



MELTDOWN



- ▶ **Result:** Programs can read memory it should not

- ▶ **Affects:** All modern CPU/OS

- ▶ **Vector:** Uses *out of order execution* to read forbidden memory and *cache timing* as side channel to exfiltrate data

- ▶ **How bad:** Bad

- ▶ **Fixes:** Needs changes in CPU and/or OS patches. Modest (X%) to severe (XX%) performance impact, higher on older CPU. Performance impact varies and depends on CPU and workload type.

SPECTRE

- ▶ **Result:** Programs can read all memory
- ▶ **How bad:** Very bad
- ▶ **Fixes:** Needs changes in CPU and/or changes in programs. Performance impact varies and depends on CPU and workload type.
- ▶ **Affects:** All modern CPU/OS
- ▶ **Vector:** Uses *speculative execution* to read forbidden memory and *cache timing* to exfiltrate data



MELTDOWN



- ▶ **Result:** Programs can read memory it should not
- ▶ **Affects:** All modern CPU/OS
- ▶ **Vector:** Uses *out of order execution* to read forbidden memory and *cache timing* as side channel to exfiltrate data
- ▶ **How bad:** Bad
- ▶ **Fixes:** Needs changes in CPU and/or OS patches. Modest (X%) to severe (XX%) performance impact, higher on older CPU. Performance impact varies and depends on CPU and workload type.