C++: Class Templates

• Similar to function templates, declare with “template <class T>”

• Then the code you write has a PLACEHOLDER value called “T”. “T” is not a class. It is a dummy. It does not exist.

• This defines an INTERFACE to operate on the class object
Moiré

- Moiré Pattern in bilayers (eg Graphene, TMDs)
- Can lead to superconductivity

http://prb.aps.org/abstract/PRB/v81/i12/e125427
2D Fourier Transform

• In optics every lens does a 2D Fourier transform
• What is the Fourier transform of a pinhole?

```python
N = 64
x = np.linspace(-10, 10, N)
y = np.linspace(-10, 10, N)

R = 2
xx, yy = np.meshgrid(x, y, sparse=True)
z = (np.sqrt(xx**2 + yy**2) >= R)*1
plt.imshow(z, 'gray')
```

<matplotlib.image.AxesImage at 0xae2a4a90>
2D Fourier Transform

- Numpy 2D FFT
- Remember to use $2^N$ pixels
- Shift result to center for convenience
- Plot in log scale
- Remember: Delta Function in 1D is sine in Fourier space

```python
Fz = np.fft.fft2(z)
Fzcenter = np.fft.fftshift(Fz)
plt.imshow(np.log(1 + np.abs(Fzcenter)), 'gray')
```
Bilayer Moiré

- Hexagonal lattice
- Bilayer with one layer rotated by angle theta
- FFT shows peaks of periodic structures
- Let’s mess around with it
• Low pass filter

```python
R = 1
xx, yy = np.meshgrid(x, y, sparse=True)
lowpass = (np.sqrt(xx**2 + yy**2) <= R)*1
plt.imshow(lowpass, "gray")
```

• Take the inverse FFT

```python
filtered = np.fft.ifft2(lowpass*Fb[layercenter])
plt.imshow(np.log(1+np.abs(filtered)), "gray")
```