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| **Project**  | **Mentor/group website** |
| 1. Developing hybrid photoacoustic nanomaterials to produce specific ultrasound frequency for neuronal stimulation
2. Developing simulation methods to understand the absorption and emission of heterogeneous nanoparticles and nanowires for photonics and solar energy applications.
 | Chen Yang<http://sites.bu.edu/yanglab/> |
| 1. Label-free detection and elimination of superbugs based on its intrinsic molecular signatures.
2. Super-resolution nonlinear optical imaging with a metamaterial lens.
3. Opto-acoustic stimulation of neurons in culture and in awake mice.
 | Jixin Cheng<http://sites.bu.edu/cheng-group/> |
| Typical optoelectronic devices such as light emitters and photodetectors employ external bulk optical elements (e.g., lenses, mirrors, polarizers, and gratings) to interface with free-space radiation, which can severely limit their miniaturization and scalability to high-density arrays.  This project explores a novel approach for the near-field control of light emission and photodetection, based on the use of periodic arrays of optical nanoantennas (i.e., metallic and/or dielectric nanoparticles of highly subwavelength dimensions).  These nanostructures are fabricated in the immediate vicinity of the device active layer using a variety of different techniques, including thin-film deposition, electron-beam lithography, reactive ion etching, and focused-ion-beam milling.  With this basic approach, we are developing lens-free image sensors that are uniquely sensitive to light incident along a single, geometrically tunable direction, for the implementation of ultrasmall artificial cameras based on the compound-eye vision modality.  Furthermore, we are investigating the fabrication of highly integrated light-emitting devices where the properties of the output light (including directionality, polarization, and spectral content) can be tailored directly at the source level, without the need for any external optical components. | Roberto Paiella <https://www.bu.edu/paiella/> |
| This project aims to develop computational microscopy techniques for achieving high throughput 3D imaging capability.  The research activity involves jointly designing novel hardware and computational techniques to circumvent conventional limitations.   | Lei Tian<http://sites.bu.edu/tianlab/> |