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Machine Learning for 6G Indoor Localization Using 802.11az and Fingerprinting Technologies

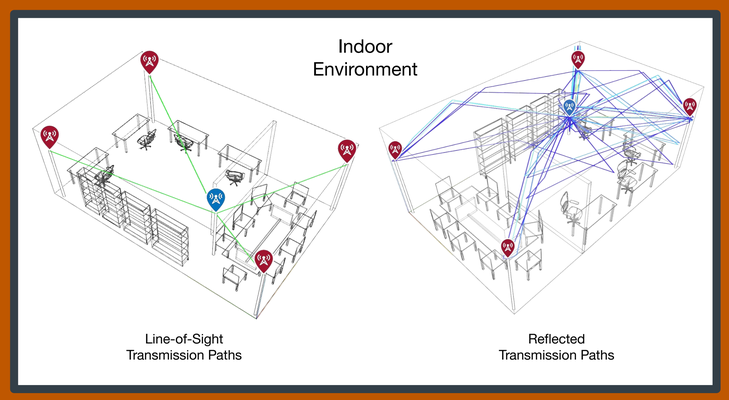
Project Definition + Context

Current localization strategies provide insufficient estimates for 6G applications such as…

- Compliant manufacturing
- Indoor navigation
- Autonomous vehicles

Using 802.11az fingerprinting and chirp waveform cross-correlation transmission strategies.

Neural networks predict location from perturbations caused by noise, refection, and propagation in the received version of the signal.

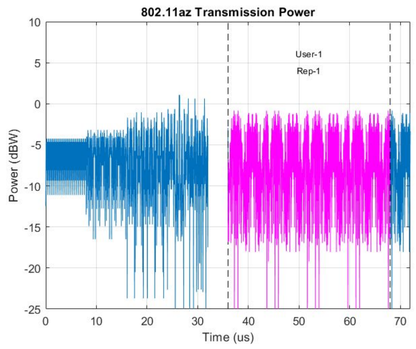


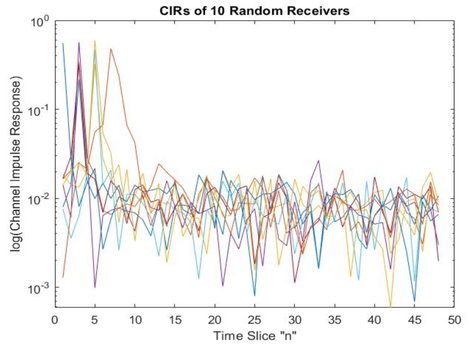
System Flow

802.11az Fingerprinting

Chirp Signal Cross-Correlations

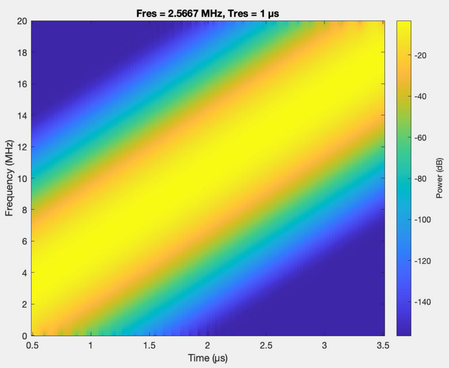
→ Convolutional Neural Network

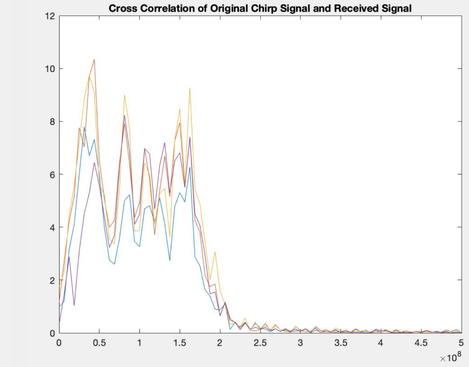




Fingerprinting

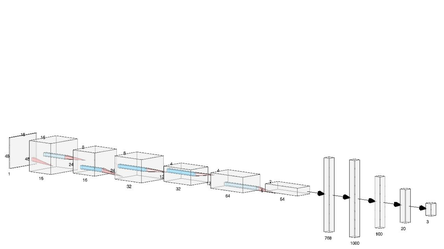
Each receiver's Channel Impulse Response fingerprint is labeled with location information for training. The CNN then learns to predict device location from nuances in the CIRs.



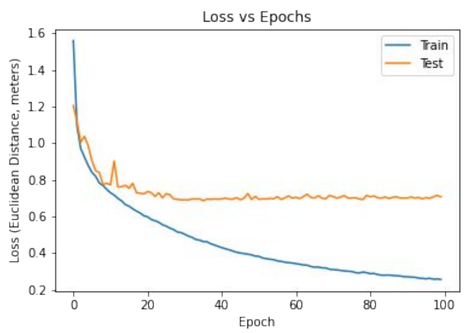


Cross-Correlation

We use the frequency of the peaks in the spectrogram to calculate the range between a transmitter and a receiver.



Neural Network Architecture



Neural Network

CNN trained on generated CIR and spectrogram datasets.
Our best performing model achieved *70 cm accuracy* on test data, outperforming the traditional trilateration methods by 30%.

Images courtesy of