Variance Induced Decision Variable Coati Optimization-Based Mini-Slot Resource Allocation in URLLC with Reduced Inter-Numerology Interference

Abstract – The emerging diverse services and applications in communication demand better reliability,

lower latency, and improved energy efficiency while having massive connection density. 3rd Generation Partnership Project (3GPP) New Radio (NR),

the 5G global access standard offers a wide range of advanced application-specific capabilities. 3GPP Release 15 includes

an Ultra-Reliable Low-Latency Communication (URLLC) which hosts a set of features that are increasingly required for future mission-critical

applications in wireless mode. They require improvements in the design of the physical layer components to satisfy stringent

URLLC requirements for ultra-reliable, low latency, and fast data delivery along with strong security features. The selection of numerologies,

scheduling, and resource allocation techniques is challenging in the design and implementation of future 5G networks.

URLLC packets of short duration suitable for any time transmission gain high priority compared to scheduled data transmission.

Thus, URLLC data transmission performance depends on the data traffic. This paper provides the optimal mini-slot secure resource allocation

using Variance Induced Decision Variable Coati Optimization Algorithm (VIDV-COA) and data traffic classification using Cosine Growing Unit ResNet (CGURN).

To minimise the interference and secure communication, Linear Amplifier - Quadrature Phase Shift Keying (LA-QPSK), and

Fibonacci Series Puncturing Polar Codes (FSPPC) are also proposed. The optimized mini-slot scenario simulation results

show significant improvement

in the data rate while achieving the URLLC user’s requirements of low- latency and reliability.