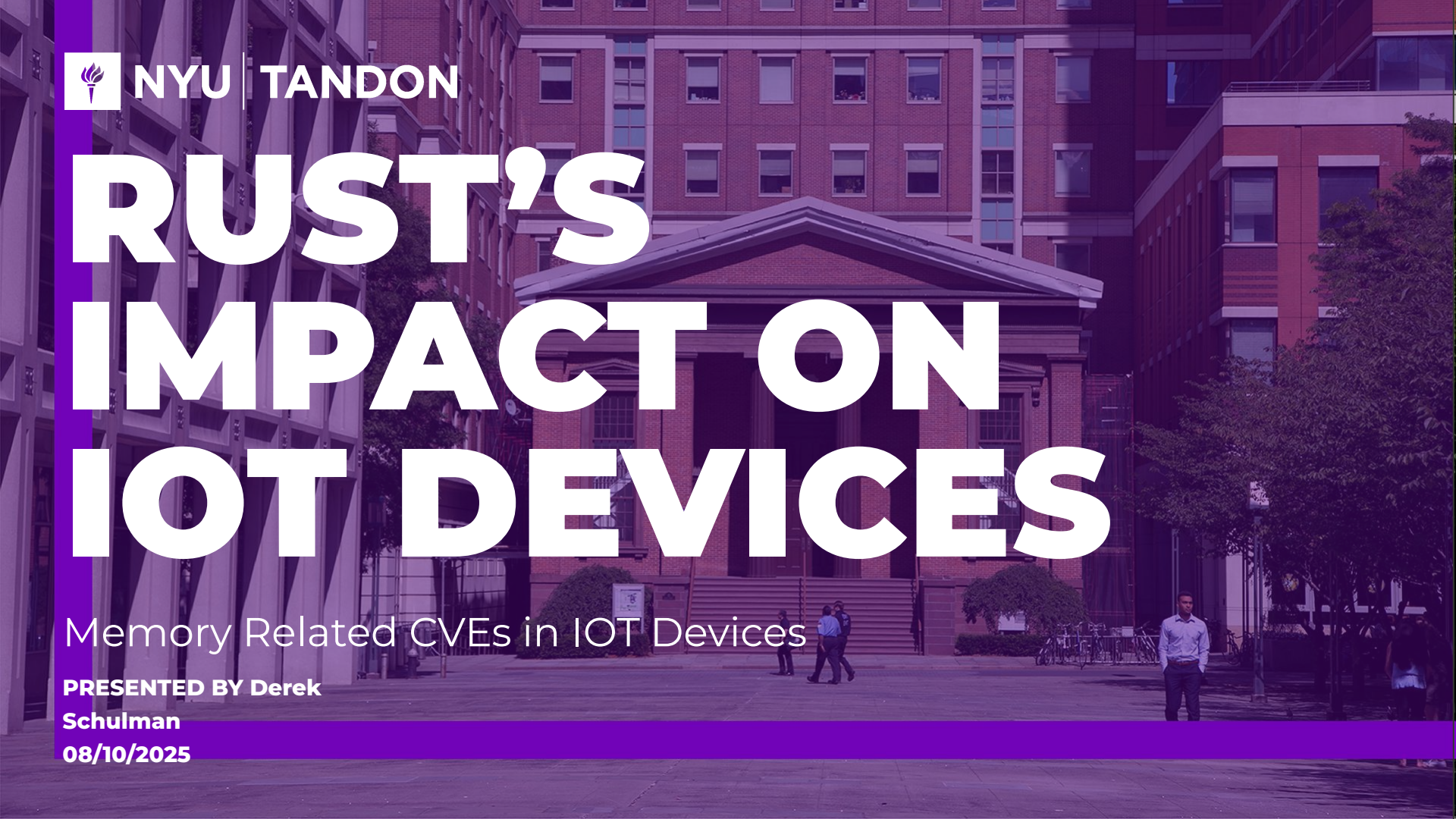

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RUST'S IMPACT ON IOT DEVICES

Memory Related CVEs in IOT Devices

PRESENTED BY Derek Schulman

08/10/2025

PROBLEM & MOTIVATION

Why does this matter

01.

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THERE ARE 21.5 BILLION INTERNET OF THINGS DEVICES IN THE WORLD.

HYPOTHESIS

What are we investigating

02.

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MEMORY CVES IN IOT

IOT devices that have micro-kernels/firmware written in RUST (or other modern memory safe languages) will have less buffer overflows or other memory management vulnerabilities when compared to micro-kernels/firmware written in more traditional languages like C/C++.

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RELATED RESEARCH

Who else is looking

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METHODOLOGY

How do we investigate

04.

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GETTING DATA

Data was pulled from the NIST NVD for 2020 through the end of July 2025 via their API.

Disclaimer: "This product uses data from the NVD API but is not endorsed or certified by the NVD."

SORTING DATA

Using Google Colab w/ Python libraries to sort through the CVEs

```
[ ] ##########################################################################
    # Filter the cleaned_data  for IOT related CVEs using the helper function
    ##########################################################################


    # Define a list of keywords related to IoT (can be expanded)
    iot_keywords = ["IoT", "Internet of Things", "smart home", "connected device", "embedded device", "wireless sensor", "industrial IoT", "IIoT"]

    # Function
    filtered_data = filter_vulnerabilities_by_keyword(cleaned_data, iot_keywords)

    # Output
    print_entries_total_and_per_year(filtered_data)
```

```
Number of entries per year:
Year 2020: 661 entries
Year 2021: 726 entries
Year 2022: 544 entries
Year 2023: 79 entries
Year 2024: 121 entries
Year 2025: 71 entries

Total number of entries: 2202
```

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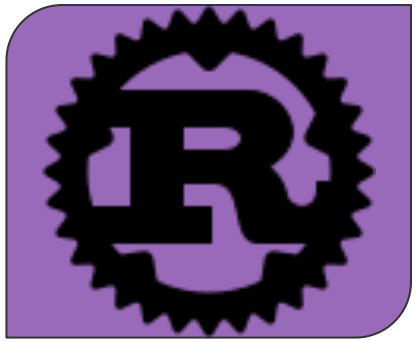
COMPARING DATA

Look to to measure RUST adoption by looking at Google searches for RUST tutorials



Worldwide, Aug 2025 :

Rank	Change	Language	Share	1-year trend
1		Python	30.5 %	+0.9 %
2		Java	15.54 %	+0.2 %
3	↑↑	C/C++	8.3 %	+1.8 %
4	↓	JavaScript	7.32 %	-1.0 %
5	↓	C#	5.32 %	-1.3 %
6		R	5.19 %	+0.5 %
7	↑↑↑↑	Objective-C	3.57 %	+1.2 %
8	↓	PHP	3.49 %	-0.8 %
9	↑	Rust	2.63 %	-0.0 %
10	↓↓	TypeScript	2.48 %	-0.5 %

RESULTS

What we saw

05.

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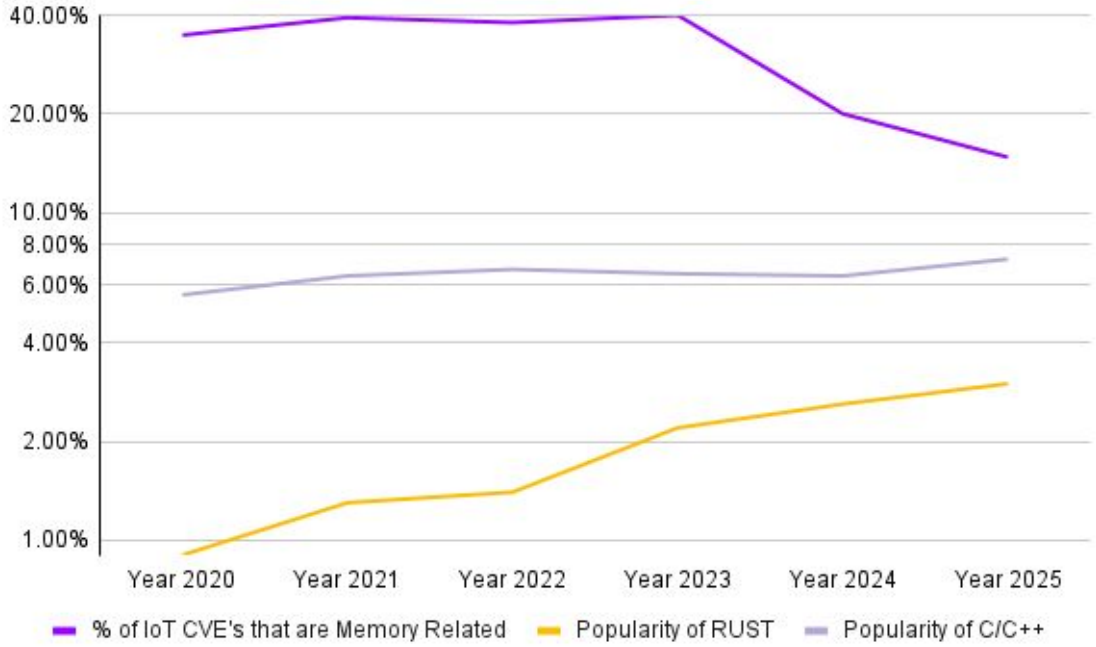
A CLEAR RELATIONSHIP

The ratio of CVEs created for IOT devices with Memory Vulnerabilities starts to decline in 2023. This drop is lagging by a year to a spike in the PYPL index for Rust. This could be due to an increased adoption of Rust in the creation of IOT Firmware. Also of note, is the relative flatness of the C/C++ index values.



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NEXT STEPS

The Future

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WHAT WOULD WE DO BETTER OR DIFFERENT

We could devise a better way to measure the use of Rust in IOT firmware.

Options would include survey study of manufactures of these devices. We could expand upon the work of PYPL and collect data directly from Google Trends. We could reverse engineer or other analysis techniques of a sample of firmwares.

Improvements to Keyword selection would also be important.

We would also want account for newness of devices.

Fin.