Relativized Succinct Arguments in the ROM Do Not Exist

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Succinct non-interactive arguments

SNARGs in the ROM

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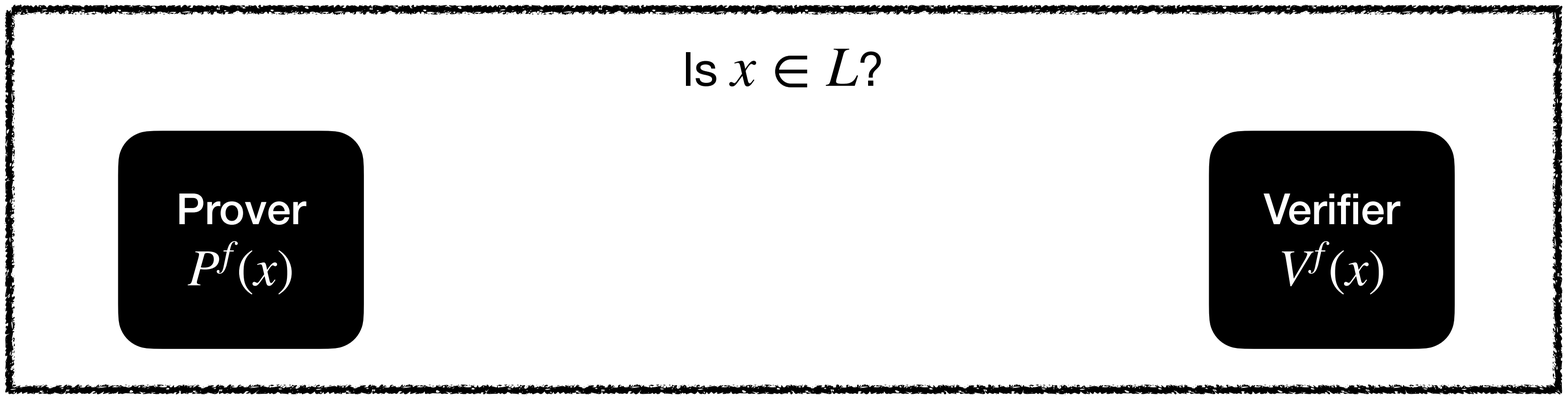

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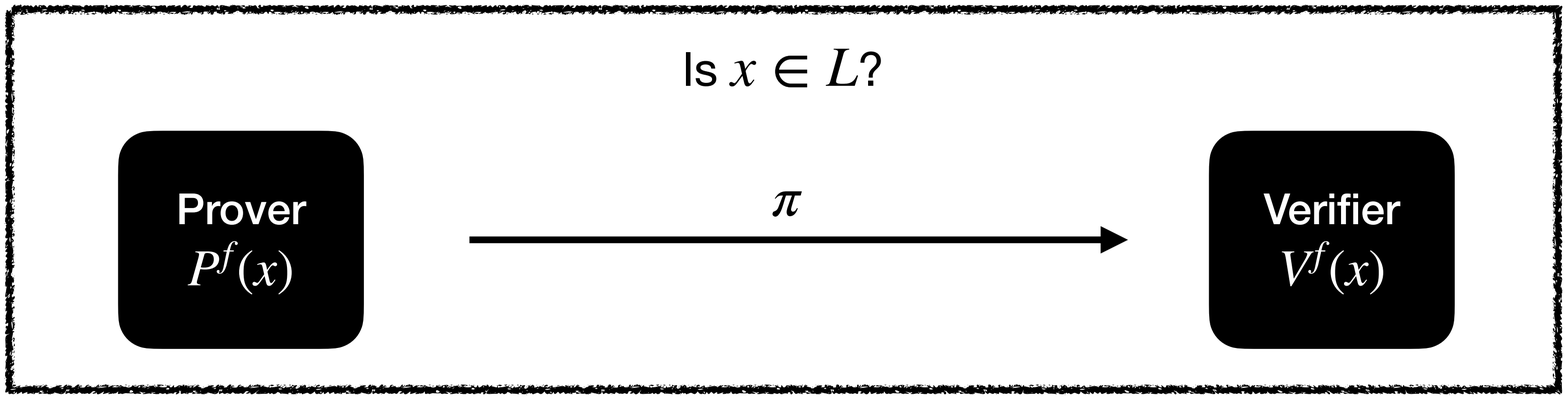

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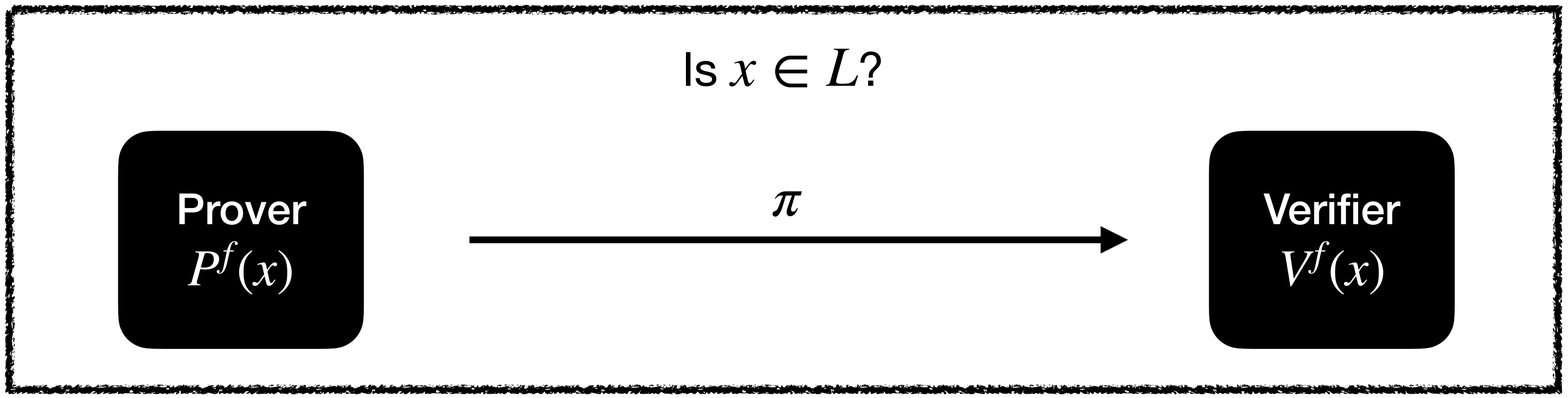

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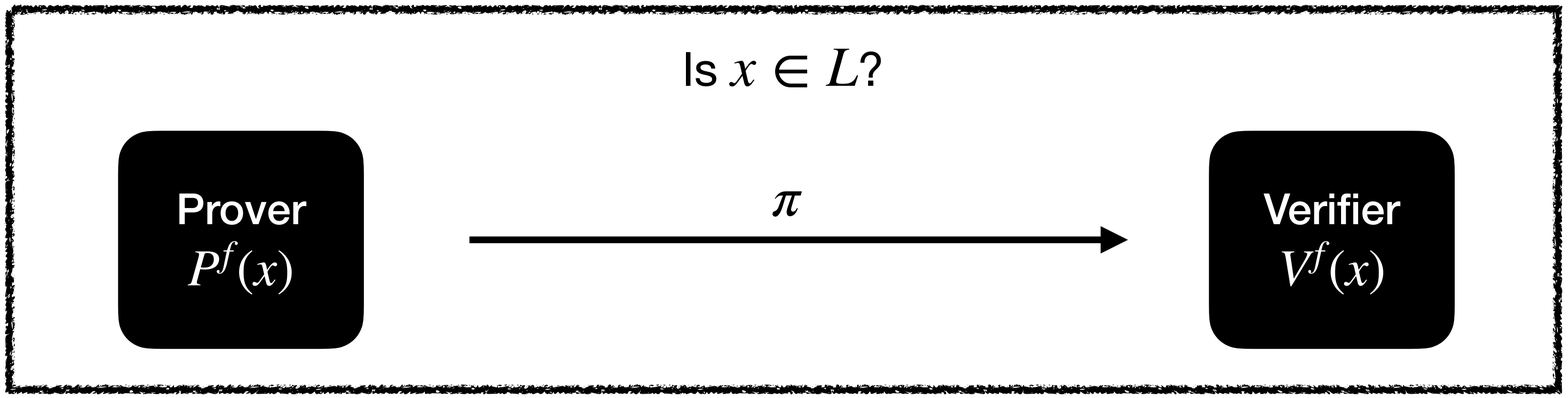

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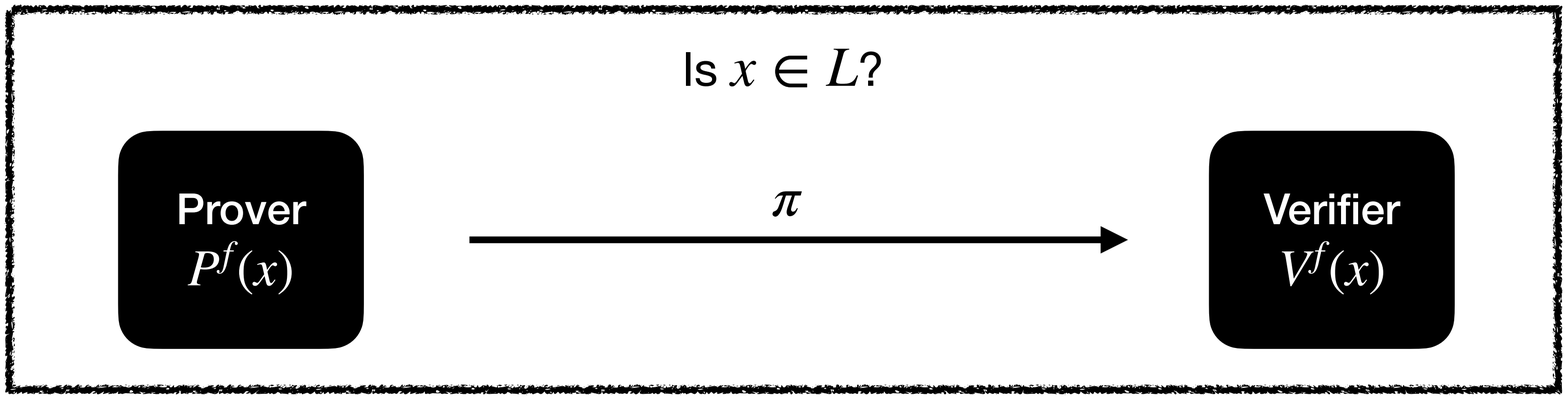

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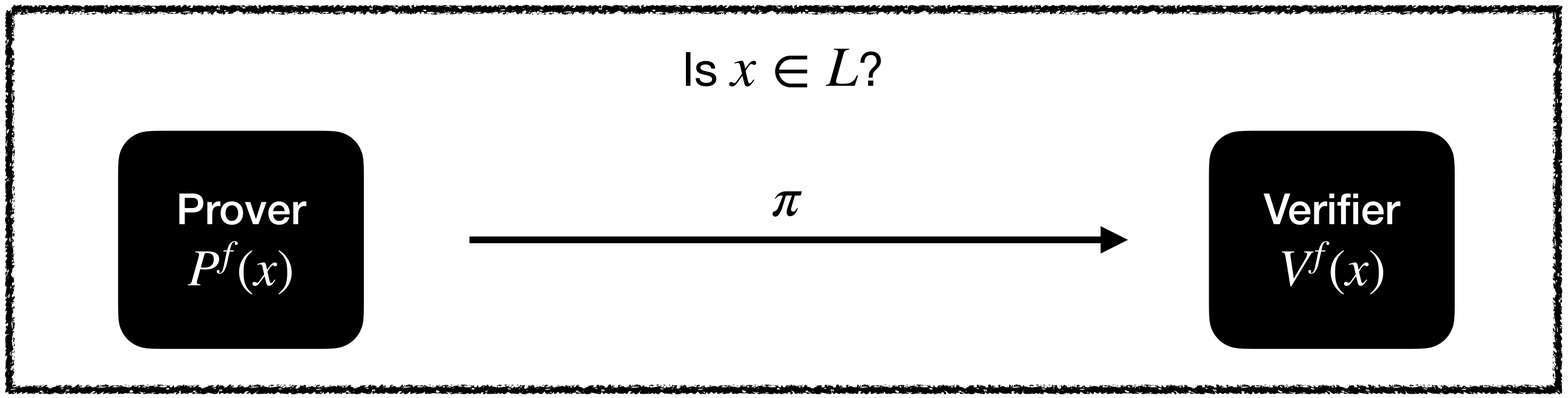

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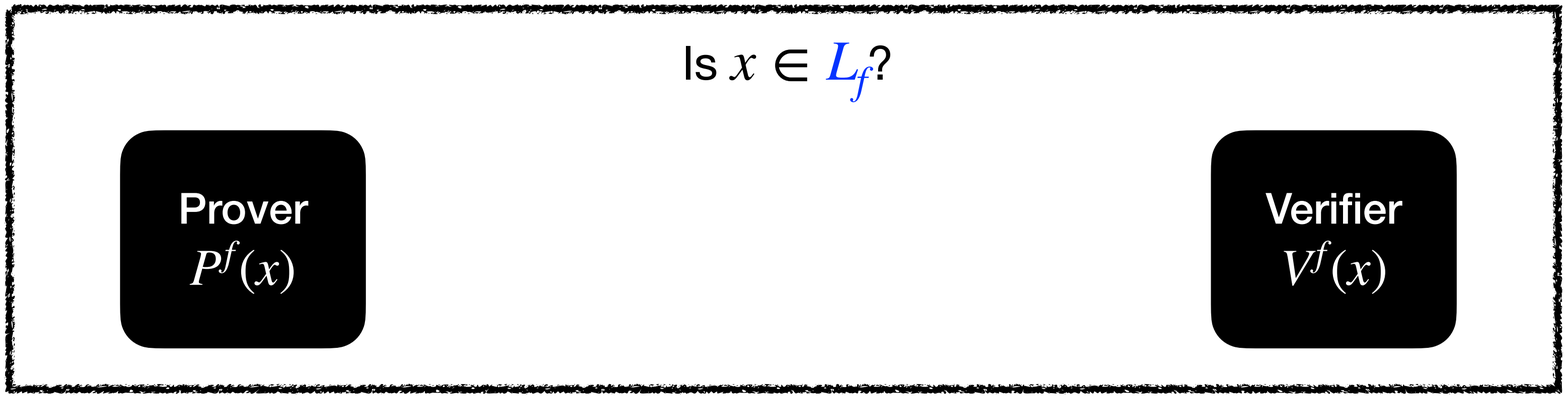

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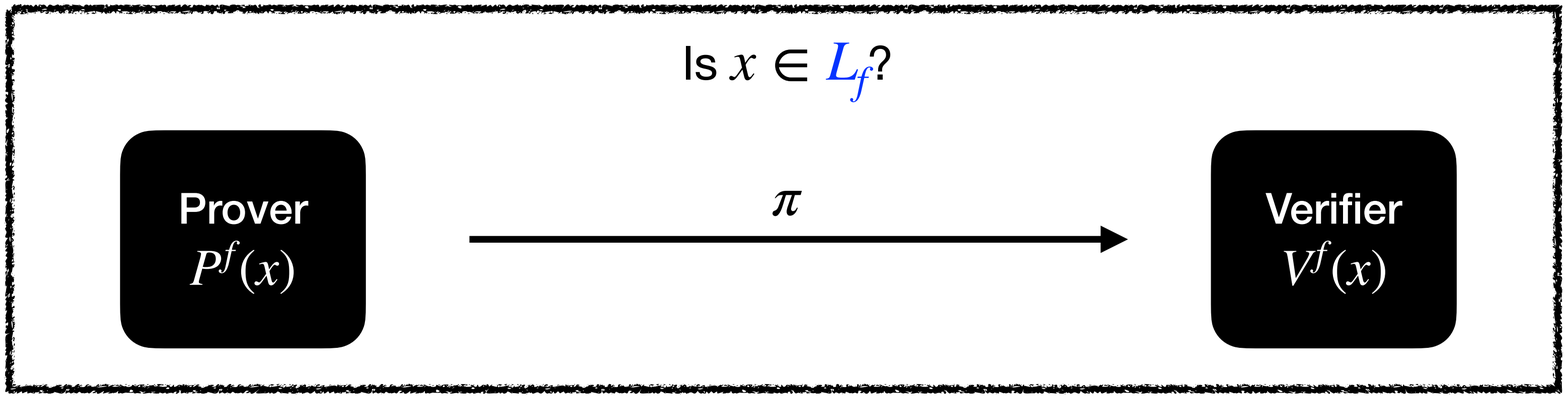

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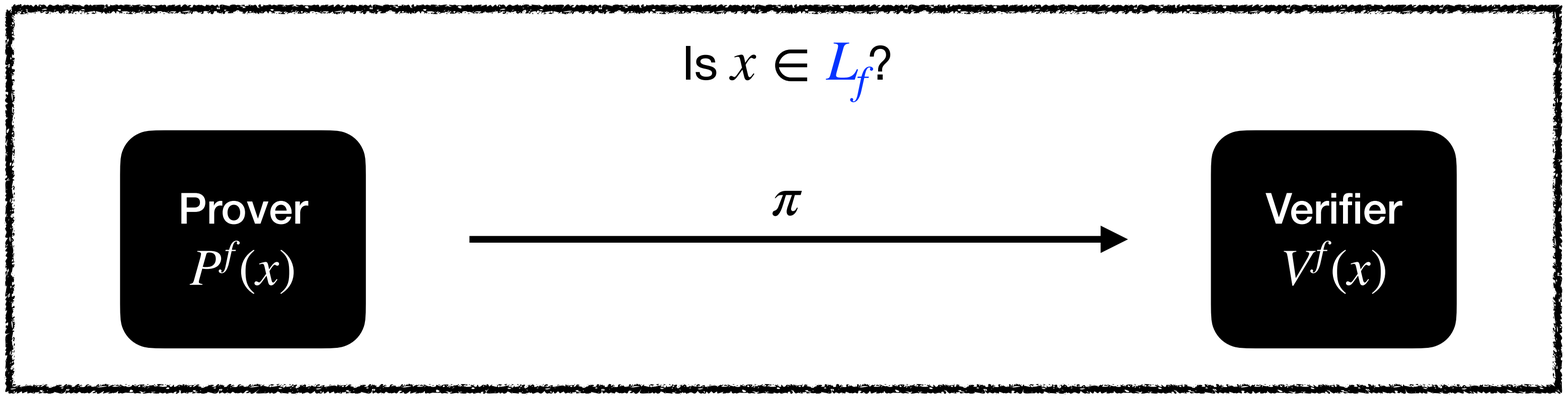

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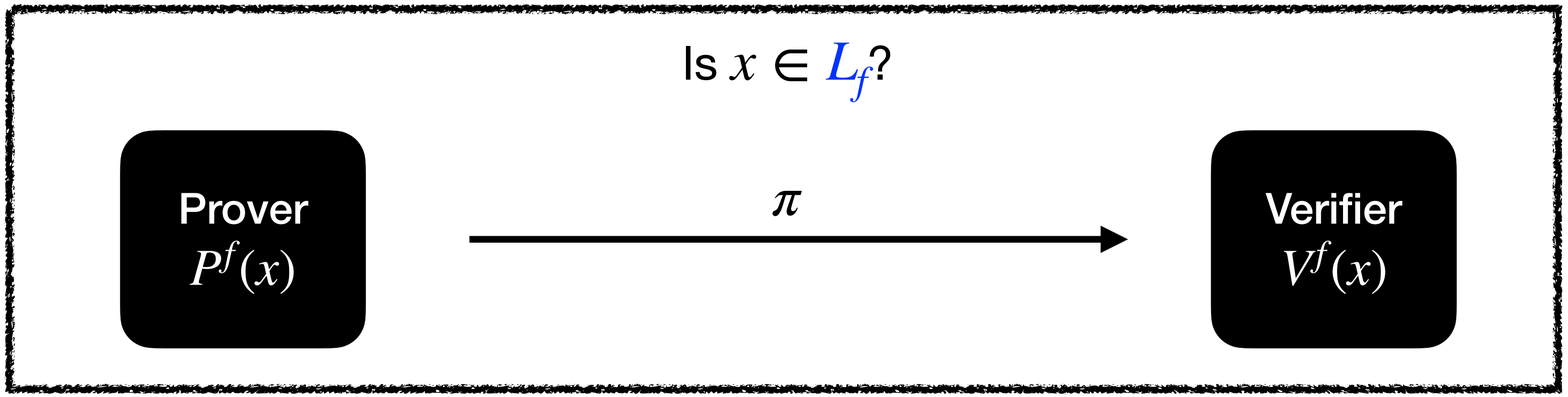

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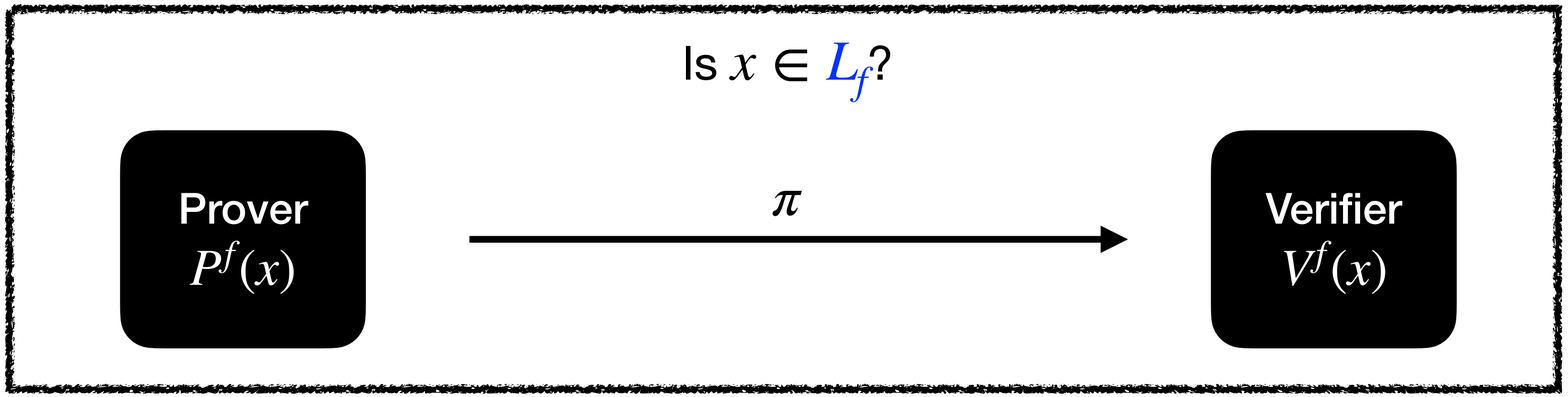

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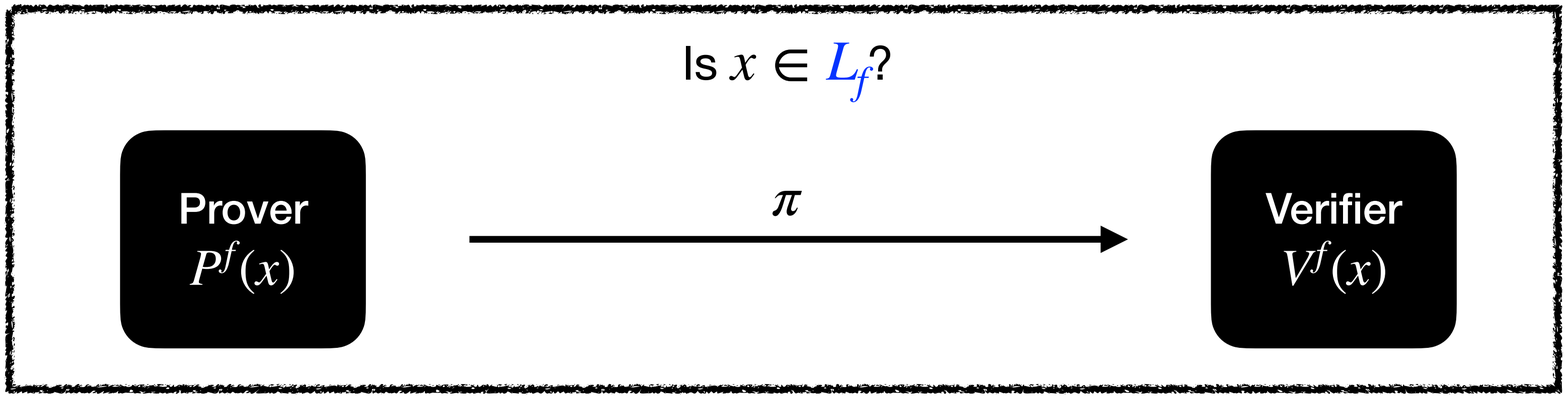

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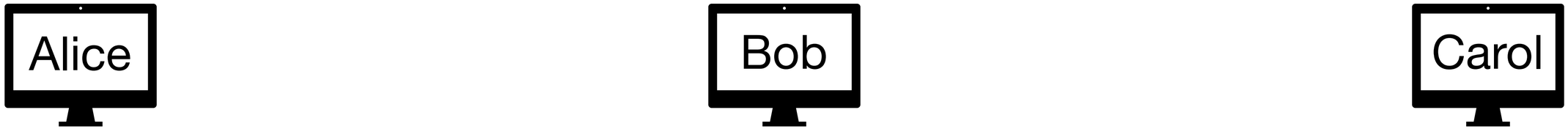

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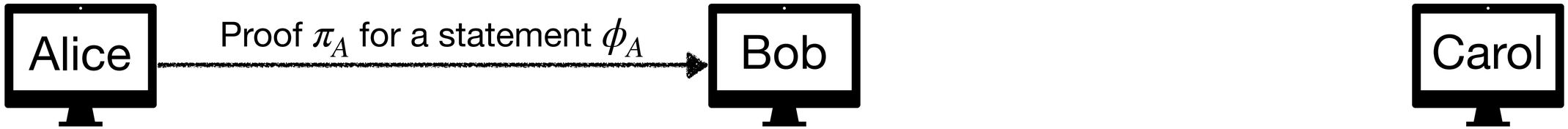

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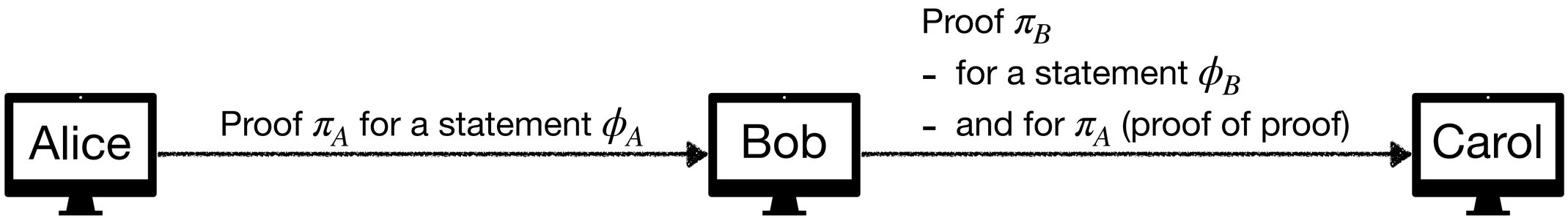

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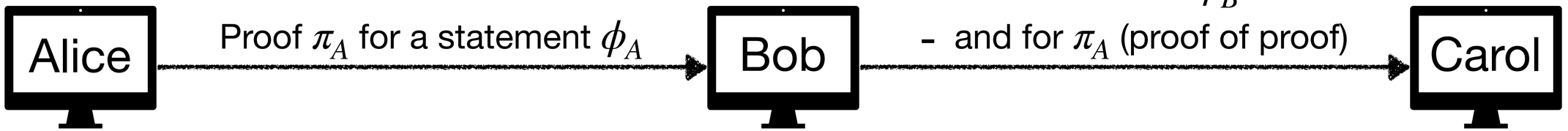

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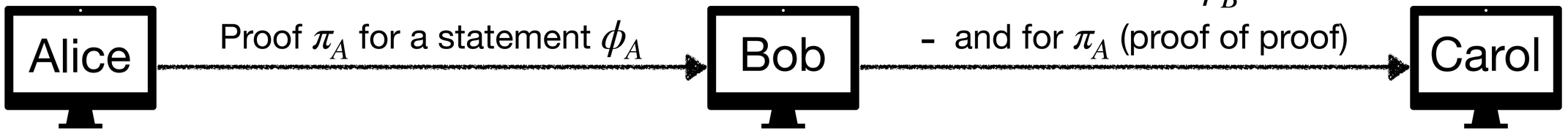

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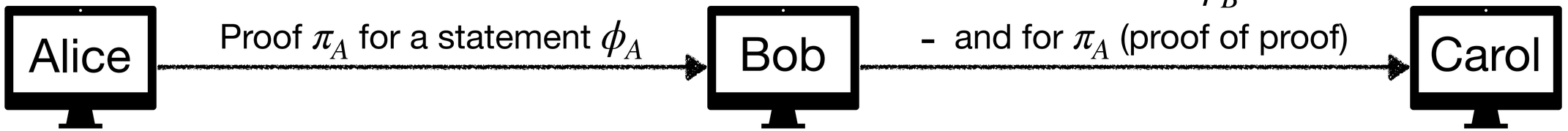

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Corollary. Relativized IVC/PCD does not exist in the ROM!

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Theorem 1. $\mathrm{DTIME}^{\mathcal{O}}[t] \not\subseteq \mathrm{ARG}^{\mathcal{O}}[\mathsf{vq} = o(t)]$.

argument proof size

Trivial Baseline 2. $\mathrm{NTIME}^{\mathcal{O}}[t] \subseteq \mathrm{ARG}^{\mathcal{O}}[\mathsf{as} = t]$.

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Existence of IVC/PCD in the ROM still remains open.

Corollary. Relativized IVC/PCD does not exist in the ROM!

Our results

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Note.
- The results hold for SNARGs secure against query-bounded and time-bounded adversaries.
- Similar results hold for interactive arguments.

Open problem: Characterization

Open problem: Characterization

Easy to learn/predict

Hard to learn/predict

Open problem: Characterization

Easy to learn/predict

Structured Oracle

Hard to learn/predict

Open problem: Characterization

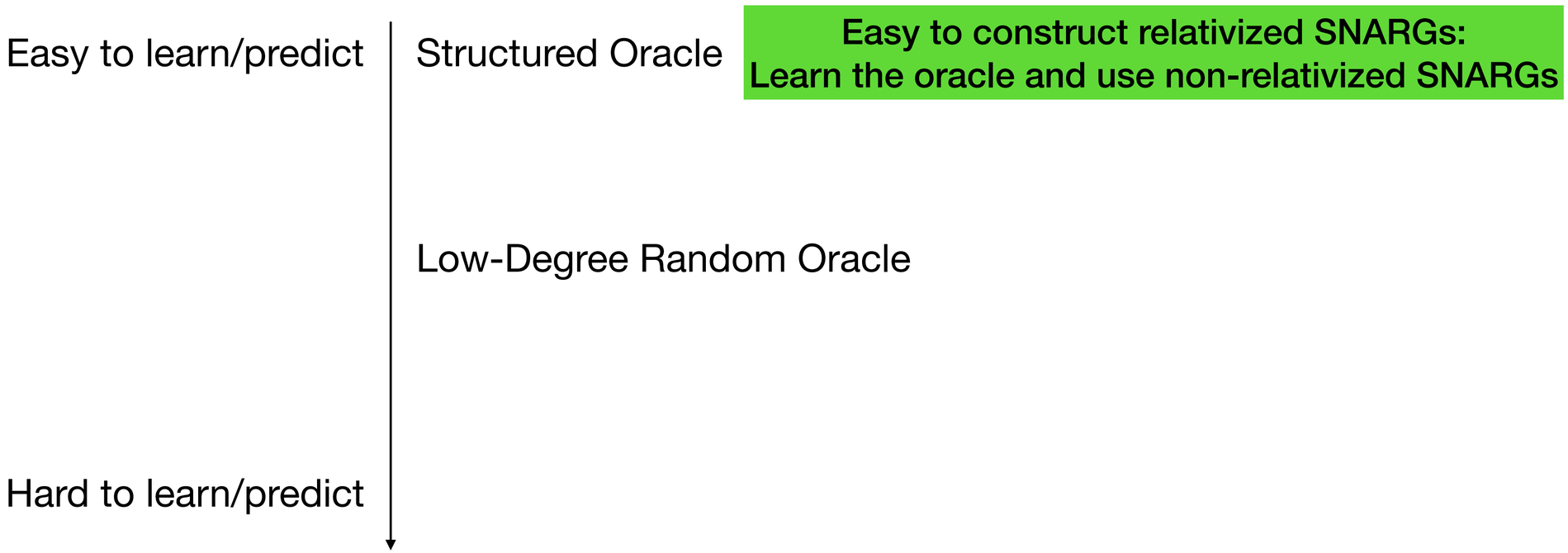
Easy to learn/predict

Hard to learn/predict

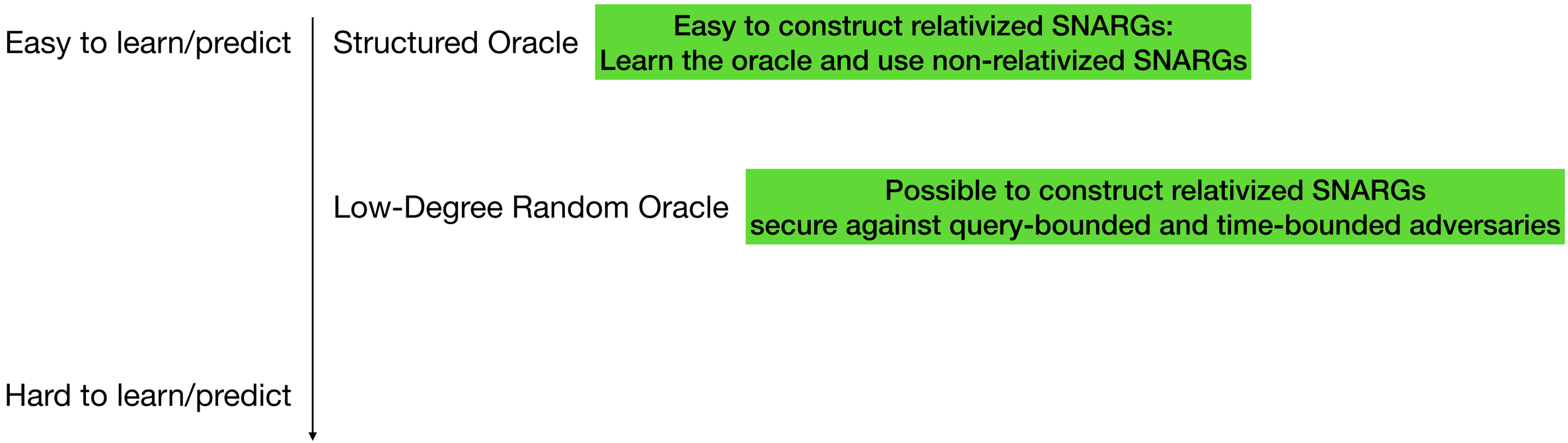
Structured Oracle

Easy to construct relativized SNARGs:
Learn the oracle and use non-relativized SNARGs

Open problem: Characterization



Open problem: Characterization



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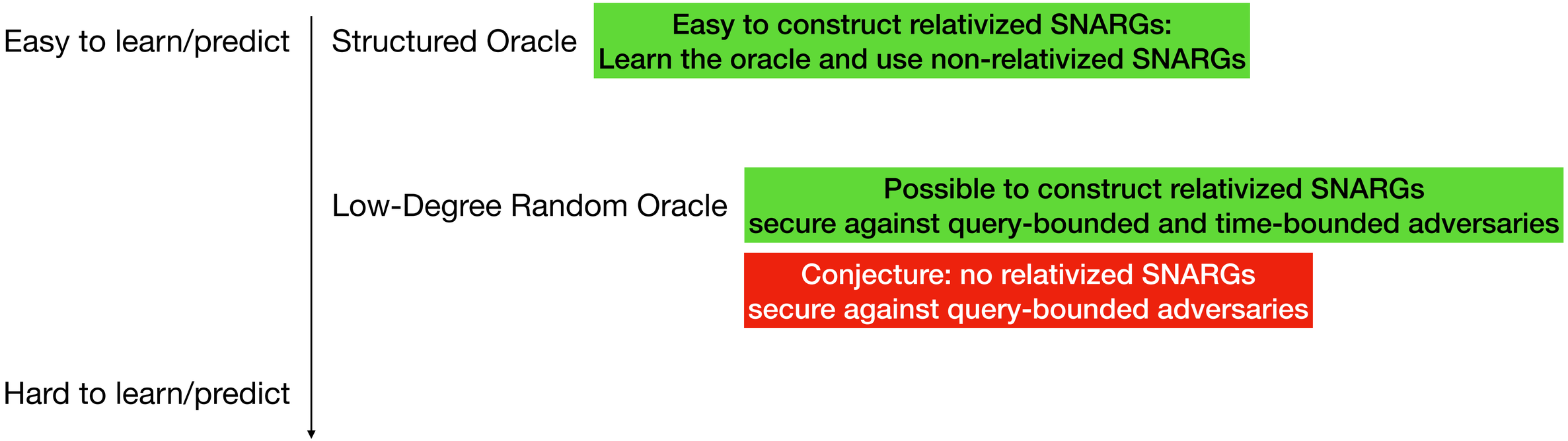

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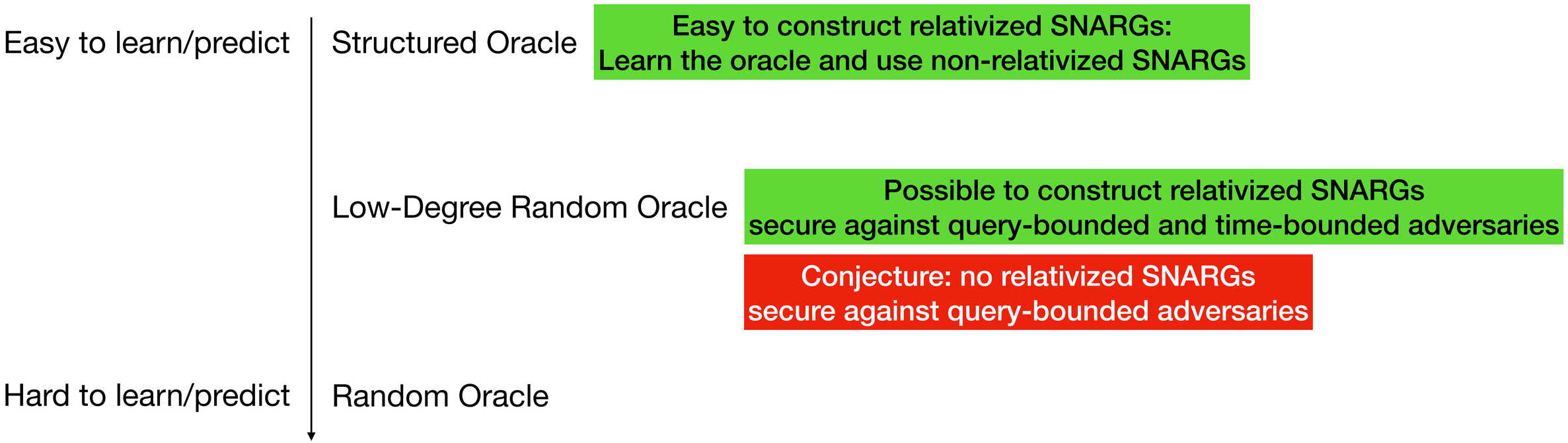
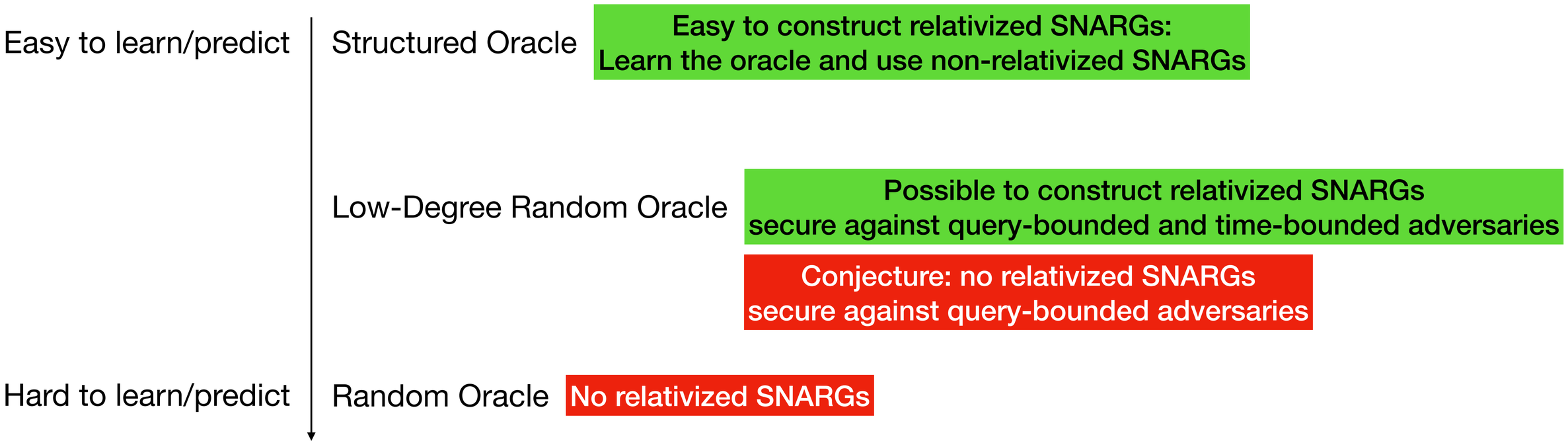
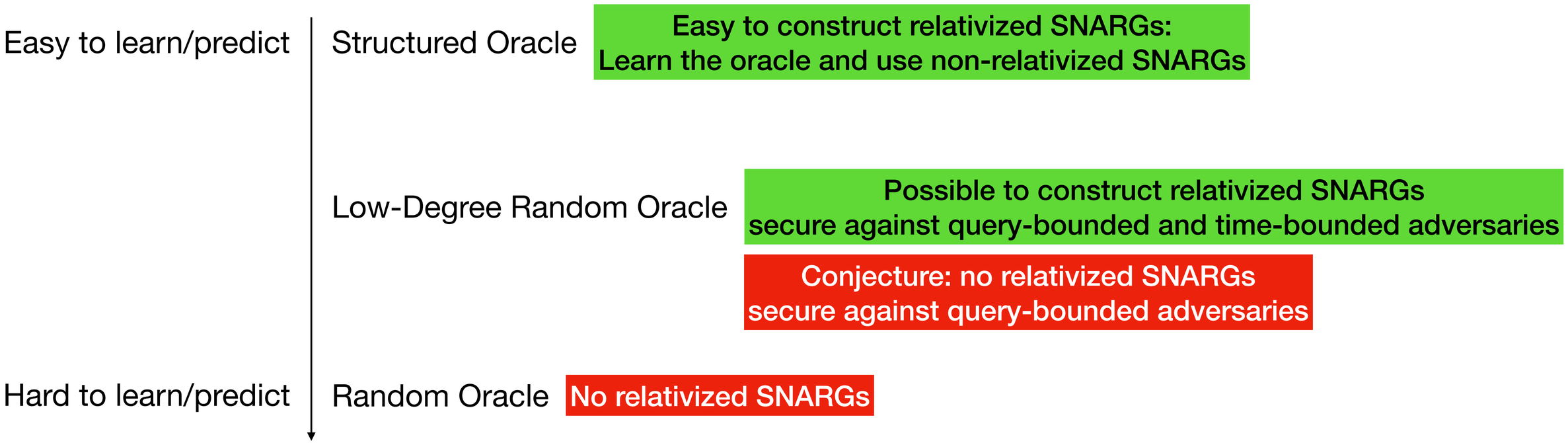


Open problem: Characterization



Open problem: Characterization



Open problem.

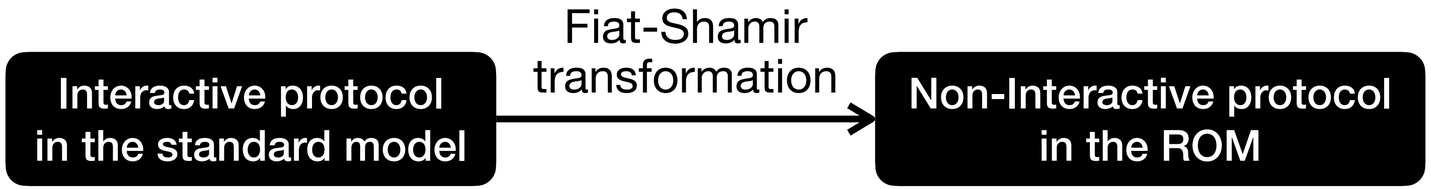
Give a sufficient and necessary condition for an oracle that separates DTIME/NTIME and relativized arguments.

Insights into Fiat-Shamir

Insights into Fiat-Shamir

Interactive protocol
in the standard model

Insights into Fiat-Shamir



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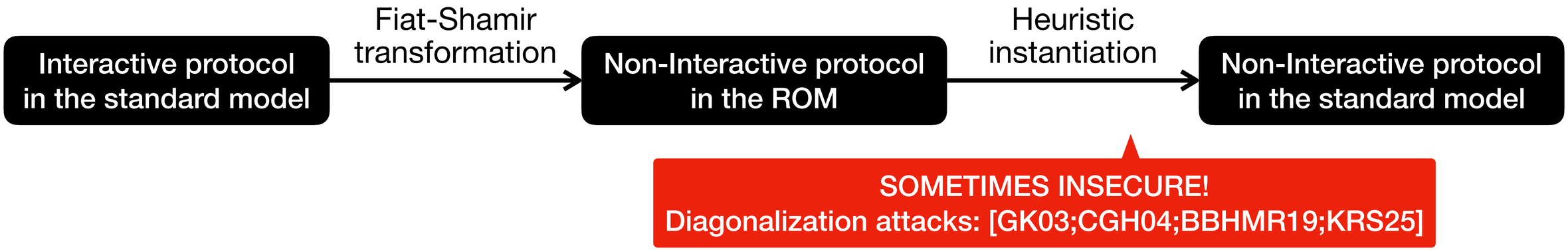

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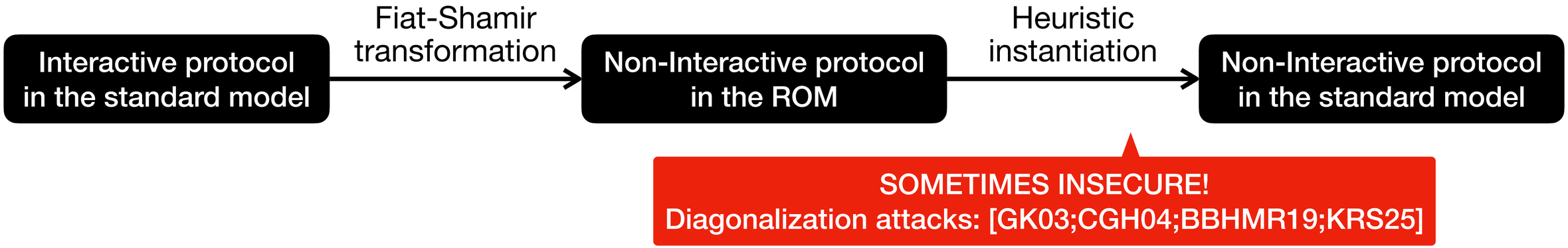
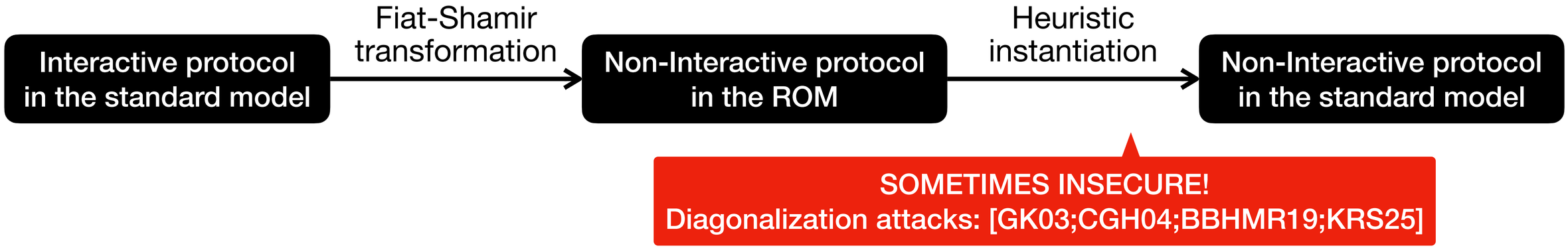
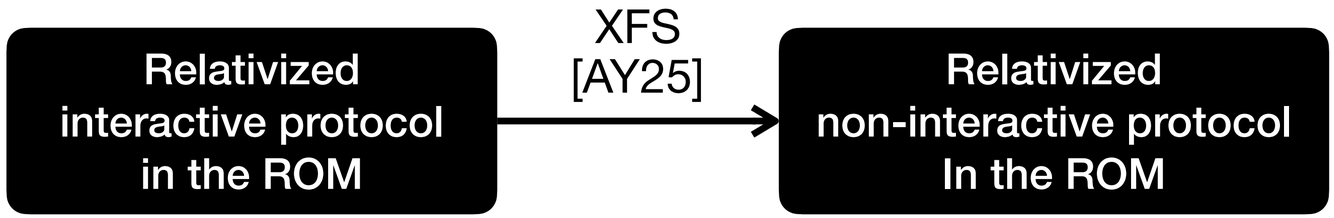


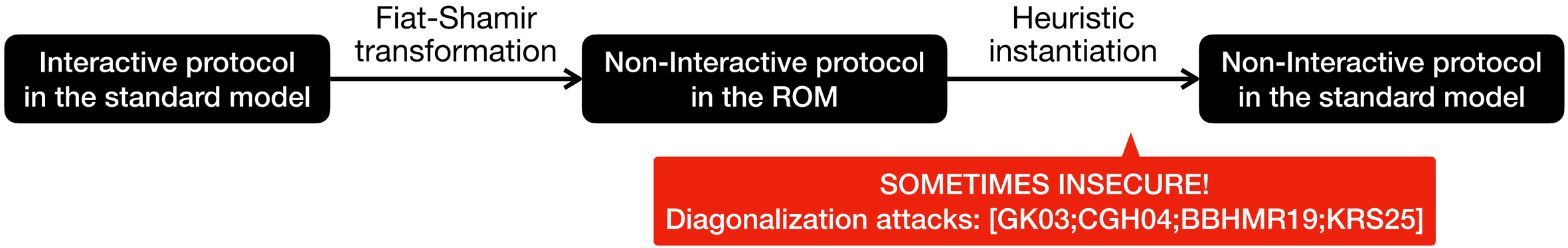
Relativized interactive protocol in the ROM

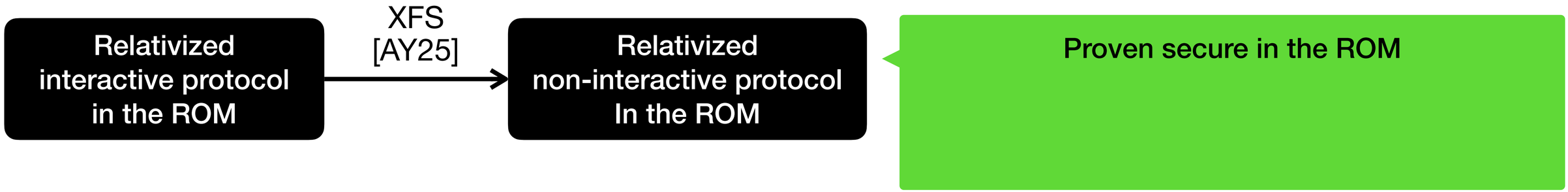
Insights into Fiat-Shamir





Insights into Fiat-Shamir





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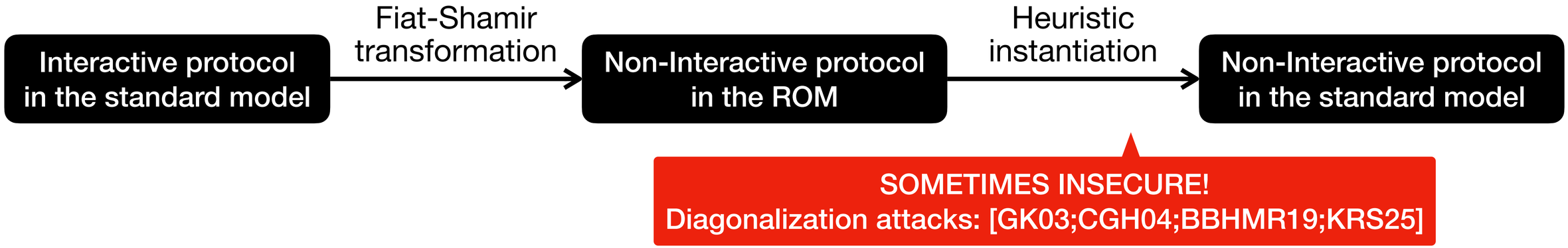

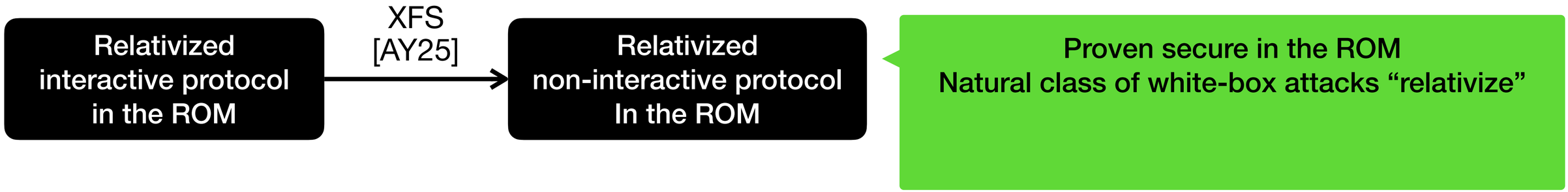

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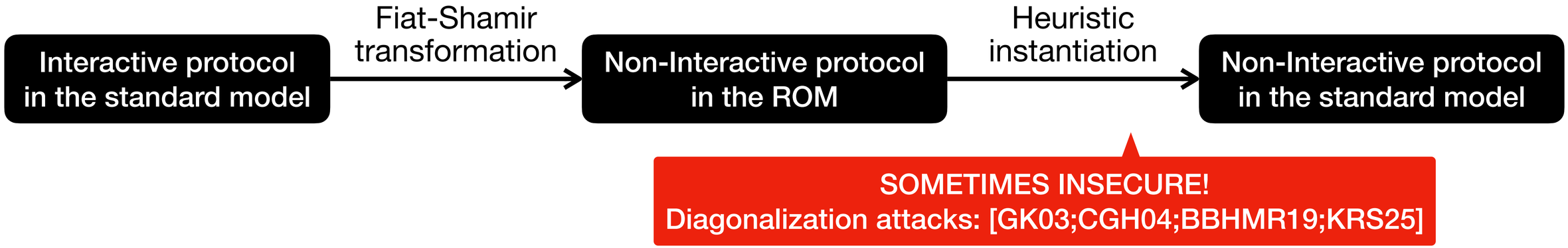

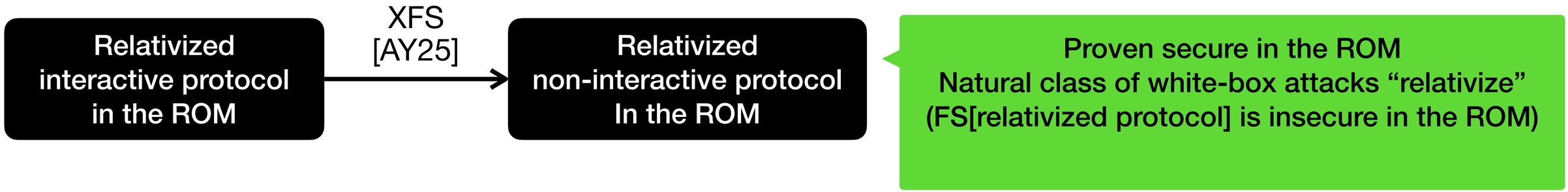

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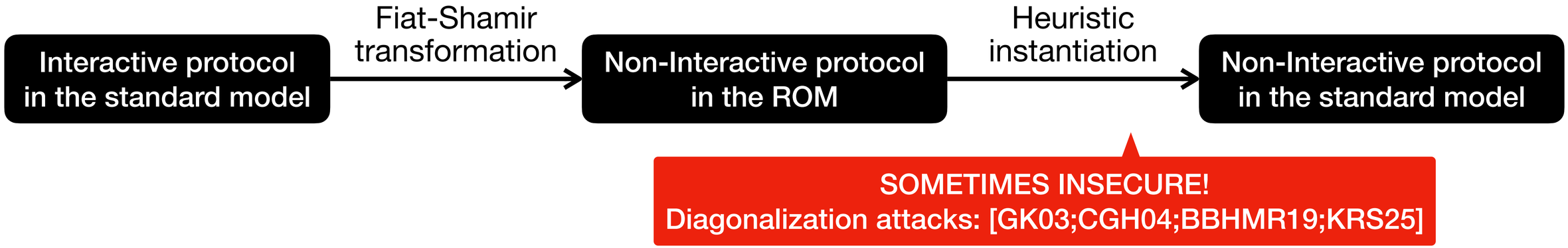

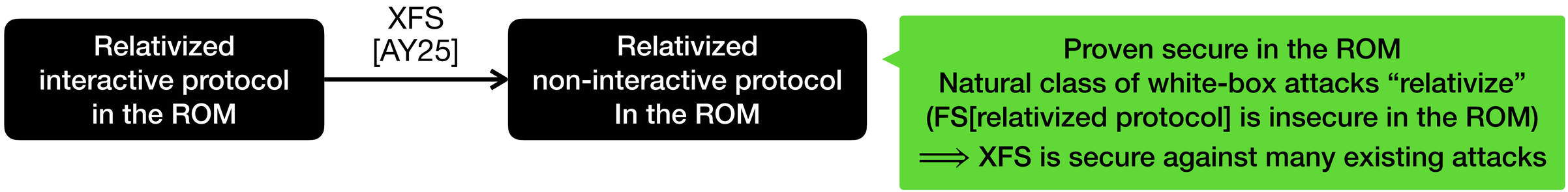

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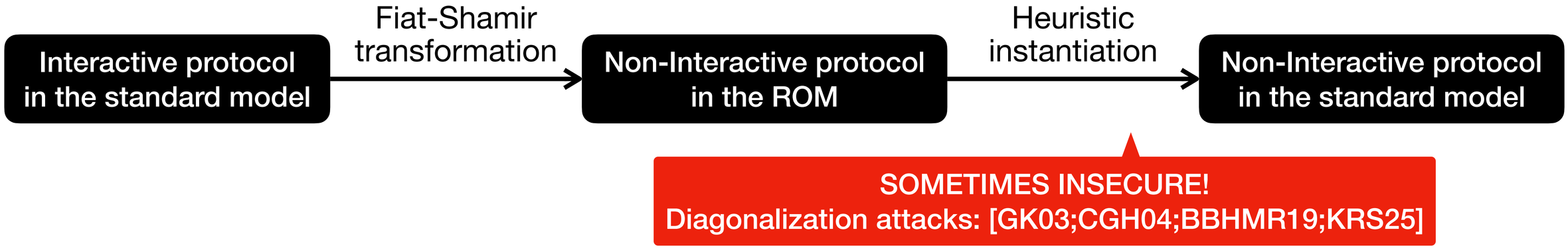
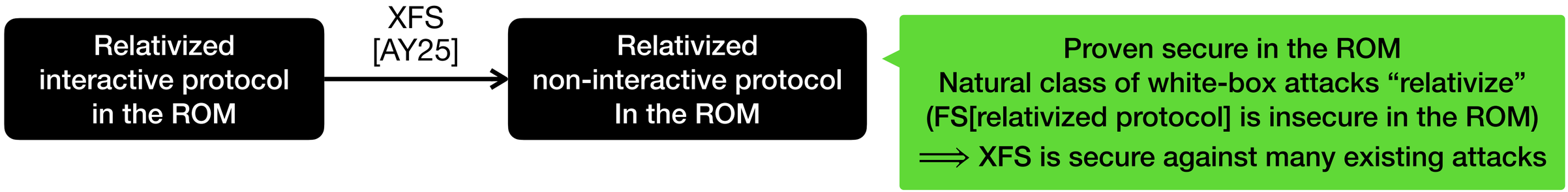
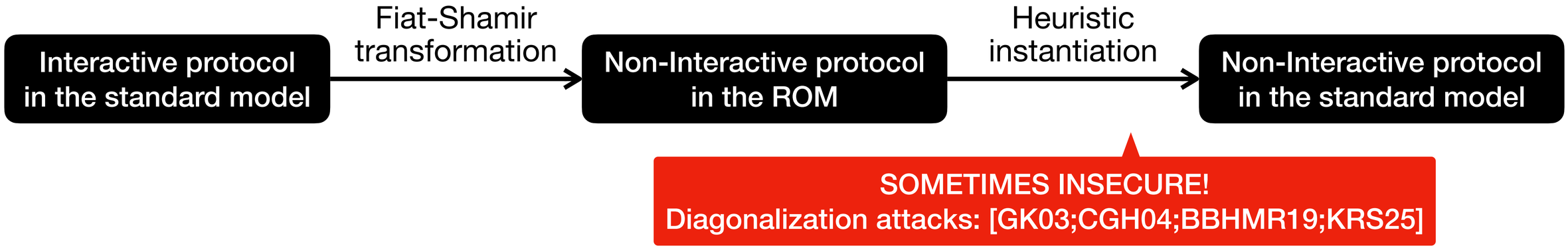
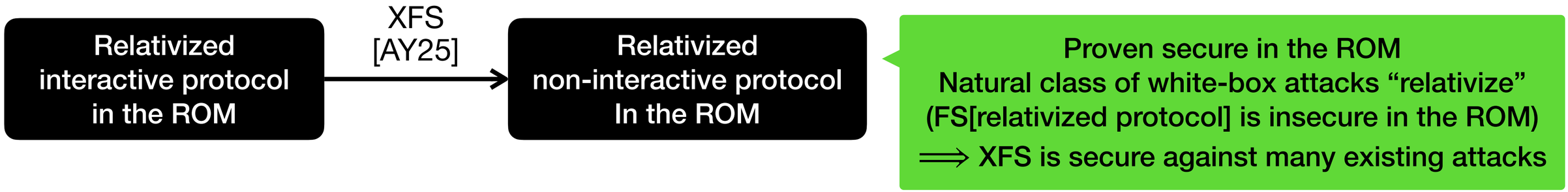




Is Fiat-Shamir transformation secure in other oracle models? LDROM? AROM?

Insights into Fiat-Shamir





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Thank you!