Protecting Obfuscation Against Arithmetic Attacks

Mor Weiss

Based on joint work with Eric Miles and Amit Sahai

CRYPTO 2015

August 16-20, 2015

DATE

Santa Barbara, CA, USA

LOCATION

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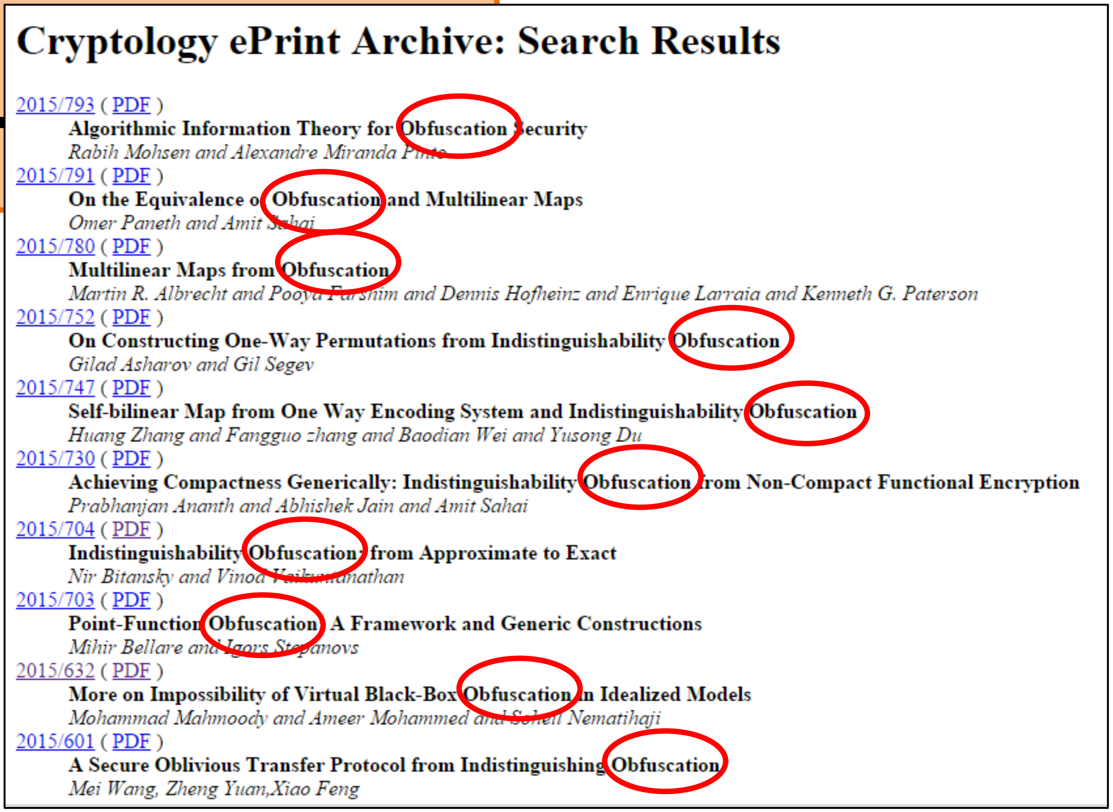
Hey!
What's new on earth?

Hey!
What's
ear



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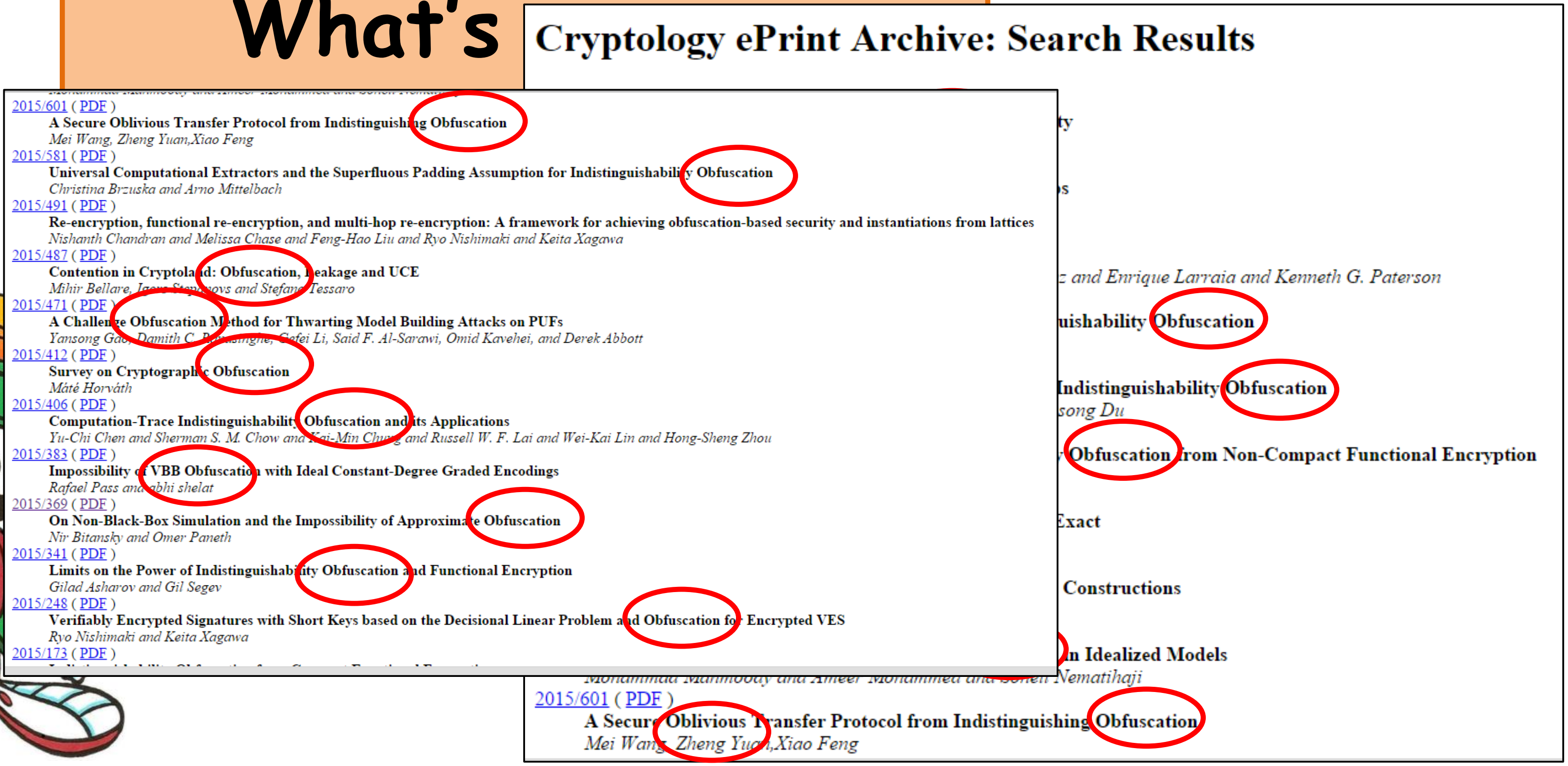

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uishability Obfuscation

Indistinguishability Obfuscation
song Du

Obfuscation from Non-Compact Functional Encryption

Exact

Constructions

n Idealized Models
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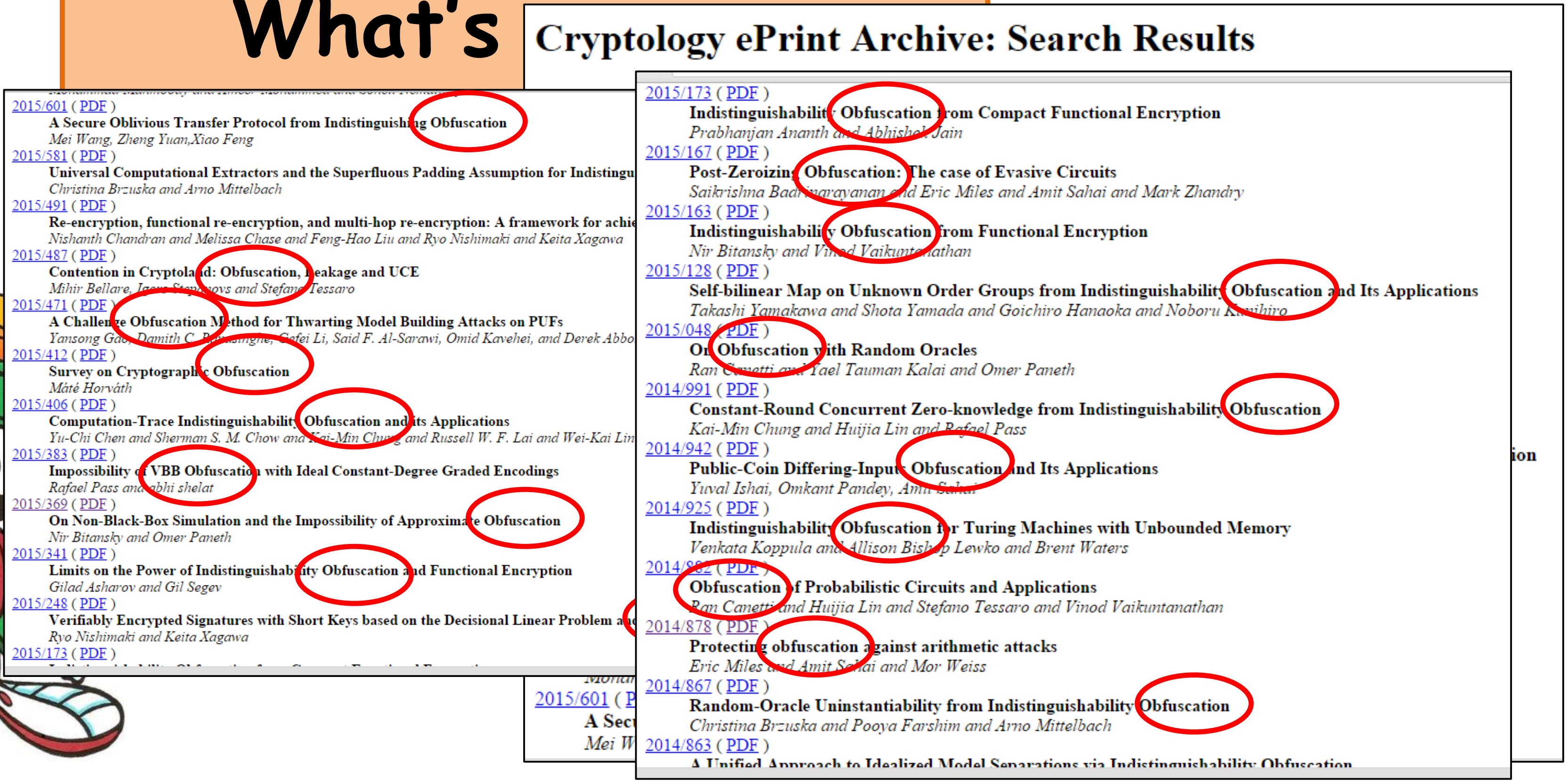

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A Sec
Mei W

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Hey!
What's new on
earth?

In one word:

Obfuscation!

signatures

Functional encryption

NIZK

Deniable encryption

KEM

OT

Obfuscation*

*Adapted from Amit's slides

STOP

Is it even secure?

candidate obfuscators

multilinear maps

*Adapted from Amit's slides

are these even secure?

Yes!

are these even secure?

Yes!

…assuming multilinear maps are

are these even secure?

Yes!

…assuming multilinear maps are

Multilinear Maps

[GGH13,CLT13
GGH15,CLT15]

Ideal Multilinear Maps

[BR13,BR14
BGKPS14,AGIS14
AB15]

Multilinear Maps

Ideal Multilinear Maps

Multilinear Maps

Add
Multiply
Is zero?

Ideal Multilinear Maps

Multilinear Maps

Add
Multiply
Is zero?

Valid ops

Ideal Multilinear Maps

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Valid ops

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Invalid Is zero?

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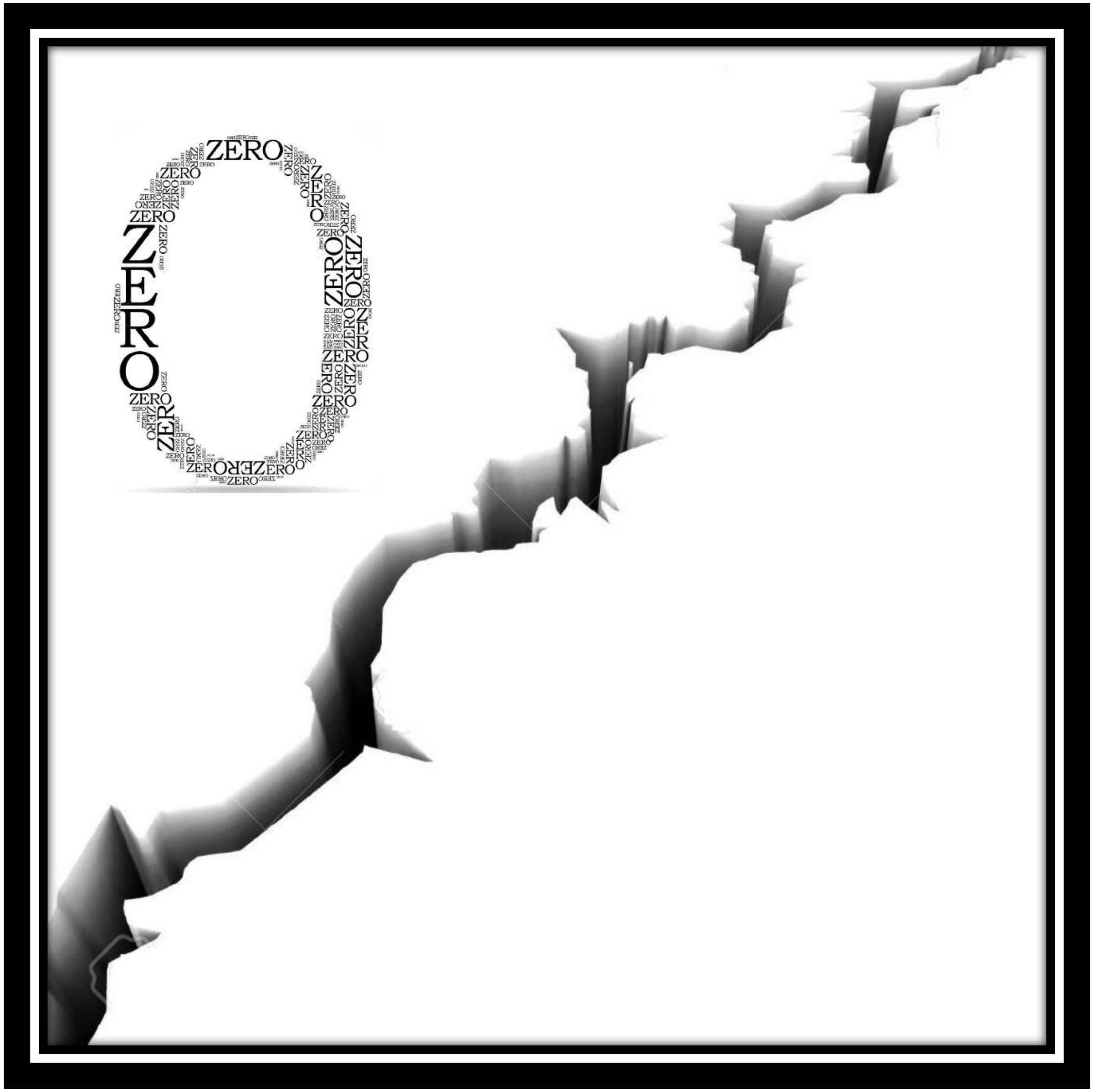
Valid ops

Invalid ops


ZERO

Ideal Multilinear Maps

Add
Multiply
Is zero?

Valid ops

Multilinear Maps

Add
Multiply
Is zero?

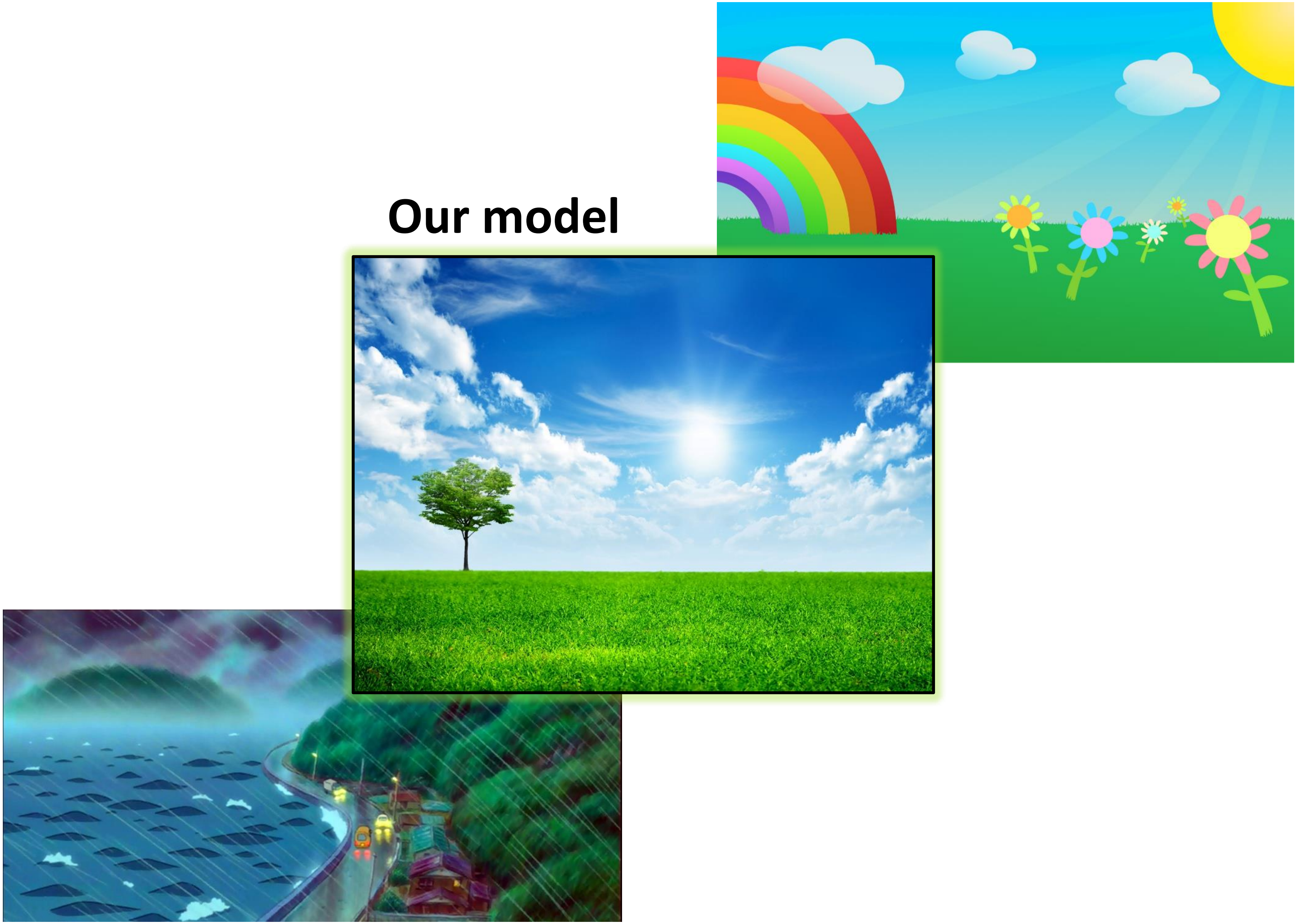
Valid ops

Invalid ops

Ideal Multilinear Maps

Multilinear Maps

Our model



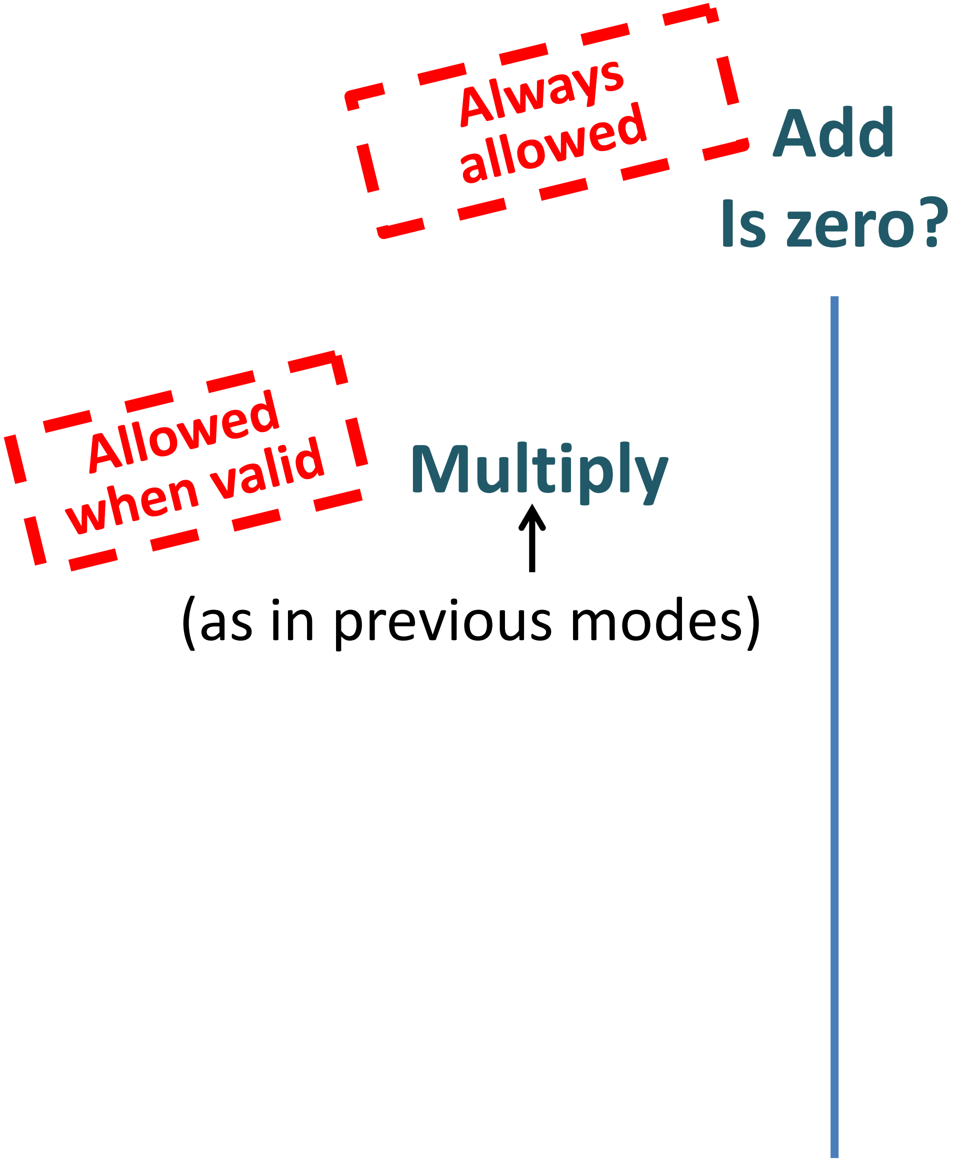
Our model

Always allowed

Add

Is zero?

Our model



Always allowed

Add

Is zero?

Allowed when valid

Multiply

↑

(as in previous modes)

Our model

Always allowed

Add

Is zero?

Allowed when valid

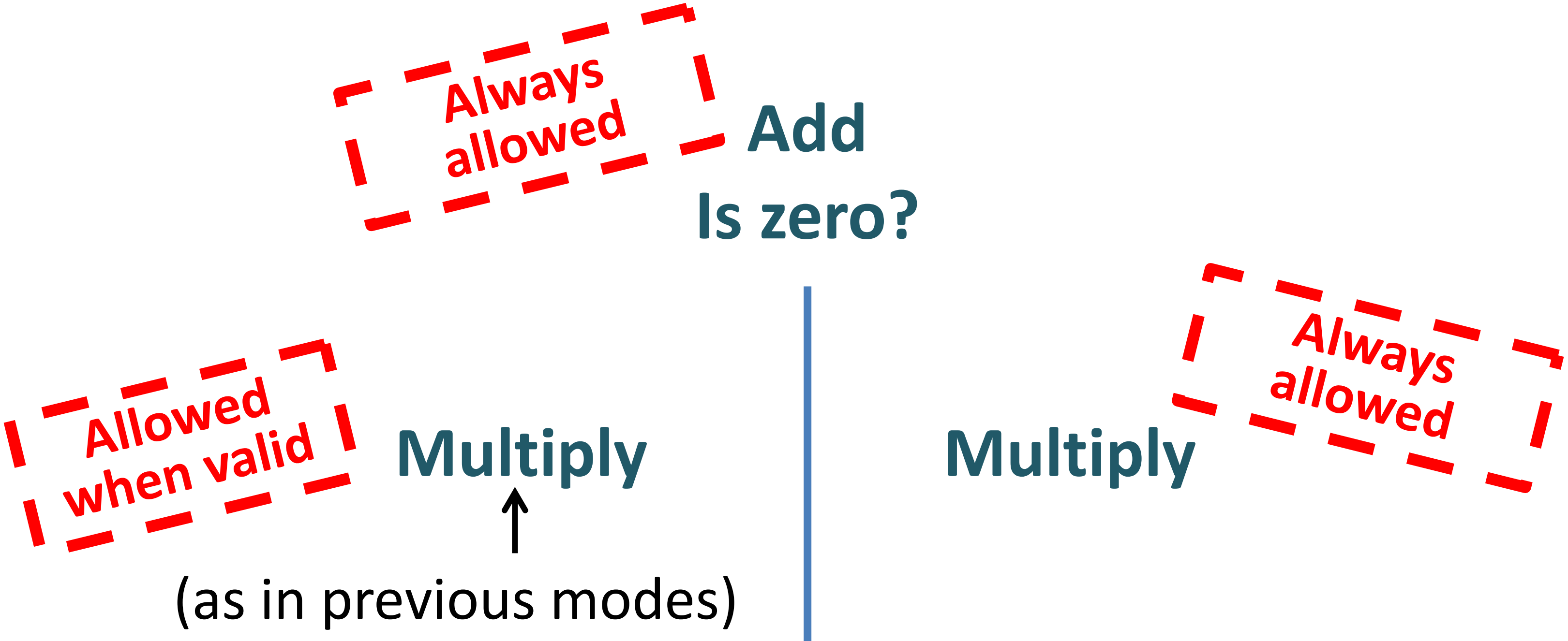
Multiply

↑

(as in previous modes)

Thm: general-purpose VBB obfuscation exists

Our model



Always allowed

Add

Is zero?

Allowed when valid

Multiply

(as in previous modes)

Multiply

Always allowed

Thm:

general-purpose VBB obfuscation exists

Our model

Always allowed

Add

Is zero?

Allowed when valid

Multiply

↑

(as in previous modes)

Thm:
general-purpose VBB obfuscation exists

Always allowed

Multiply

Thm:
Existence of general-purpose VBB obfuscation related to "algebraic P vs. NP" question

https://eprint.iacr.org/2014/878