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# Minimum Description Feature Selection for Complexity Reduction in Machine Learning-based Wireless Positioning

**Minimal-description feature set with CNN/attention localizes users accurately in low-SNR/NLOS while slashing data complexity.**

Researchers from Purdue University and Arizona State University have developed a new neural network architecture that streamlines deep learning-based wireless positioning (WP). By using a minimum description feature set instead of the traditional high-dimensional power delay profile (PDP), their method focuses only on the strongest signal power measurements and their timing. This simplified input is processed through convolutional and self-attention layers, enabling precise zone classification and coordinate localization even in complex environmentsâ€”with much less data. To maintain accuracy across different signal-to-noise ratios and channel conditions, the team applies a model order selection strategy using log-likelihood, acquisition probability, and Kullback-Leibler divergence to fine-tune the feature set size.

**Technology Validation:** The technology was rigorously tested through simulations in both LOS and NLOS scenarios across residential and outdoor environments. Ablation studies and adaptive feature size testing further validated the model's robustness and efficiency.

Related Publications: M. S. Oh, A. Bijoy Das, T. Kim, D. J. Love and C. G. Brinton, "Minimum Description Feature Selection for Complexity Reduction in Machine Learning-Based Wireless Positioning," in IEEE Journal on Selected Areas in Communications, vol. 42, no. 9, pp. 2585-2600, Sept. 2024, doi: 10.1109/JSAC.2024.3413977.

**Advantages**:

-Reduces Design Complexity

-Improved Accuracy in Low SNR and NLOS conditions

**Technology ID**

2025-BRIN-70919

**Category**

Artificial Intelligence & Machine Learning/AI Model Optimization & Acceleration Tools

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-Data Driven Feature Size Selection

**Applications**:

-Autonomous Vehicles

-Emergency Communication Systems

-Smart Infrastructure (IoT)

**TRL:** 4

**Intellectual Property:**

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**Keywords:** Computer Technology, deep learning, Electrical Engineering, low complexity localization, wireless positioning