Secure Non-Interactive Reducibility is Decidable

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Our results

Secure Non-Interactive Reduction (SNIR) Problem

Is there a statistical SNIR for securely sampling (U, V) given (X, Y)?

i.e., $\forall \epsilon > 0$, an ϵ-SNIR for (U, V) given n_ϵ copies of (X, Y).

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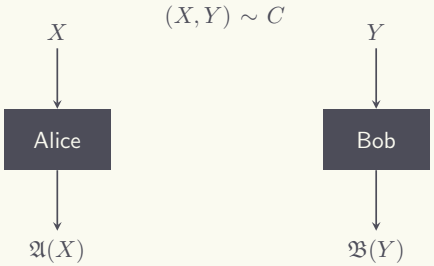
Corollary

SNIR problem is **decidable**. Further, if there is a statistical SNIR for (U, V) given (X, Y), a perfect SNIR for the same can be computed.

Perspectives of a SNIR



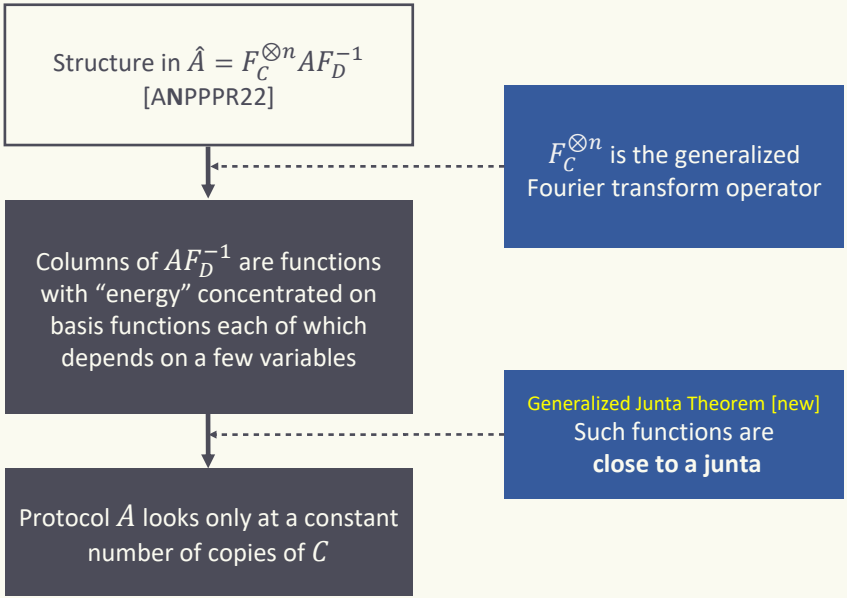
Cryptographic view: Secure protocol to sample (U, V) given many copies of (X, Y) non-interactively

Linear Algebraic view: Can be viewed as matrices: $A^\intercal C B = D$

Spectral view: "Spectral protocol" obtained via singular value decomposition of C, D: $\widehat{A}^\intercal \Sigma_C \widehat{B} = \Sigma_D$

Fourier Analytic view: When C is in the form of many independent copies, analyze A, B as functions of many variables

Suppose (A, B) is an ϵ-SNIR for securely sampling a copy of D using n copies of C (i.e., $C^{\otimes n}$)



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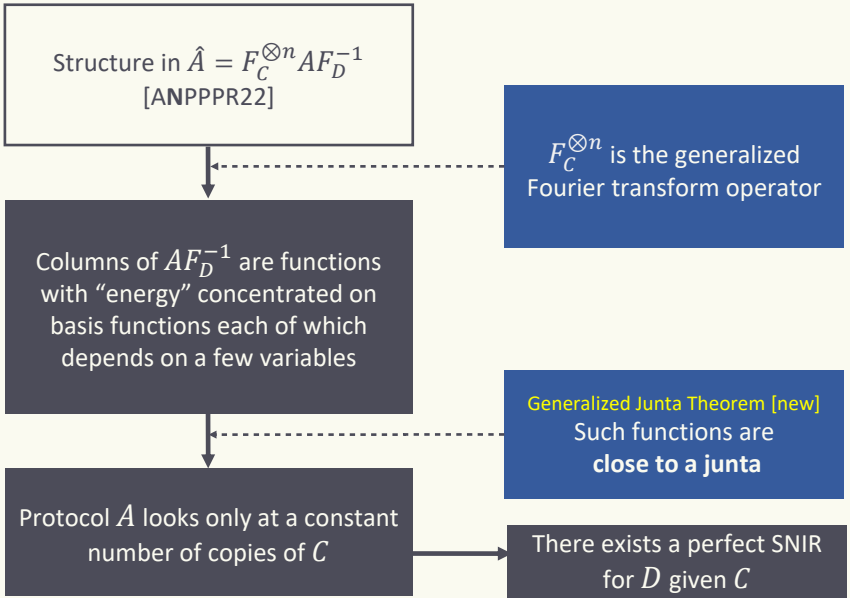

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Thank you!