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Interference mitigation in satellite-5G coexistence using CNN-based interference classification and power control

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Abstract

The growing demand for wireless connectivity has increased pressure on shared spectrum, especially between satellite communication networks and emerging 5G systems. When these signals operate close to one another frequently, noticeable interference may occur and reduce signal quality. This study explores a deep learning-based interference mitigation approach that combines spectrogram-driven CNN classification with adaptive power control. The CNN model identifies three transmission cases: satellite-only, terrestrial-only, and coexistence and achieved accuracy close to 98% during testing. Using the classification output, an adaptive power strategy was applied, resulting in an improvement in SINR from roughly 10 dB to over 27 dB under coexistence conditions. A feedforward neural network supported by a genetic algorithm was also used to fine-tune system parameters. The findings demonstrate that the proposed method strengthens terrestrial-satellite coexistence and offers a practical direction for interference control in future wireless systems. (c) 2026 Elsevier Ltd. All rights are reserved, including those for text and data mining, AI training, and similar technologies.

Keywords

Author Keywords: [5G interference](#); [Satellite communication](#); [Deep learning](#); [CNN](#); [Genetic algorithm](#); [SINR optimization](#)

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Data availability statement

The datasets used and produced in this study are not publicly available, as they are part of an ongoing thesis project and are owned by the university.

Categories/ Classification

Research Areas: Automation & Control Systems