Contribution ID: **124** Type: **Študenti informatika**

From Noise to Readable Images: Eavesdropping on Computer Screens via Custom Hardware and Deep Learning Image Reconstruction

Wednesday, November 26, 2025 10:45 AM (10 minutes)

A computer transmits visual information to a monitor as a continuous stream of RGB pixels, with their intensities encoded as voltage levels in the signal traveling through the video cable. The high-frequency voltage transitions of the signals generate unintentional electromagnetic emissions, which can be intercepted and used to reconstruct the displayed image. Under standard conditions, using conventional software-defined radios with the TempestSDR software, such reconstruction is only feasible at very short distances, typically below one meter. This work presents methods to extend both the range and the quality of these reconstructions. By employing a directional Yagi–Uda antenna, a low-noise amplifier, and a band-pass filter, we increased the effective capture distance to approximately 20 meters. To further enhance image quality, we automated the dataset generation process, creating a large dataset representing typical computer usage scenarios. We trained two image restoration convolutional neural networks, DRUNet and DnCNN, and achieved improvements across all tested image quality metrics. Additionally, we integrated the trained models into TempestSDR, making high-quality image reconstruction easier for users. Our findings demonstrate the potential vulnerability of display devices and emphasize the need for preventive measures to enhance their security.

Pracovisko fakulty (katedra)/ Department of Faculty

Department of Computer Science

Tlač postru/ Print poster

Budem požadovať tlač /I hereby required to print the poster in faculty

Authors: TUCH, Filip (Comenius University); OSTERTÁG, Richard (Comenius University)

Presenter: TUCH, Filip (Comenius University)

Session Classification: Študentské, doktorandské, postdoktorandské osobnosti

Track Classification: Študentské, doktorandské, postdoktorandské osobnosti