Princeton University
COS 217: Introduction to Programming Systems
Common C Dynamic Memory Management Errors

Proper Sequence

```
int *pi;
...
pi = (int*)malloc(sizeof(*pi));
...
*pi = 5;
...
free(pi);
...
```

Memory Leak (alias Garbage Creation)

```
int *pi;
...
pi = (int*)malloc(sizeof(*pi));
...
*pi = 5;
...
pi = someothervalue;
...
```

Dangling Pointer (alias Dangling Reference)

```
int *pi;
...
pi = (int*)malloc(sizeof(*pi));
...
*pi = 5;
...
free(pi);
...
*pi = 6;
...
```

Dangling Pointer (Indirect)

```
int *pi1;
int *pi2;
...
pi1 = (int*)malloc(sizeof(*pi));
...
*pi1 = 5;
...
pi2 = pi1;
...
free(pi1);
...
*pi2 = 6;
...
```

Double Free

```
int *pi;
...
pi = (int*)malloc(sizeof(*pi));
...
*pi = 5;
...
free(pi);
...
free(pi);
...
```

Double Free (Indirect)

```
int *pi1;
int *pi2;
...
pi1 = (int*)malloc(sizeof(*pi));
...
*pi1 = 5;
...
pi2 = pi1;
...
free(pi1);
...
free(pi2);
...
```

Improper Reallocation

```
int *pi;
...
pi = (int*)calloc(5, sizeof(*pi));
...
realloc(pi, 10 * sizeof(*pi));
...
free(pi);
```