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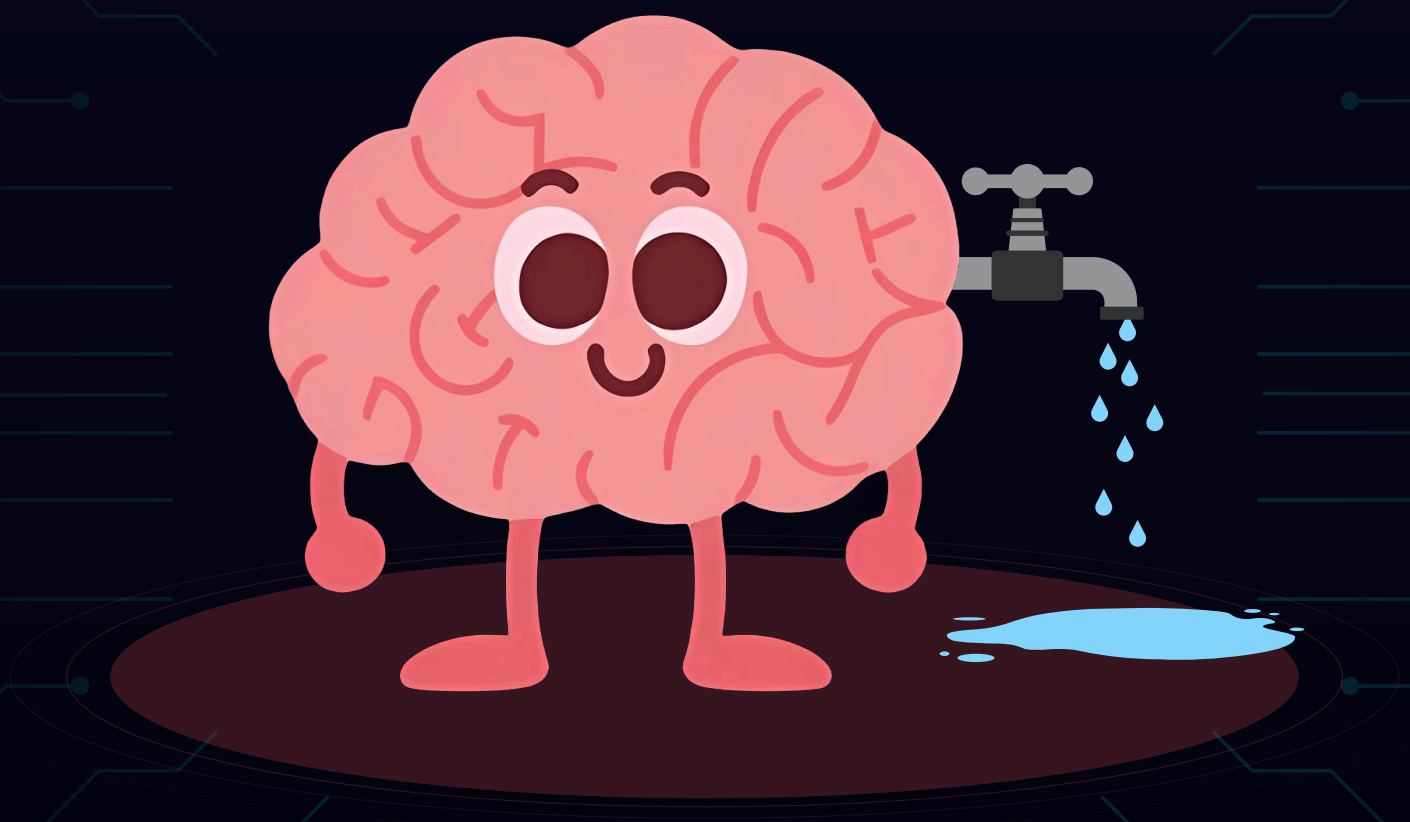
1 min read



Memory Leaks in iOS

— Quick Fix Guide —

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What is a

Memory Leak?

👉 A **memory leak** occurs when an app retains memory that is no longer needed. This can result in:

- Increased RAM usage
- Poor performance
- App crashes

👉 iOS uses **ARC** to manage memory, but developers must still:

- Write code carefully
- Avoid retain cycles and other memory management pitfalls

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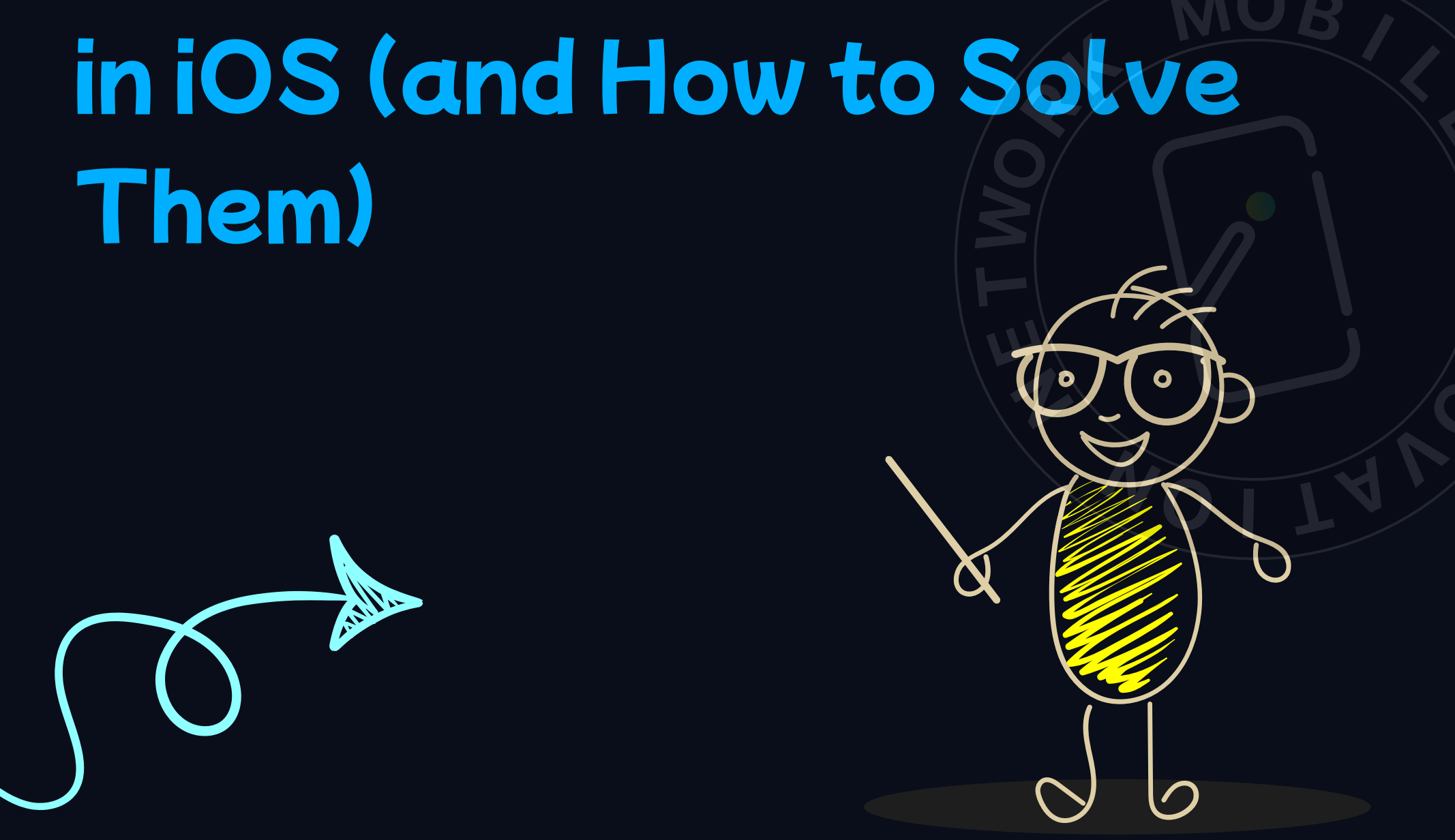
Common Causes of

Memory Leaks in iOS (and How to Solve Them)



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1. Retain Cycles in Closures

Closures can strongly capture self, causing retain cycles.

❌ PROBLEM

```
class HomeViewController: UIViewController {

    var onDataLoaded: (() -> Void)?

    override func viewDidLoad() {
        super.viewDidLoad()
        // ❌ Leak: Closure strongly captures `self`
        loadData {
            self.updateUI()
        }
    }

    deinit { print("HomeViewController deallocated") }
}
```

✅ How to Fix

```
loadData { [weak self] in
    self?.updateUI() // ✅ Weak capture
}
```

- Use [weak self] or [unowned self]

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2. Delegates Not Marked as Weak

Properties are strong by default. Forgetting weak on delegates can cause retain cycles.

❌ PROBLEM

```
protocol DataManagerDelegate: AnyObject { /* ... */ }

class DataManager {
    var delegate: DataManagerDelegate? // ❌ Should be `weak`!
}

class ViewController: UIViewController, DataManagerDelegate {
    let dataManager = DataManager()

    override func viewDidLoad() {
        super.viewDidLoad()
        dataManager.delegate = self // Retain cycle!
    }
}
```

✅ How to Fix

```
class DataManager {
    weak var delegate: DataManagerDelegate? // ✅
}
```

- Always mark delegates as weak

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3. Timers Not Invalidated

If you use a Timer and don’t invalidate it or break the reference, it will keep firing and retain its target.

❌ PROBLEM

```
timer = Timer.scheduledTimer(withTimeInterval: 1.0, repeats: true) { _ in
    self.updateCountdown()
}
```

✅ How to Fix

```
timer = Timer.scheduledTimer(withTimeInterval: 1.0, repeats: true) { [weak self] _ in
    self?.updateCountdown()
}
```

- Also, always call:

  timer.invalidate()

- when the timer is no longer needed (e.g., in deinit or viewWillDisappear).

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4. Observers Not Removed

If you add an observer to NotificationCenter and don’t remove it, the system will retain your object

❌ PROBLEM

```
class ProfileController: UIViewController {
    override func viewDidLoad() {
        super.viewDidLoad()
        // ❌ Observer not removed
        NotificationCenter.default.addObserver(
            self,
            selector: #selector(handleUpdate),
            name: .profileUpdated,
            object: nil
        )
    }

    // Missing removal in `deinit`
}
```

✅ How to Fix

```
deinit {
    NotificationCenter.default.removeObserver(self)
}
```

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5. Strong Self Captured in Async Tasks

Async APIs like DispatchQueue, Combine, or async/await can capture self strongly.

❌ PROBLEM

```
DispatchQueue.global().async {
    self.doWork()
}
```

✅ How to Fix

```
DispatchQueue.global().async { [weak self] in
    self?.doWork()
}

Same for Combine:

publisher
    .sink { [weak self] value in
        self?.handle(value)
    }
```

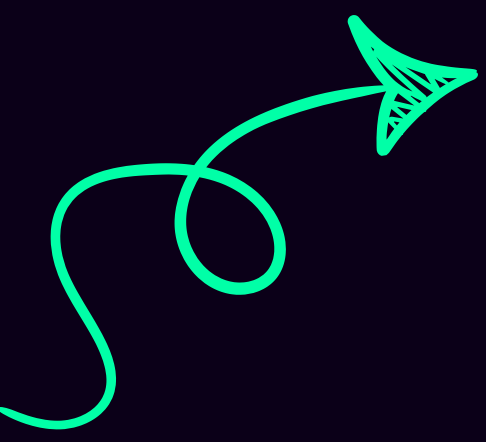
🛠️ Tools to Detect Leaks

👉 Xcode Memory Graph Debugger

- Analyze retained objects in live app

👉 Instruments (Leaks + Allocations)

- Profile memory over time



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Best Practices

👉 Use **weak/unowned** for closures, delegates, and reference cycles.

👉 **Avoid lazy var** closures capturing self without [weak self].

👉 **Leverage deinit:** Add print statements to confirm deallocation.

👉 **Test Navigation:** Push/pop view controllers repeatedly to catch leaks.

📌 Final Thoughts

👉 Memory leaks in iOS may not cause immediate crashes.

👉 They silently degrade app performance over time.

👉 Understanding how ARC works is essential.

👉 Be aware of common traps like:

- Retain cycles
- Strongly captured closures
- Forgotten observers

👉 This knowledge helps build faster and more reliable apps.

Thank you for your Attention!