When Cryptography Is Not Enough: Practical Attacks on Consumer UWB Devices



UWB-based ranging and distance bounding are now widely deployed in consumer ecosystems for car access, device finding, and proximity-based authentication. Recent top-tier work has shown that implementation-level choices, analogue front-end behaviour, and receiver validation logic can enable distance reduction and spoofing-style attacks even when the underlying cryptographic mechanism appears sound. The research landscape is now fragmented: attacks differ in their prerequisites and the hardware assumptions they exploit, and it is unclear which still apply to current generations of devices and which have been silently fixed.

This project will produce a rigorous systematisation of knowledge (SoK) of UWB and distance bounding attacks, grounded in empirical validation on real devices where possible. The intern will consolidate recent attacks and defence proposals, build a taxonomy organised by attacker capability, signal manipulation strategy, and protocol layer, and then reproduce or retest a selected subset of attacks on current consumer platforms. A key goal is to translate academic attacks into a practical toolkit and a mitigation checklist that vendors and protocol designers can actually use.

During the internship, the intern will read and aid in summarising the state of the art, extracting common assumptions and failure modes, and designing an experimental plan to test representative devices or developer kits. The work will also include mitigation analysis. This can range from protocol-level mitigations, through receiver-side validation changes, to system-level defences such as sensor fusion or rate limiting. The output should clearly separate what can be mitigated by cryptographic protocol design from what fundamentally depends on receiver implementation and analogue signal processing.

Practicalities

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Nature of the work:	10% literature, 20% theoretical work, 70% software
Number of students:	1

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