CAAM 420 Lecture Notes

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Announcements

- Week 5 Notes are posted
- Version of assignment posted with hints on subtleties of IEEE floating point
  - the mantissa is based on a normalized value causing a hidden bit see assignment for more detail.
  - subtleties on exponent bits, see assignment for more detial.

Stack and Heap

- Stack
  - Small amount of memory
  - Finite size
- Heap
  - Size is as big as RAM minus memory of Stack
  - dynamic size from running processes
- **Side Note:** `scanf` is an easy way to pause a program
- Stack Overflow
  - Grab an array of some length `N = 1,600,000`
  - This array is too big to be saved on the stack
    - core dumped because can't store 10 million bytes (if type double)
    - Program doesn't even load
- Can allocate memory to Heap to avoid this problem (Heap is much larger)

`Malloc` and `Free`

```
type *p = (type *) malloc((number of items)*sizeof(type));
```

- `malloc` measures things in bytes
- Returns pointer to first address of memory dedicated to Heap
- Be extra careful when using pointers
- `malloc` and `free` are a pair
  - Write to addresses not allocated to program with `malloc`
  - Clear the addresses to reuse using `free`
  - overusing `free` **will not** free free space.
  - Always use (malloc) and `free` **as a pair**
- **Side Note:** Can look at all examples with meaningful names:

  ```
  ls ex*_*
  ```

  - * means any set of characters
- Memory Leak
  - Pointer only exists inside fun()
  - fun() needs to return a pointer to allow program to access, otherwise memory is leaked