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SCALib: Side-Channel Analysis Library

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Available Features

Leakage Assessment:

- Signal-to-Roise Ratio
- Uni/Multi-variate higher-order T-test

Attack Tools:

- Gaussian Templates & LDA
- Soft-Analytical Side-Channel Attacks (SASCA)

Post-processing:

- Key rank estimation

→ **And more to come.**

Goals & Philosophy

Easy to use:

- Simple Python API.
- Detailed documentation and examples.
- On PyPI: `pip install scalib`.

High performance:

- Single/multi core optimizations.
- `Rust/C` back-end.
- Incremental API.
- Optimized RAM usage.

ANSSI's AES-128 on STM32

Affine masking:

- *Masks* r^m *and* r_i^a:

$$x_i = (r^m \otimes \text{Sbox}[pt_i \oplus k_i]) \oplus r_i^a$$

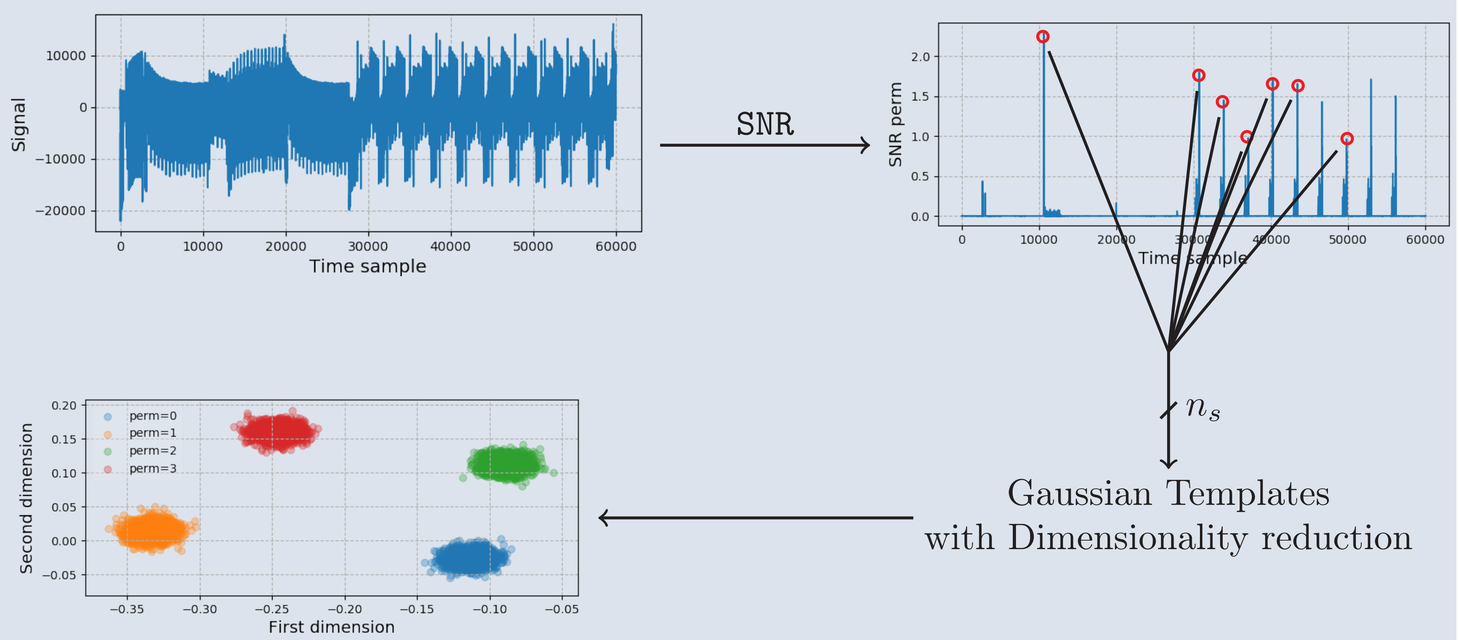
- Pre-computed masked Sbox.

Shuffling:

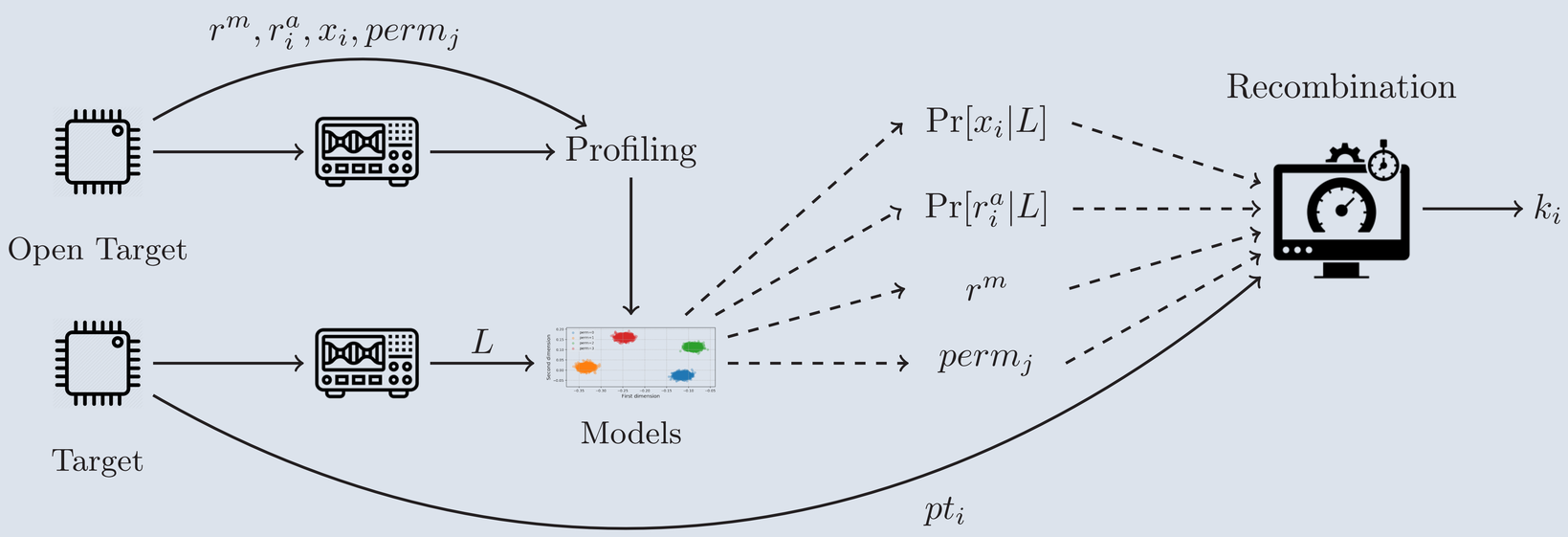
- Permutation on 16 Sboxes.
- *Permutation on 4 MixColumns.*

→ Both masking and shuffling are combined to increase side-channel protection.

Leakage Profiling Strategy (e.g. permutation indexes)



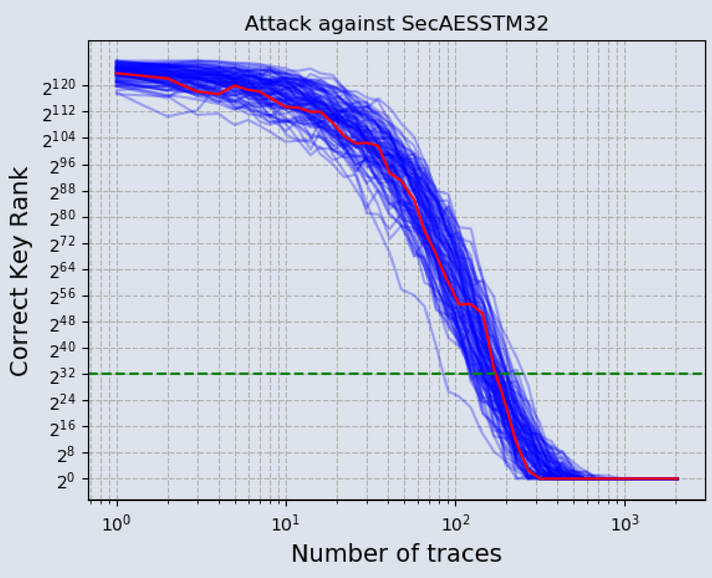
Attack Description



Attack Parameters:

- 60 kSample/trace.
- 125MSample/sec with 12-bit resolution.
- 37 intermediate values are profiled.
- SNR computed with 8192 traces.
- Between 400 and 800 PoIs are used.
- Models computed with 16384 traces.

Attack Results



Attack Performance:

- SNR computed in ≈ 40 sec.
- Templates are built in ≈ 40 sec.
- 200 traces are required to break a key.
- One 128-bit key is recovered in ≈ 1 sec.

References

[1] O. Bronchain and F.-X. Standaert, "Side-channel countermeasures' dissection and the limits of closed source security evaluations," *IACR TCHES*, vol. 2020,

[2] O. Bronchain, G. Cassiers, and F.-X. Standaert, "Give me 5 minutes: Attacking ASCAD with a single side-channel trace," *IACR ePrint*, p. 817, 2021.

[3] Ryad Benadjila et al, *SECAES STM32*, https://github.com/ANSSI-FR/SecAESSTM32.

[4] O. Bronchain and G. Cassiers, *SCALib sources*, https://github.com/simple-crypto/SCALib.

[5] O. Bronchain and G. Cassiers, *SCALib doc.* https://scalib.readthedocs.io/en/latest/.