

Digital Logic Design + Computer Architecture

Sayandeep Saha

**Assistant Professor
Department of Computer
Science and Engineering
Indian Institute of Technology
Bombay**



Introduction

Course Website

<https://cs230-iitb.github.io/autumn-2026/>

Who is talking??

- Sayandeep Saha (<https://www.cse.iitb.ac.in/~sayandeepsaha/>)
- Research Interests: Security and Cryptography
- Research Group: SHArC (<https://sharciitb.github.io/>)
- Office Hours: Monday 11:40 am — 12:10 am after the class/ Through prior appointment via mail

I am a Computer Scientist...

CS230 Deep Learning

Deep Learning is one of the most highly sought after skills in AI. In this course, you will learn the foundations of Deep Learning, understand how to build neural networks, and learn how to lead successful machine learning projects. You will learn about Convolutional networks, RNNs, LSTM, Adam, Dropout, BatchNorm, Xavier/He initialization, and more.

[Syllabus](#)[Ed \(link via Canvas\)](#)[Lecture videos \(Canvas\)](#)[Lecture videos \(Fall 2018\)](#)

Instructors



Andrew Ng

Instructor

Time and Location

Wednesday 9:30AM-11:20AM

Zoom

Sorry Guys... But this is also about...

- Machine and Learning...Better to say “learning about machines...”

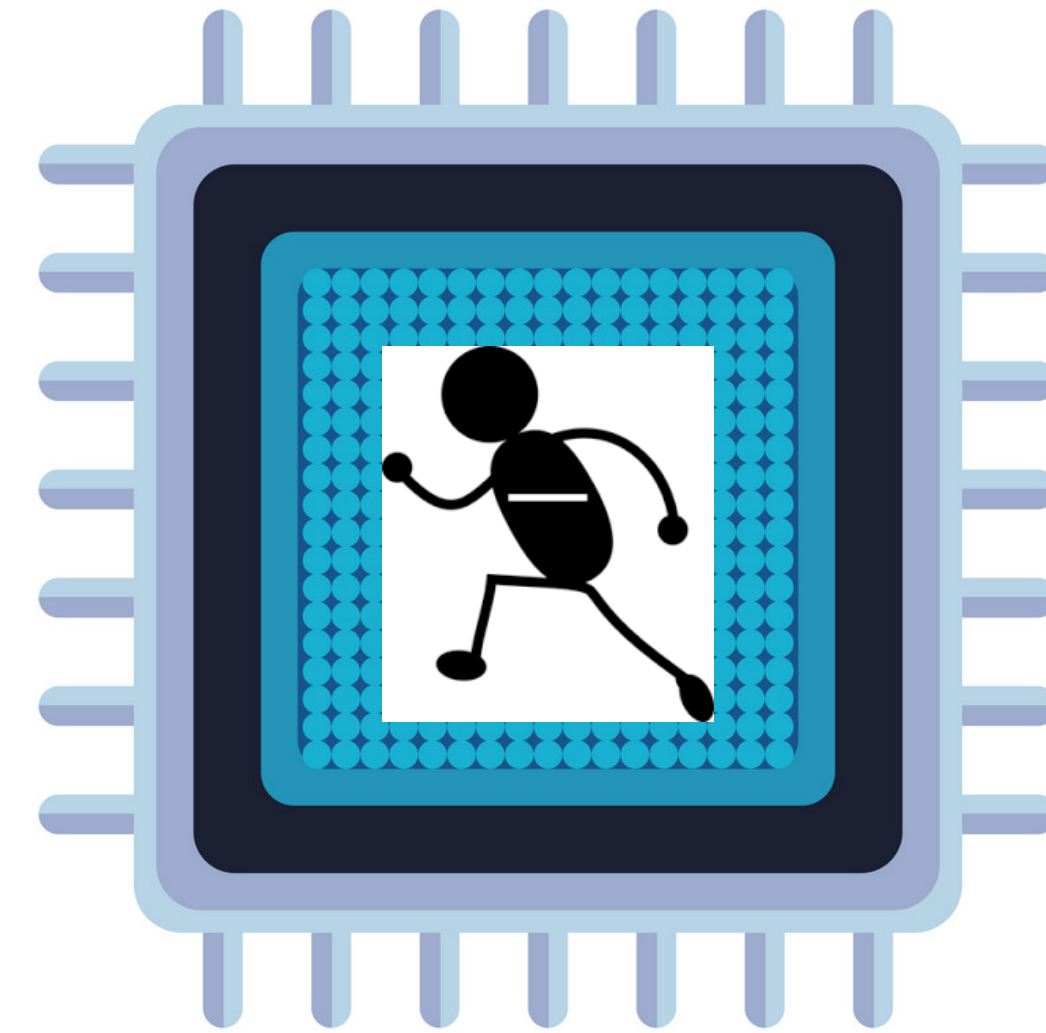


How is it Related to “Machine Learning”?

- **Ever thought about where your tensorflow/pytorch runs?**
- Machine Learning
 - Concepts were there since 1980's
 - Then why such buzz in 2026??
- Those days we didn't have such powerful machines to train our models

Why should I bother about chips??

- It is Electronics... :(
- Indeed it is....But then...



VectorStock®

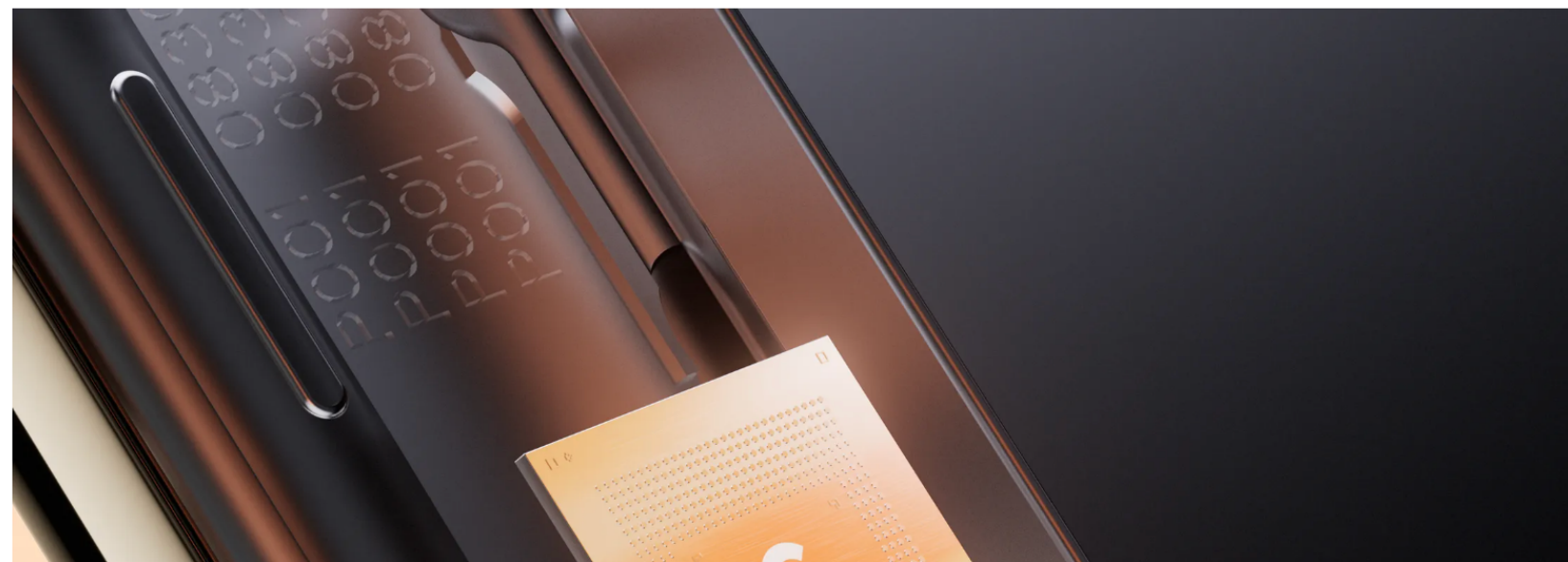
VectorStock.com/25043592

Why should I bother about chips??

- It is Electronics... :(
- Indeed it is....But then everyone wants their own processor, why???

Google's Next Pixel Phone Will Be Powered by a Custom Chip

Following the industry trend of tech giants manufacturing their own processors, the company will start putting bespoke silicon in its mobile hardware.



News / [Technology Science](#)

Meta Launches New AI Chip For Facebook, Instagram And WhatsApp

The chip, internally known as "Artemis," signifies Meta's move towards reducing reliance on Nvidia's AI chips and cutting down energy costs.

TIMES NOW Authored by: TN Tech Desk | Updated Apr 11, 2024, 09:50 IST



Why should I bother about chips??

- It is Electronics... :(
- Hardware is the new software

Google's Next Pixel Phone Will Be Powered by a Custom Chip

Following the industry trend of tech giants manufacturing their own processors, the company will start putting bespoke silicon in its mobile hardware.



News / [Technology Science](#)

Meta Launches New AI Chip For Facebook, Instagram And WhatsApp

The chip, internally known as "Artemis," signifies Meta's move towards reducing reliance on Nvidia's AI chips and cutting down energy costs.

TIMES NOW Authored by: TN Tech Desk | Updated Apr 11, 2024, 09:50 IST

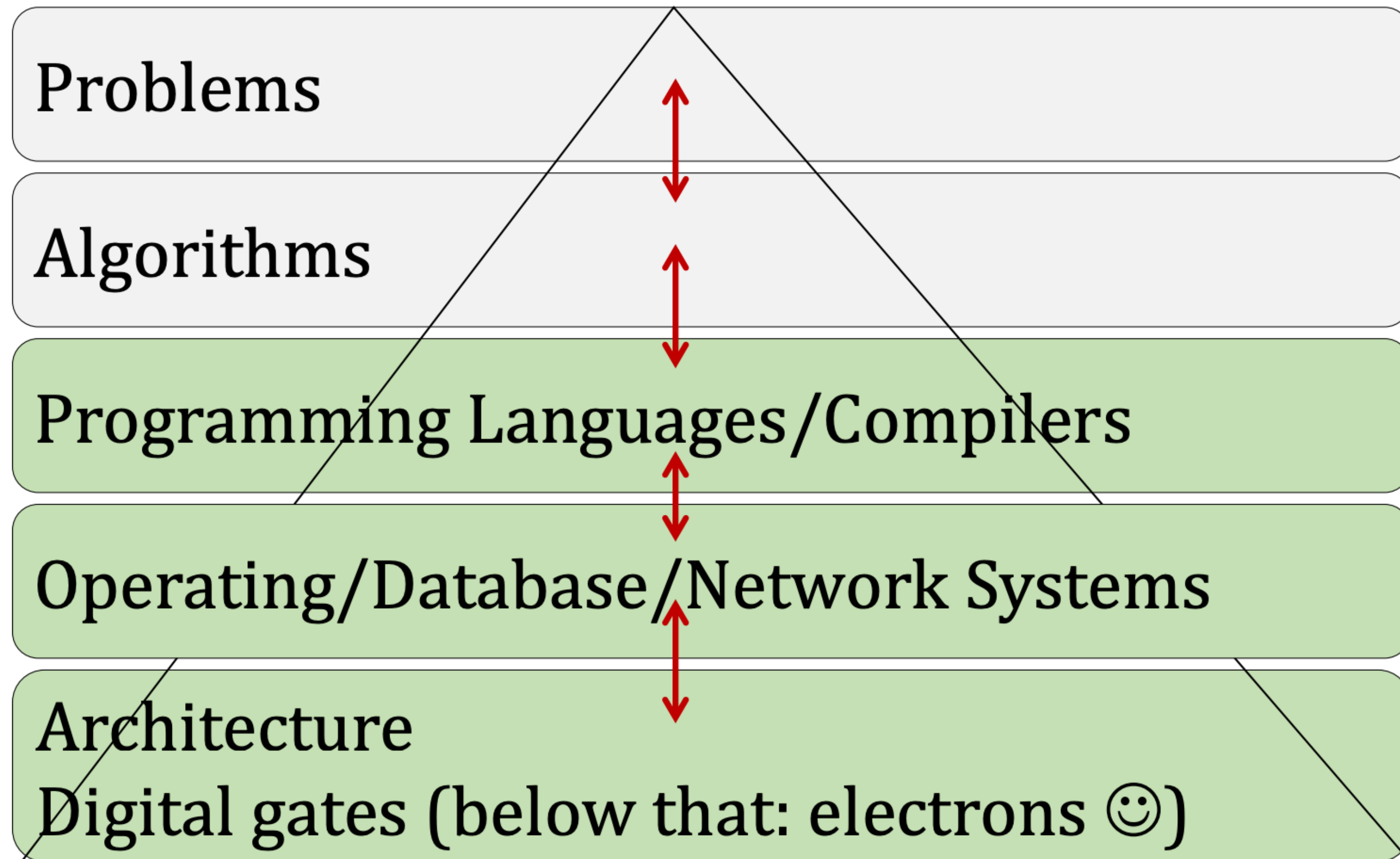


Abstraction...

- **We only use our computers...do not bother what is inside...**
 - Don't bother about unnecessary complexity...just use things as black box
 - Can you develop a game while thinking on how your electrons behave??



Abstraction...



Abstraction...

- But then, it only works when you don't care much about performance...
- Recent trend in industry...
 - Design and optimize everything...
- Breaking the abstraction barrier..
 - But that's ok, performance gives money



And Finally, Security...

- Hardware hacking is the new “cool” thing...

Crypto Keys Could Be Compromised by Intel and AMD ‘Hertzbleed’ Chip Vulnerability

🕒 2 mins

By [Martin Young](#)
15 June 2022, 07:40 GMT+0000

Updated by [Geraint Price](#)
15 June 2022, 07:40 GMT+0000

[Twitter](#) [Email](#) [LinkedIn](#)

In Brief

The attack observes power signature of any cryptographic workload.

Modern Intel Core and AMD Ryzen chips are affected.

We use cookies to improve your experience.

TRENDING: Maingear MG-1 AMD PC Build GeForce RTX 4070 Radeon RX 7900 XTX Ryzen 7 7800X3D Alienware

HOME NEWS

AMD And Intel CPUs Rocked By New Speculative Execution Attack With A Huge Performance Hit

by [Zak Killian](#) — Wednesday, July 13, 2022, 05:08 PM EDT

[in](#) [f](#) [twitter](#) [share](#) [0 Comments](#)

[BECOME A PATRON](#)



Technology

Using just a \$25 device a researcher hacked into Elon Musk's Starlink system

What will the technology mogul have to say about this?



Intel ups protection against physical chip attacks in Alder Lake

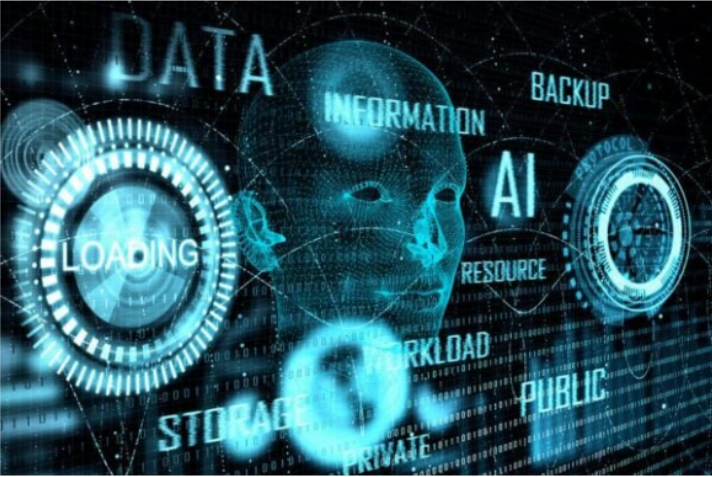
Repurposes logic originally used for spotting variations in voltage, timing in older circuits to help performance

[Dan Robinson](#) Fri 12 Aug 2022 // 15:00 UTC

BLACK HAT Intel has disclosed how it may be able to protect systems against some physical threats by repurposing circuitry originally designed to counter variations in voltage and timing that may occur as silicon circuits age.

The research was presented by Intel at the [Black Hat USA 2022](#) cybersecurity conference this week, and details logic inside the system chipset that is intended to complement existing software mitigations for fault injection attacks, the chipmaker said.

It makes use of a Tunable Replica Circuit (TRC), logic developed at Intel Labs to monitor variations such as voltage droop, temperature, and aging in circuits to improve



AI power analysis breaks post-quantum security algorithm

[Technology News](#) | February 19, 2023

By Nick Flaherty

[AUTHENTICATION & ENCRYPTION](#)

One of the key post quantum security algorithms agreed as the latest standard has been broken by Swedish researchers

And Finally, Security...

- Hardware hacking is the new “cool” thing...
- We can just hack a hardware by writing a piece of code

Crypto Keys Could Be Compromised by Intel and AMD ‘Hertzbleed’ Chip Vulnerability

🕒 2 mins

By [Martin Young](#) Updated by [Geraint Price](#)
15 June 2022, 07:40 GMT+0000 15 June 2022, 07:40 GMT+0000

[Twitter](#) [Email](#) [LinkedIn](#)

In Brief

The attack observes power signature of any cryptographic workload.

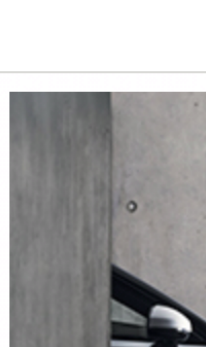
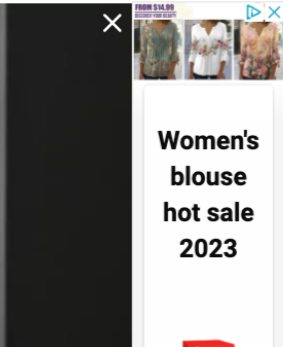
Modern Intel Core and AMD Ryzen chips are affected.

We use cookies to improve your experience.

Using just a \$25 device a researcher hacked into Elon Musk's Starlink system

Technology

What will the technology mogul have to say about this?



TRENDING: [Maingear MG-1 AMD PC Build](#) [GeForce RTX 4070](#) [Radeon RX 7900 XTX](#) [Ryzen 7 7800X3D](#) [Alienw](#)

[HOME](#) [NEWS](#)

AMD And Intel CPUs Rocked By New Speculative Execution Attack With A Huge Performance Hit

by [Zak Killian](#) — Wednesday, July 13, 2022, 05:08 PM EDT

[in](#) [f](#) [t](#) [<](#) 0 Comments

[BECOME A PATRON](#)



Intel ups protection against physical chip attacks in Alder Lake

Repurposes logic originally used for spotting variations in voltage, timing in older circuits to help performance

[Dan Robinson](#)

Fri 12 Aug 2022 // 15:00 UTC

BLACK HAT Intel has disclosed how it may be able to protect systems against some physical threats by repurposing circuitry originally designed to counter variations in voltage and timing that may occur as silicon circuits age.

The research was presented by Intel at the [Black Hat USA 2022](#) cybersecurity conference this week, and details logic inside the system chipset that is intended to complement existing software mitigations for fault injection attacks, the chipmaker said.

It makes use of a Tunable Replica Circuit (TRC), logic developed at Intel Labs to monitor variations such as voltage droop, temperature, and aging in circuits to improve



AI power analysis breaks post-quantum security algorithm

[Technology News](#) | February 19, 2023

By Nick Flaherty

[AUTHENTICATION & ENCRYPTION](#)

One of the key post quantum security algorithms agreed as the latest standard has been broken by Swedish researchers

And Finally, Security...

- Hardware hacking is the new “cool” thing...
- We can just hack a hardware by writing a piece of code

Crypto Keys Could Be Compromised by Intel and AMD ‘Hertzbleed’ Chip Vulnerability

🕒 2 mins

By [Martin Young](#)

Updated by [Geraint Price](#)

15 June 2022, 07:40 GMT+0000

15 June 2022, 07:40 GMT+0000

🐦

✉

in

In Brief

The attack observes power signature of any cryptographic workload.

Modern Intel Core and AMD Ryzen chips are affected.

We use cookies to improve your experience.

TRENDING: [Maingear MG-1 AMD PC Build](#) [GeForce RTX 4070](#) [Radeon RX 7900 XTX](#) [Ryzen 7 7800X3D](#) [Alienw](#)

HOME

NEWS

AMD And Intel CPUs Rocked By New Speculative Execution Attack With A Huge Performance Hit

by [Zak Killian](#) — Wednesday, July 13, 2022, 05:08 PM EDT

in

f

🐦

🔗

💬 0 Comments

BECOME A PATRON

Technology

Using just a \$25 device a researcher hacked into Elon Musk's Starlink system

What will the technology mogul have to say about this?

×

Intel ups protection against physical chip attacks in Alder Lake

Repurposes logic originally used for spotting variations in voltage, timing in older circuits to help performance

[Dan Robinson](#)

Fri 12 Aug 2022 // 15:00 UTC

BLACK HAT Intel has disclosed how it may be able to protect systems against some physical threats by repurposing circuitry originally designed to counter variations in voltage and timing that may occur as silicon circuits age.

The research was presented by Intel at the [Black Hat USA 2022](#) cybersecurity conference this week, and details logic inside the system chipset that is intended to complement existing software mitigations for fault injection attacks, the chipmaker said.

It makes use of a Tunable Replica Circuit (TRC), logic developed at Intel Labs to monitor variations such as voltage droop, temperature, and aging in circuits to improve



AI power analysis breaks post-quantum security algorithm

[Technology News](#) | February 19, 2023

By Nick Flaherty

AUTHENTICATION & ENCRYPTION

One of the key post quantum security algorithms agreed as the latest standard has been broken by Swedish researchers

Let's Pause

- **This is a foundational course for entering...**
 - The world on modern computer architecture, AI accelerators...
 - **Byproduct:** It will make you a better coder for sure...
 - Modern computer security
 - And many more...
- Let's now talk a bit on the course logistics...

Logestics

Plan Ahead...

Mid Semester Exam	30%
End Semester Exam	40%
Quiz (two)	30% (combined)
Tutorials	Not Graded
Home Assignments	Not Graded

Plan Ahead...

Tutorial I (tentative)	2nd/3rd week of Aug
Tutorial II (tentative)	1st week of Sept
Quiz I (tentative)	1st week of Sept
Mid-Sem	3rd week of Sept
Tutorial III (tentative)	2nd/3rd week of Oct
Tutorial IV (tentative)	Last week oct/1st week Nov
Quiz II (tentative)	Last week oct/1st week Nov
Last Class	5th Nov

The tutorial and quiz dates will be **solely decided by the instructor** and will be announced one week before.

Do not ask for any adjustments in these dates. Anyone asking will lose 2 marks

Attendance...

No attendance for class

Attendance is Mandatory for Tutorials and Quizzes

Either come or not come. Do not enter class if you more than
5 mins late

Slides...

Slides will not contain everything

Attend lectures, Take class notes.

Pause me and ask **Questions**

What I Expect...

Please ask questions...

I will be more than happy if you are interested to do some advanced project — not as a part of these course though

CS231

No lab on the first week

Will be taken by Professor Biswa

Academic Dishonesty

<https://www.iitb.ac.in/newacadhome/procedures201521July.pdf>

<https://www.iitb.ac.in/newacadhome/punishments201521July.pdf>

Piazza

All notifications on Piazza only

https://piazza.com/iit_bombay/summer2026/cs230

Access Code: cs230

Final grades will be on Moodle

TA Interaction

There will be TAs

Your TA will be your first point of contact

How to Reach Me?

- Mailto: sayandeepsaha@cse.iitb.ac.in
 - Sub: [CS230]: <your sub>
- Always CC to the head TA.
- Please don't mail to sayandeepsaha@iitb.ac.in OR sayandeep@cse.iitb.ac.in
- Please do not spam — 5 marks will be deducted

TAs

To be announced this week...

Absence in Exams

- Absence in Exams:
 - Mail with proper provable justification (e.g., institute-approved documents)
 - Mail by CCing the TA
 - Mail ASAP (preferably within a day of exam)

Crib Sessions During Exam...

Handle it carefully...

Do not mail, everything should be through the crib forms etc..

Lecture Formats

- Traditional — no flipped classroom
- Interactive
- Stop and ask me if you don't get it.
- Do not assume that you will get all from slides — **slides are just summaries.**
- You take care of your study, we shall take care of your grades

Finally...

No open screen in my class. You should leave if you have urgent calls or WhatsApp messages to reply



Thank you