a) Schematic of an optical correlator  $I_{in}$ conv block  $I_{out}$ max pool class scores sensor readout 回 →camera b) Optimized kernels multichannel, unconstrained multichannel, nonneg. tiled kernels, nonneg. large kernel, nonneg. accuracy = 0.7591 accuracy = 0.7786 accuracy = 0.7216accuracy = 0.7345c) Phase mask optimization for large kernel phase mask rad.  $I_{in}$  $I_{out}$ relative scores **PSF** two-step, **acc. = 0.7045** ice cream rad. apple end-to-end, **acc. = .6221**