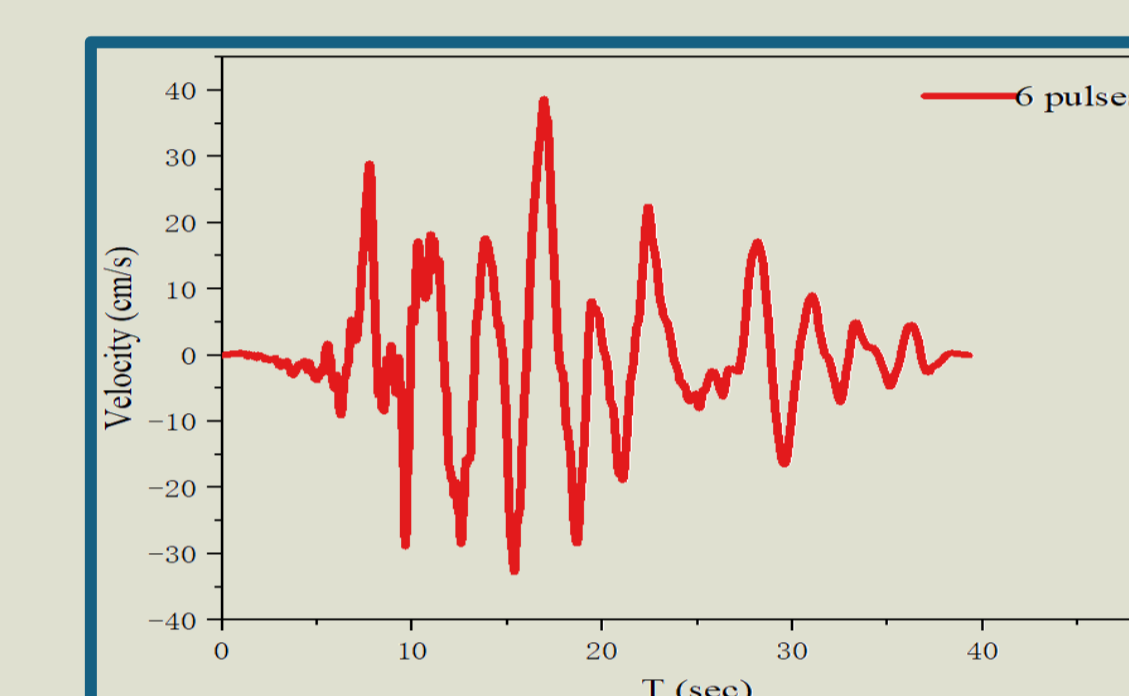
Unclear single low-amplitude velocity (relatively) pulse

STRONG MULTI-PULSES



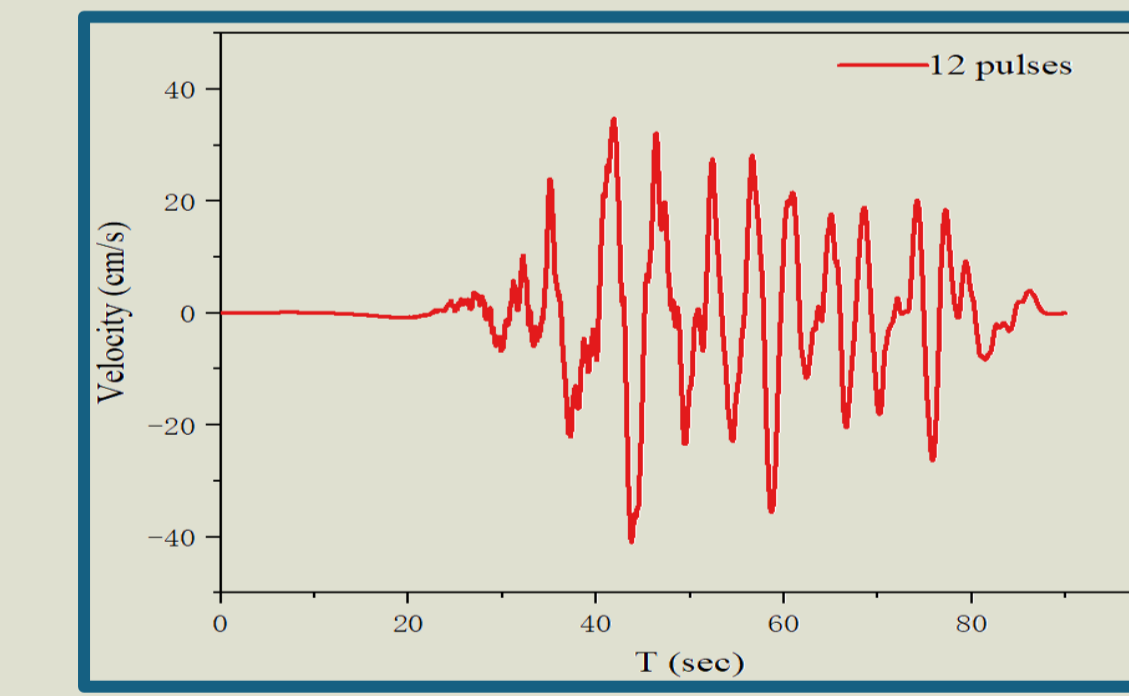
Apparent multiple strong velocity pulses

WEAK MULTI-PULSES



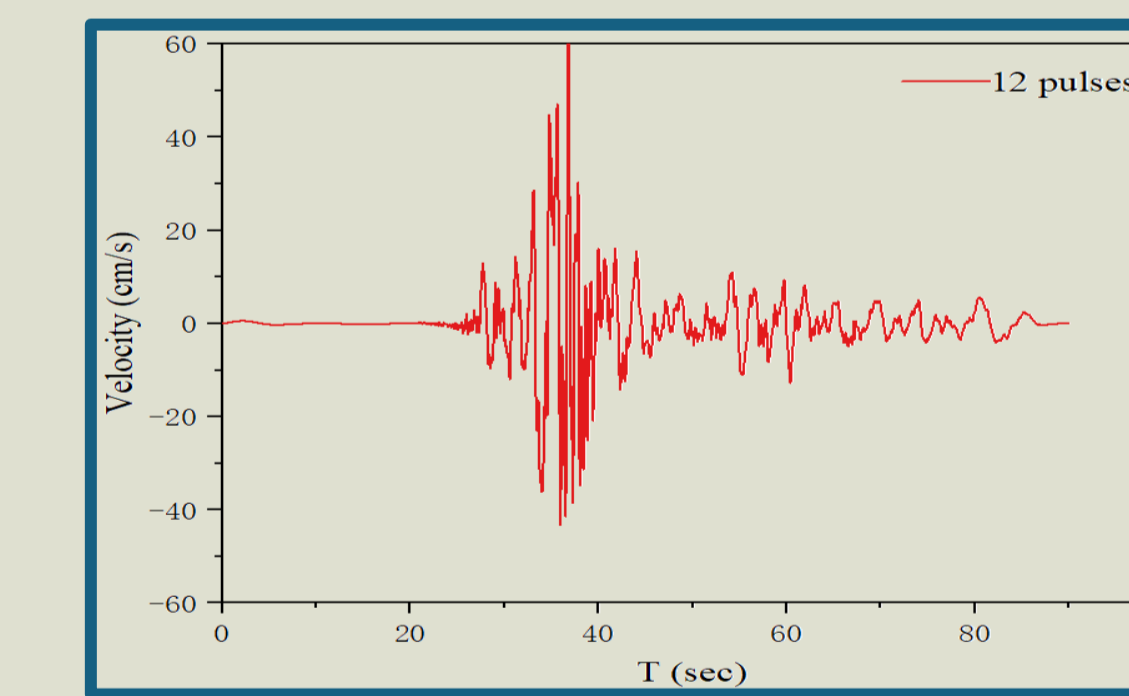
Multiple low-amplitude velocity (relatively) pulses

LOOSE-DISTRIBUTED MULTI-PULSES



Long time intervals between pulses and long pulse period

TIGHT-DISTRIBUTED MULTI-PULSES



Short time intervals between pulses and short pulse period

CONCLUSION

1. Propose a reliable classification method based on parameter characterization.
2. Accurately and efficiently extract single strong velocity pulse without subjective judgment. Further classify single pulse based on intensity.
3. Realise identification and classification of multiple pulses, and discover the characteristics of their intensity and distribution.
4. Systematically improve the classification issue of ground motion recordings.