Scopus

Back

Chatter detection in the turning process using acoustic wavelet scattergrams and transfer learning

Sharma, Sanjay [a] ✉ ; Gupta, Vijay Kumar [a] ; Rahman, Mustafizur [b] ; Saleh, Tanveer [c]

[a] Discipline of Mechanical Engineering, Machine Dynamics and Vibration Lab, PDPM Indian Institute of Information Technology, Design and Manufacturing, Jabalpur 482005, India

Show all information

0

Citations

Full text ⌄   Export ⌄   🔖 Save to list

Document   Impact   Cited by (0)   References (38)   Similar documents

Abstract

Chatter is an unwanted vibration in machining processes that degrades surface quality, reduces productivity, and shortens tool life. Reliable chatter detection is essential, particularly under varying machining conditions where traditional vibration-based approaches are often intrusive, complex, and require expert interpretations. This study introduces a novel time–frequency representation of acoustic signals using wavelet scattergrams for chatter detection in the turning process. These wavelet scattergrams generated through a wavelet scattering network (WSN) are used as an input to fine-tune a deep neural network (DNN) using a transfer learning framework. To ensure robust evaluation, experiments were conducted with five different overhang workpiece configurations, where the acoustic signals from the first four configurations were used for training and validation, and a completely new workpiece configuration was used to test the model performance. Among the

evaluated models, ResNet50V2 achieved the highest classification accuracy of 99.2% while maintaining a low detection latency of about 62 ms, outperforming MobileNet and DenseNet121. The results demonstrate that the proposed method can reliably detect chatter using a non-intrusive microphone sensor and limited experimental data while maintaining robustness across varying machining conditions, making it suitable for accurate chatter detection in industrial applications. © 2026 Elsevier Ltd

Author keywords

Acoustic signal; Chatter detection; Transfer learning; Turning process; Waveletscattergram

Indexed keywords

Engineering controlled terms

Cutting tools; Deep neural networks; Learning systems; Microphones; Partial discharges; Signal detection; Transfer learning; Turning

Engineering uncontrolled terms

Acoustic signals; Chatter detection; Machining conditions; Machining Process; Scattergrams; Tool life; Transfer learning; Turning process; Waveletscattergram; Workpiece

Engineering main heading

Acoustic waves

Funding details

Details about financial support for research, including funding sources and grant numbers as provided in academic publications.

Corresponding authors

Corresponding author	S. Sharma

Affiliation	Discipline of Mechanical Engineering, Machine Dynamics and Vibration Lab, PDPM Indian Institute of Information Technology, Design and Manufacturing, Jabalpur 482005, India

Email address	20pmeo14@iiitdmj.ac.in

Abstract

Author keywords

Indexed keywords

Funding details

Corresponding authors

About Scopus

What is Scopus

Content coverage

Scopus blog

Scopus API

Privacy matters

Language

Customer Service

Help

Tutorials

Contact us

ELSEVIER

Terms and conditions ↗   Privacy policy ↗   Cookies settings

RELX™