# Counters & Registers

Electrical Engineering

The sequential building blocks, sorted by clocking and by what they hold.

*Same flip-flops, arranged for counting or for storage.*

## Counters

- **Ripple: each stage clocks the next one**
- **Synchronous: one clock reaches every stage**
- **Modulo-n: decode the count and reset**
- **Up or down: direction from a control input**
- **Ring and Johnson: shift-based sequences**

## Registers

- **Parallel load: every bit on one edge**
- **Shift: serial in, serial out**
- **Serial in, parallel out deserialises**
- **Universal: load, shift either way, or hold**
- **A shift register also divides frequency**

Ripple counter outputs are skewed by accumulated delay, so decoding one produces glitches a synchronous counter would not.