Computer Architecture Cheatsheet

- **Trends in Computer Architecture**
  - Major components: CPU, memory, System bus, IO bus, storage, IO peripherals
  - Exponential growth of transistor count → Moore's Law
  - Processor-memory speed gap → caches
  - "Power wall"/"multi-core crisis"
- **C Programming**
  - Basic C syntax: function and variable declarations, control structures (if/else, switch, while, do/while, for), structures
  - Arrays and pointers: arrays are objects in memory, array variables are always associated with a specific array
  - Memory management: address vs value, using unary & and *, malloc and free
  - C strings: trailing null terminator, `strcpy()`, `strlen()`, `strcmp()`, `strcat()`, `memcpy()`, `memmove()`
  - `printf`, `fprintf`, `sprintf`, `scanf`, `fscanf`, `sscanf`, `fopen`, `fclose`
- **Data Representation**
  - Binary (unsigned) integers: fixed-width arithmetic, sign-magnitude, 1's complement, 2's complement
  - Hexadecimal and octal
  - IEEE floating point: sign bit, exponent bits, significant (fractional) bits, exponent bias, special exponent values
- **Assembly**
  - High-level ideas: fetch/execute cycle, opcode and operands, operation types (mov, arithmetic and logic, control)
  - IA32 / X86 assembly (AT&T / GAS style): 2-argument form for add, sub, etc., operand types (byte/word/double word), register names, mov instruction, operands (immediate, absolute, direct, indirect)
  - lea, push, pop, call, ret