

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

### Double Free

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

### Double Free (Indirect)

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

### Improper Reallocation

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