Zhenpeng Xu's Portfolio

-- Additive manufacturing process and its applications

Zhenpeng Xu

Ph.D. candidate at

Advanced Manufacturing and Metamaterials Laboratory
University of California, Los Angeles

Education background

Education

- **University of California Los Angeles, Los Angeles, CA, USA** Sep. 2019 - Present

  Ph.D. student, Civil Engineering

- **Virginia Tech, Blacksburg, VA, USA** Jul. 2018 - Sep. 2019

  Ph.D. student, Mechanical Engineering

- **University of Florida, Gainesville, FL, USA** Aug. 2016 - Jun. 2018

  M.Sc., Mechanical Engineering

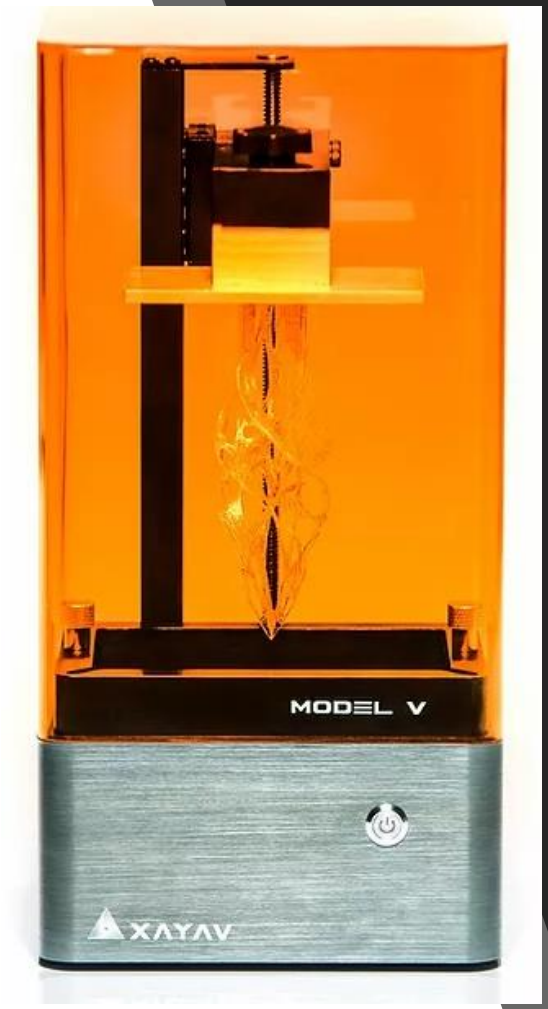
- **Beihang University, Beijing, China** Sep. 2012 - Jun. 2016

  B.Eng., Mechanical Engineering

Projects

1. **Desktop LCD 3D printer**
2. Large-area, high-precision DLP 3D printer
3. Multi-material 3D printing
4. Ultra-lightweight antenna
5. Metamaterials

Desktop LCD 3D printer



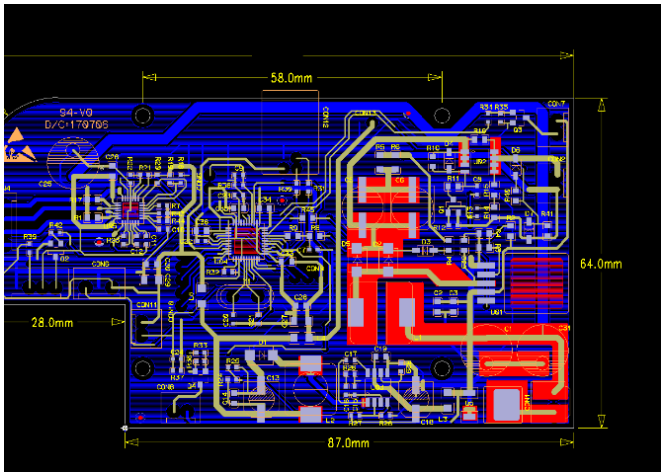
Co-Founded XAYAV Inc.: Focus on Desktop LCD 3D printer

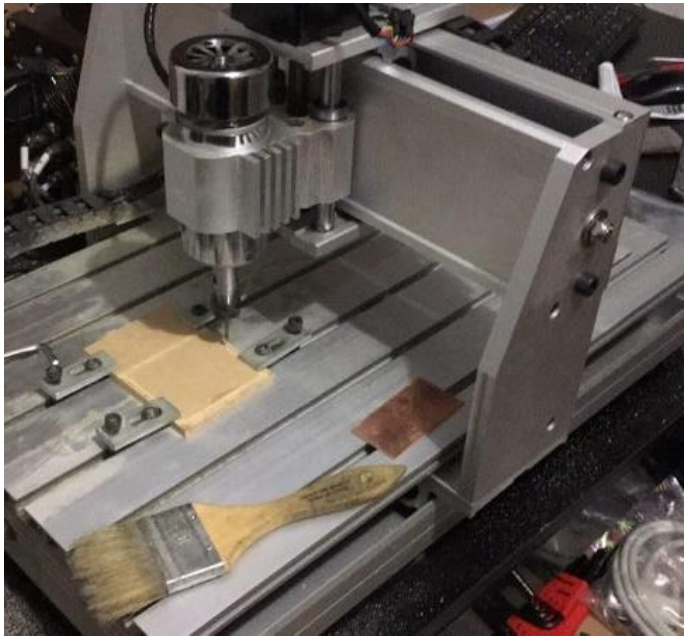
XAYAV Inc. (www.xayav.com), Gainesville, FL, USA

Aug. 2016 - May. 2018

XAYAV was founded in 2016, specializing in developing and applying desktop-level light-curing 3D printing technology. The company was founded in Shenzhen, and its sales base is in Florida, USA. As one of the co-founders, I am mainly responsible for machine design, R&D, and supply chain management.

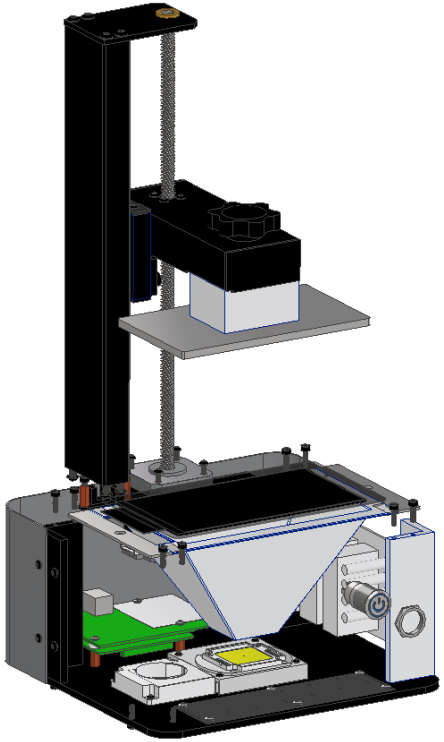
- Designed and prototyped a desktop LCD 3D printer by milling, lathe, CNC, hand tools, etc.
- Finalized the manufacturing processes of the printer, including metal machining, sheet metal forming, die casting, acrylic molding, PCB manufacturing, silk screen printing, etc.
- Investigated and visited suppliers (Shenzhen, China) for production; managed the supply chain to balance inventories and distribution.
- Successfully sold hundreds of printers with the team.

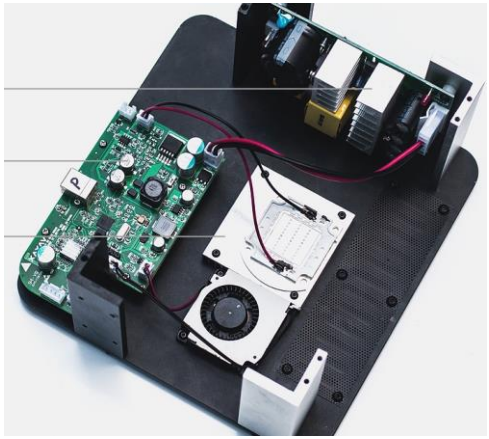


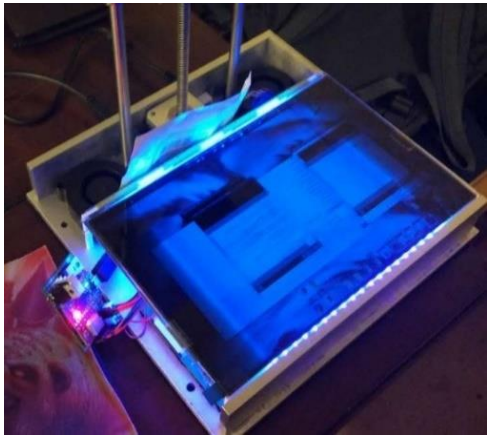


Most of the prototype components were machined by ourselves

I led the team and developed three generations of prototypes, and finally settled on all the manufacturing processes







The printed part by our printer shows excellent accuracy

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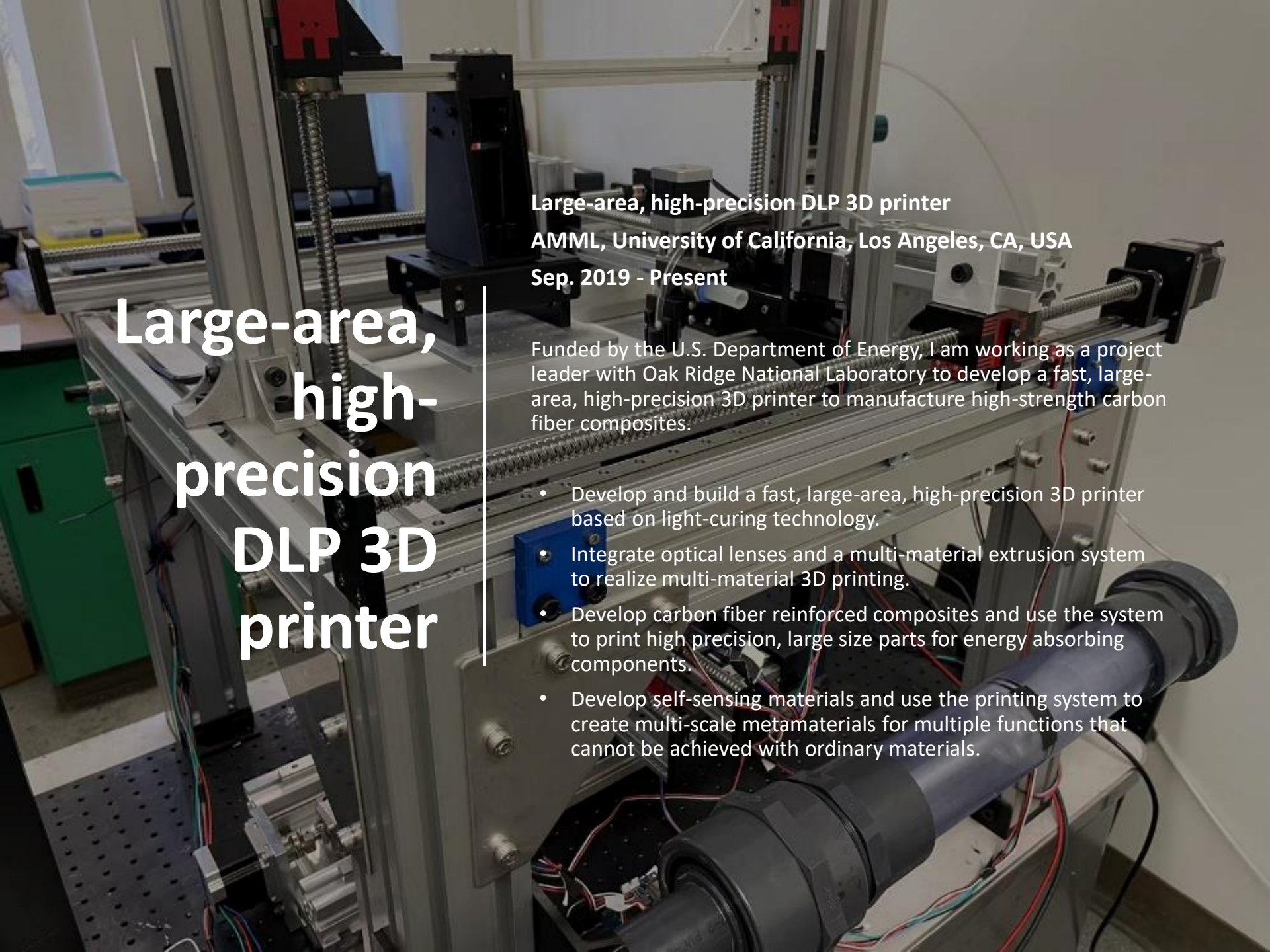


Large-area, high-precision DLP 3D printer

Large-area, high-precision DLP 3D printer

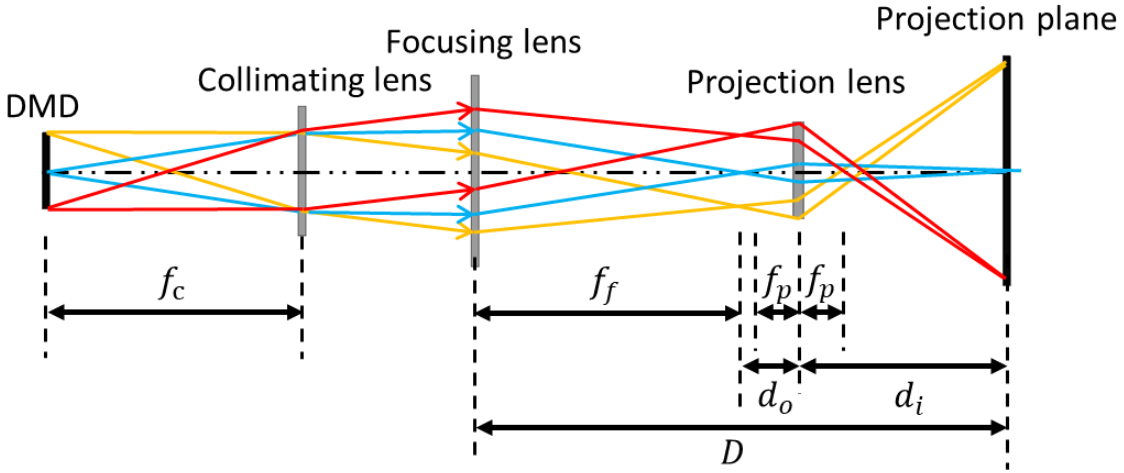
AMML, University of California, Los Angeles, CA, USA

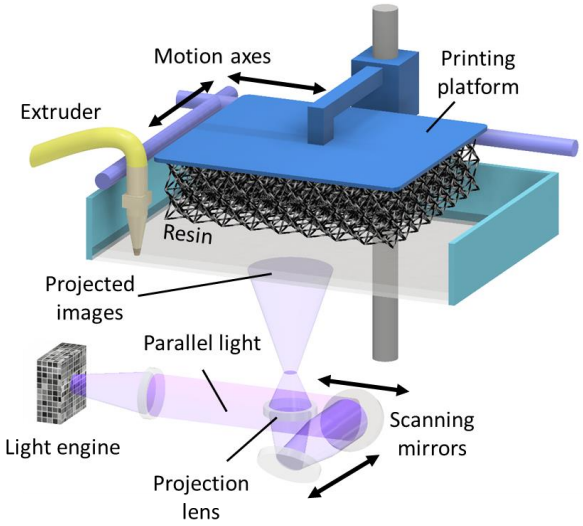
Sep. 2019 - Present

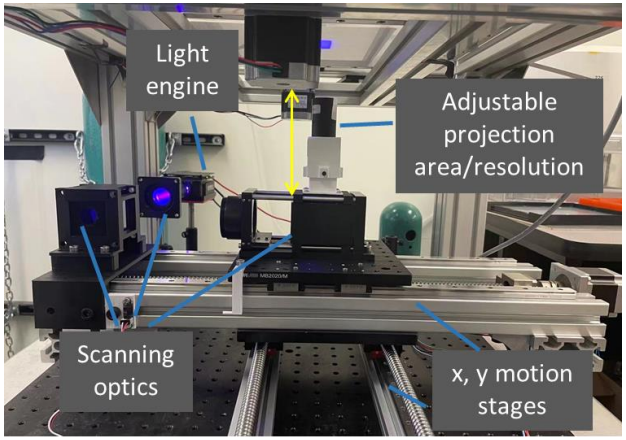
Funded by the U.S. Department of Energy, I am working as a project leader with Oak Ridge National Laboratory to develop a fast, large-area, high-precision 3D printer to manufacture high-strength carbon fiber composites.

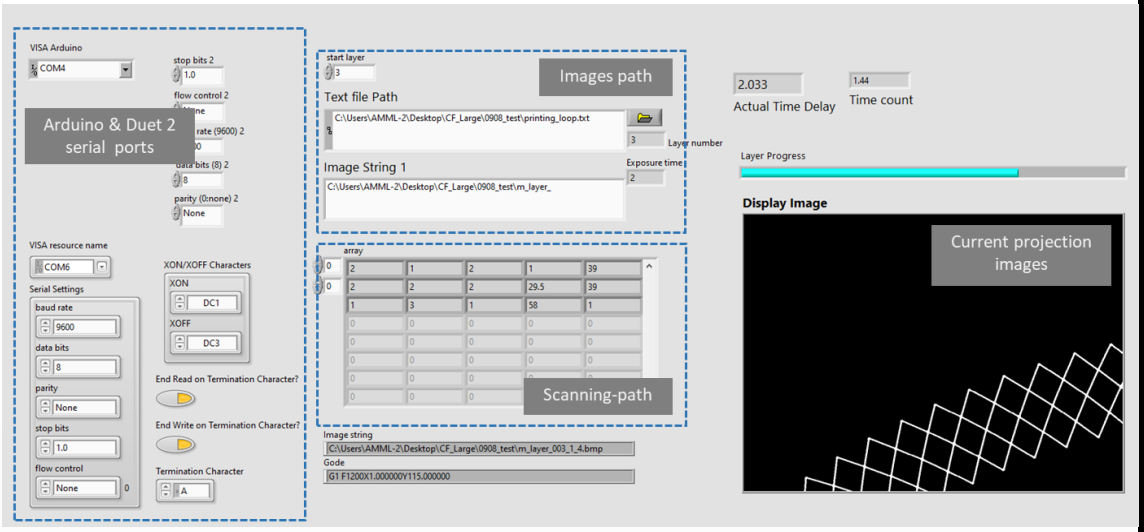
- Develop and build a fast, large-area, high-precision 3D printer based on light-curing technology.
- Integrate optical lenses and a multi-material extrusion system to realize multi-material 3D printing.
- Develop carbon fiber reinforced composites and use the system to print high precision, large size parts for energy absorbing components.
- Develop self-sensing materials and use the printing system to create multi-scale metamaterials for multiple functions that cannot be achieved with ordinary materials.

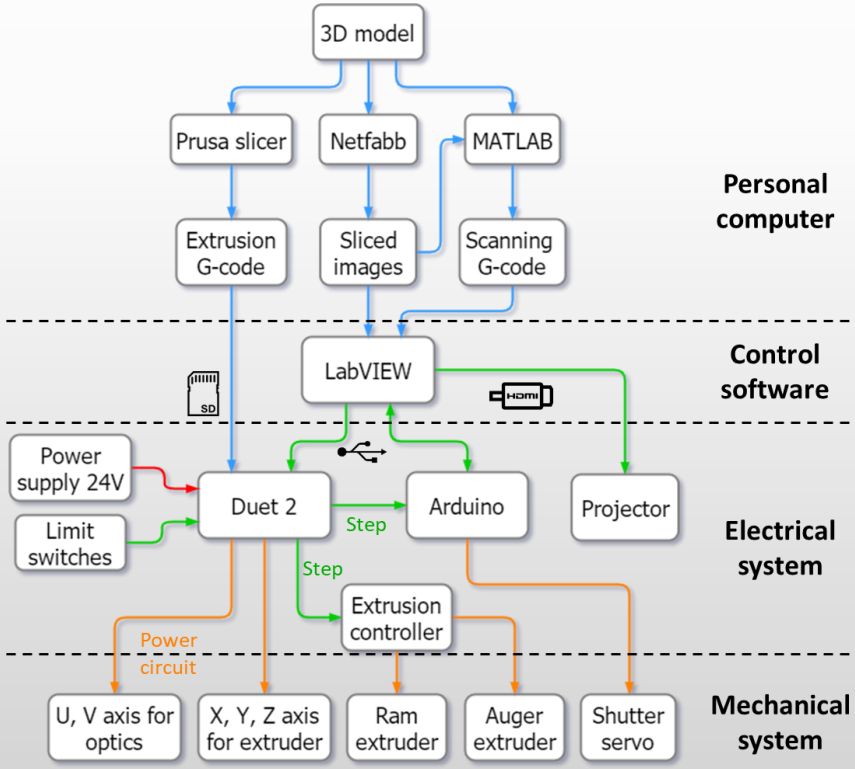
Optical design





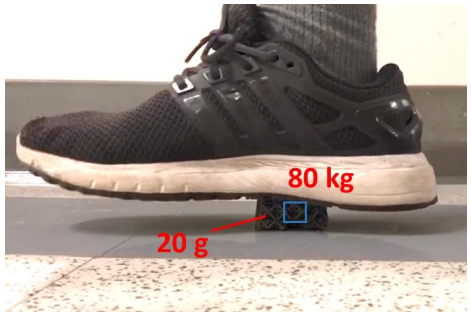


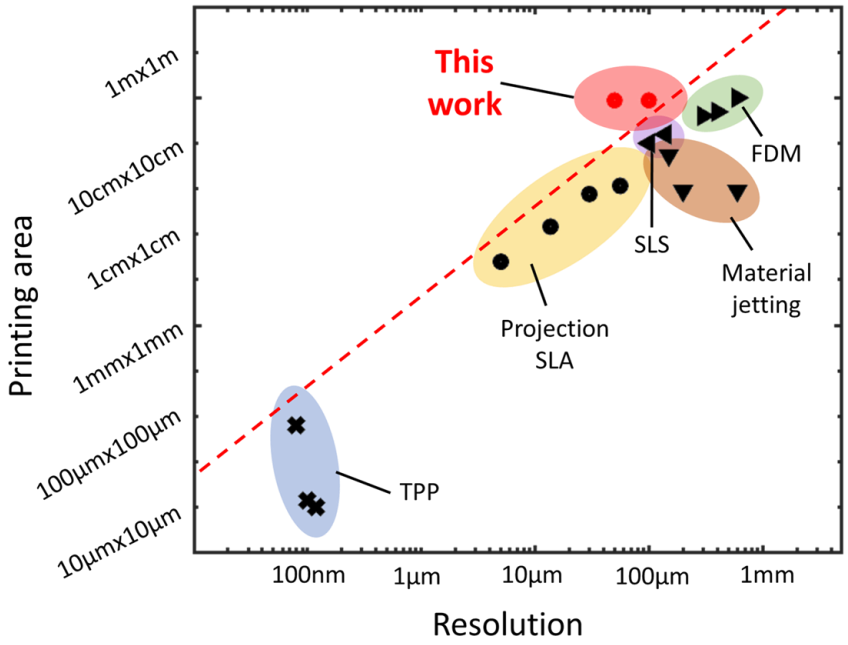




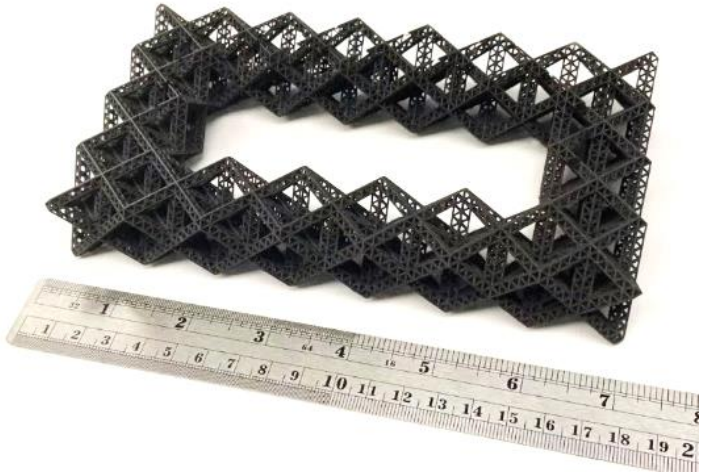
Software & Mechatronics diagram

Fabricated samples





- The developed system enabled the fabrication of architectures that have multi-scale features from tens of micrometers to hundreds of millimeters.



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Multi-material 3D printing

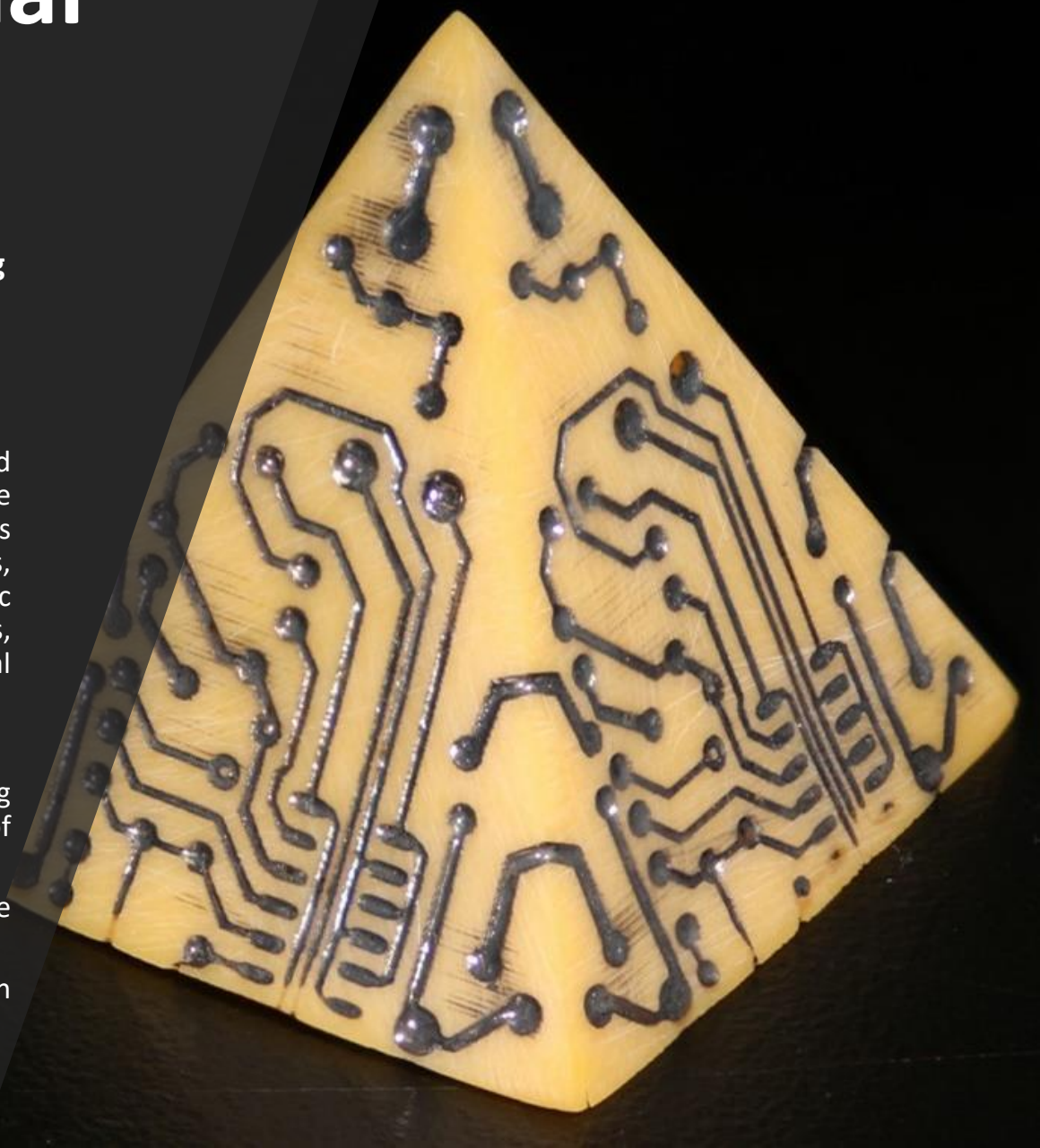
Development of multi-material 3D printing

AMML, UCLA, CA, USA

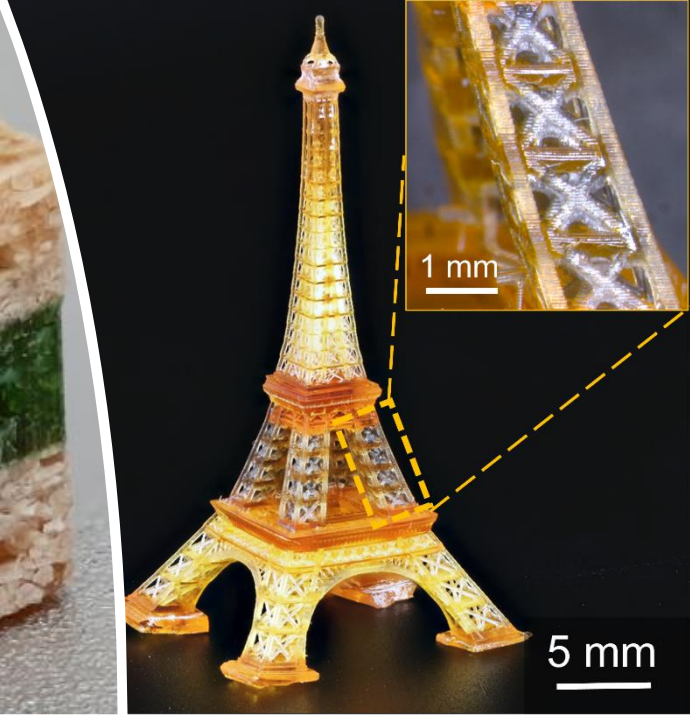
July. 2018 - Present

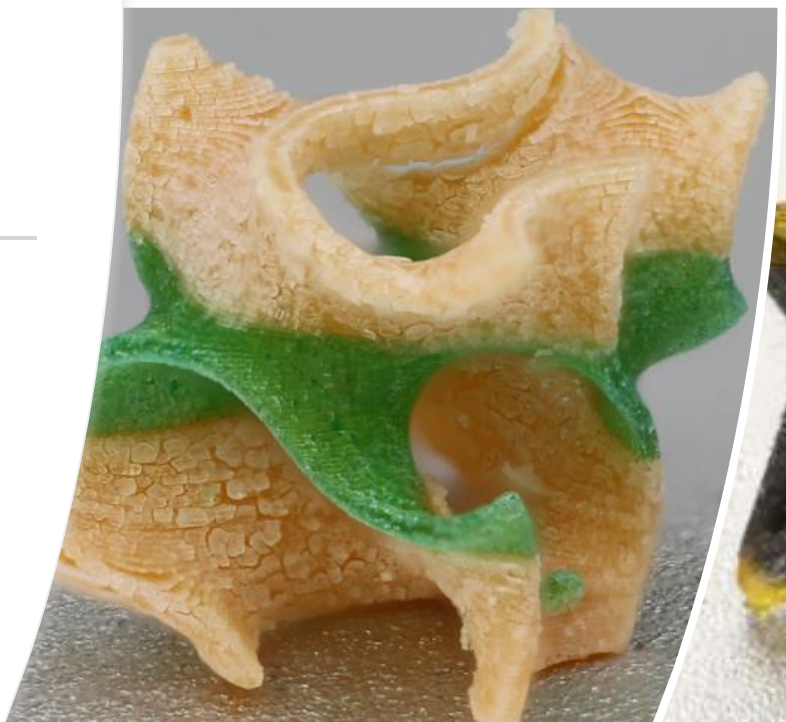
I developed a technique for multi-material 3d printing based on light curing. The technique allows the selective deposition of single metals and various combinations of active materials, including ceramics, semiconductors, magnetic and colloidal materials, and colloidal materials, to form location-specific three-dimensional topologies.

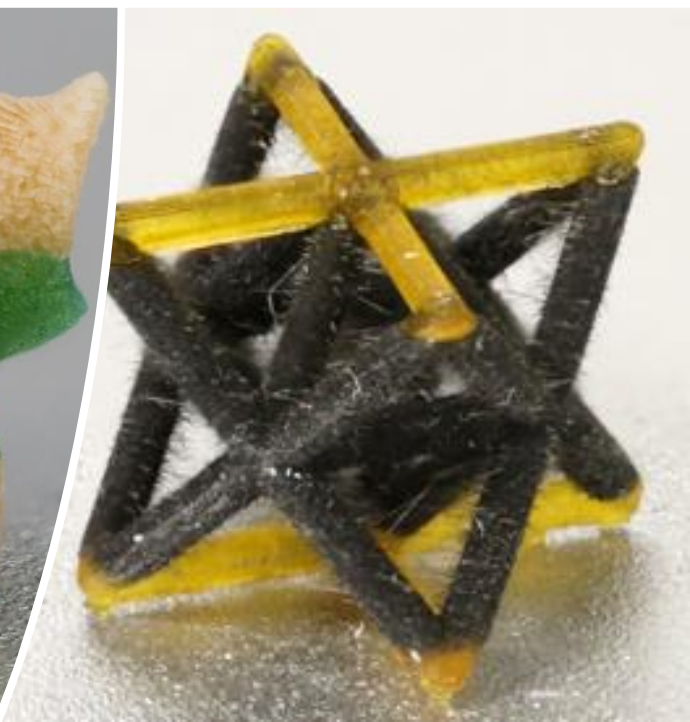
- Developed a multi-material printing system and used it for the printing of various resins.
- Write papers, publish, and report on large conferences.
- Responsible for communicating with sponsors and preparing reports.



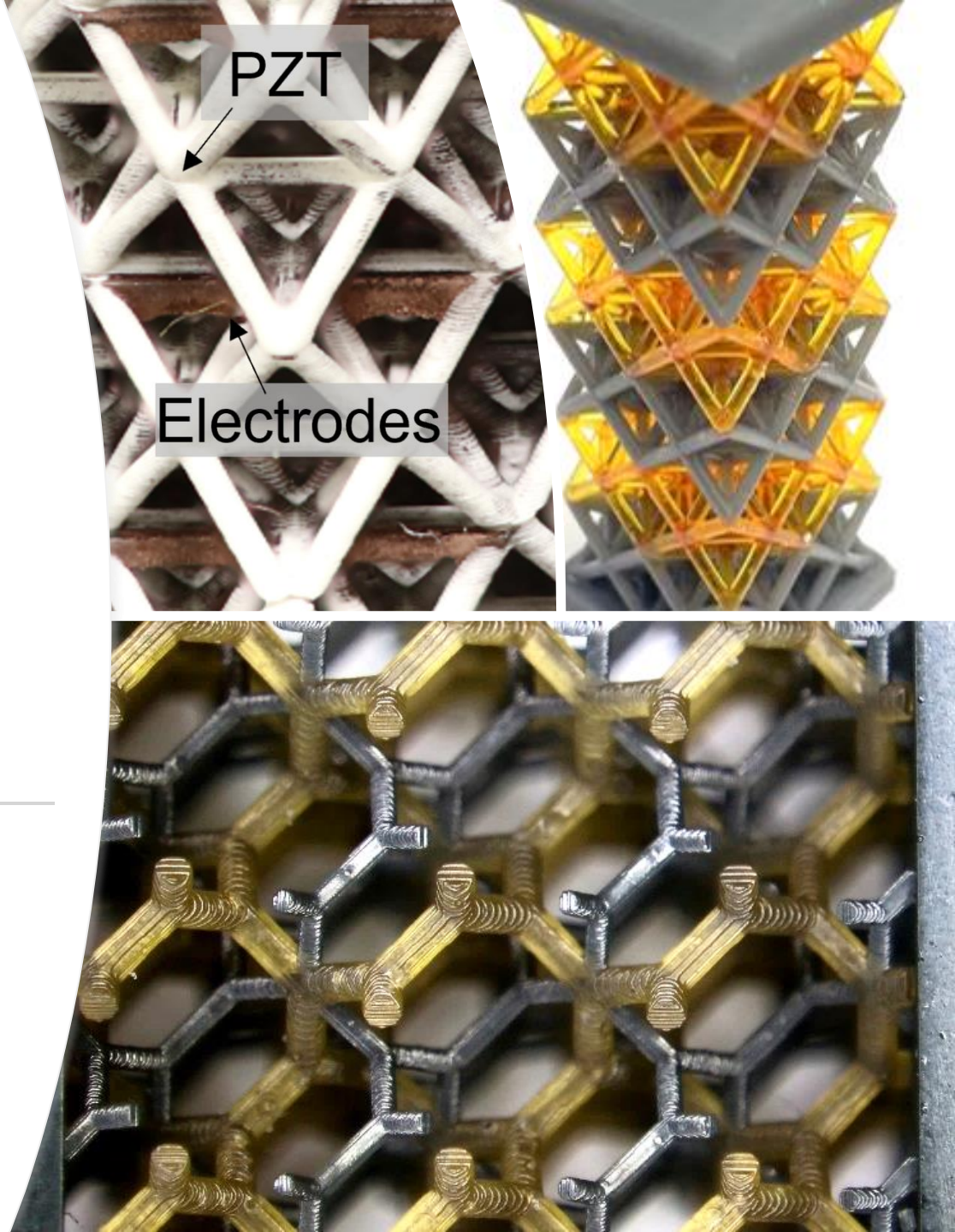
Sample gallery







Sample gallery



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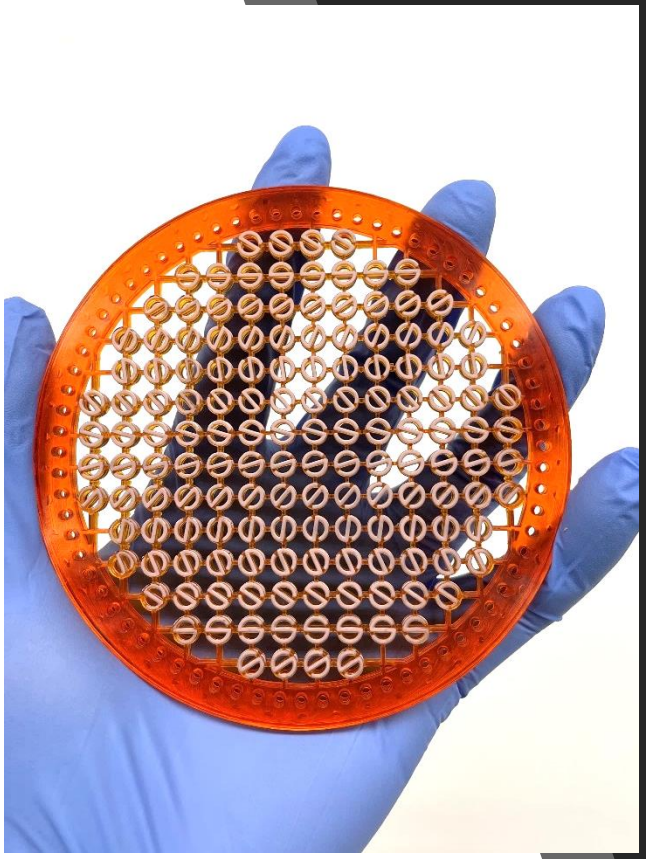
Ultra-lightweight antenna



Development of a group of ultra-lightweight antennas

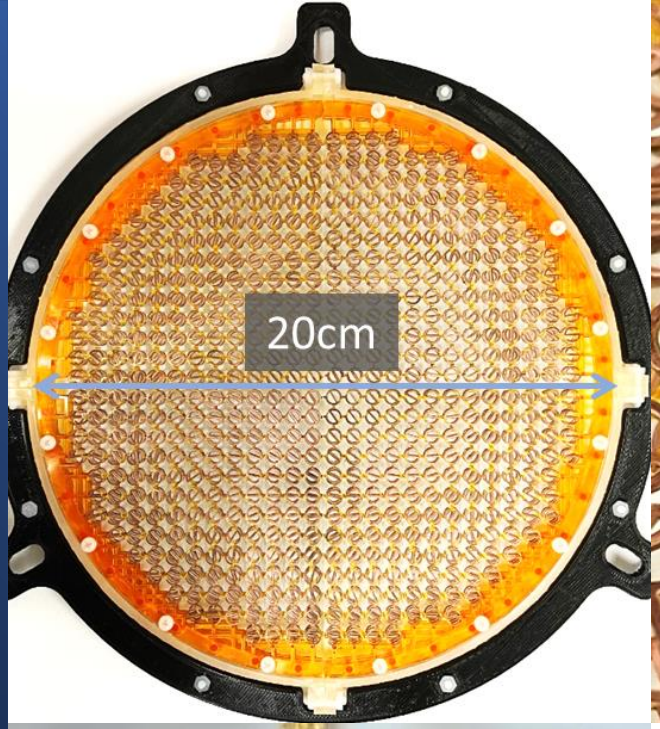
AMML, University of California, Los Angeles, CA, USA

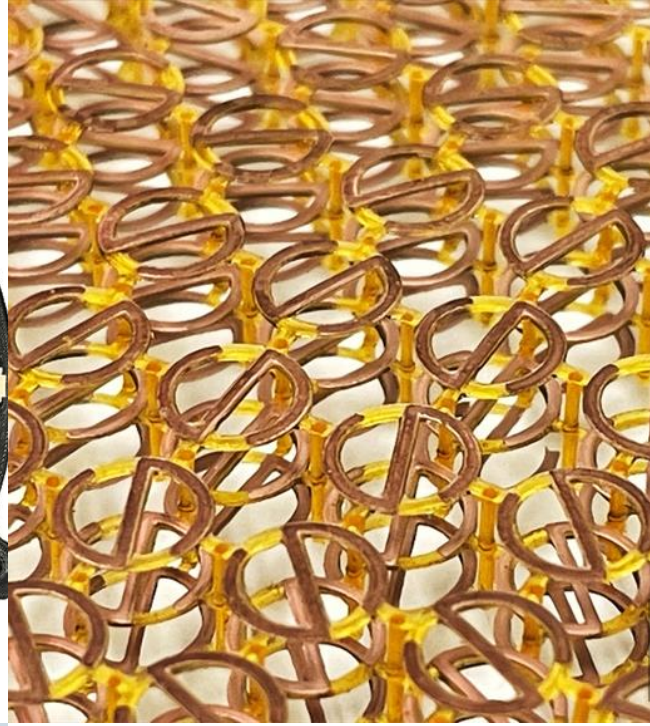
Apr. 2020 - Present

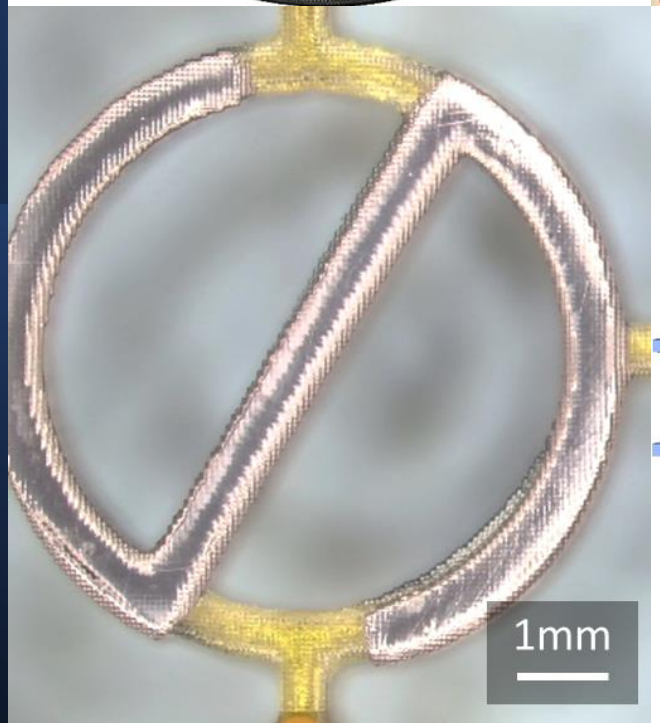
Collaborated with Prof. Yahya's group at UCLA, I utilized multi-material additive manufacturing and selective deposition via controlled surface charge polarity to manufacture previously impossible ultra-lightweight antennas. The resulted antennas demonstrated that through lattice incorporation and minimizing the excessive dielectric supporting material, we can achieve order-of-magnitude less weight. Additionally, the fabrication is faster (days to weeks) and 1/10 the cost (< $100/antenna) compared to traditional PCB/CNC manufacturing.

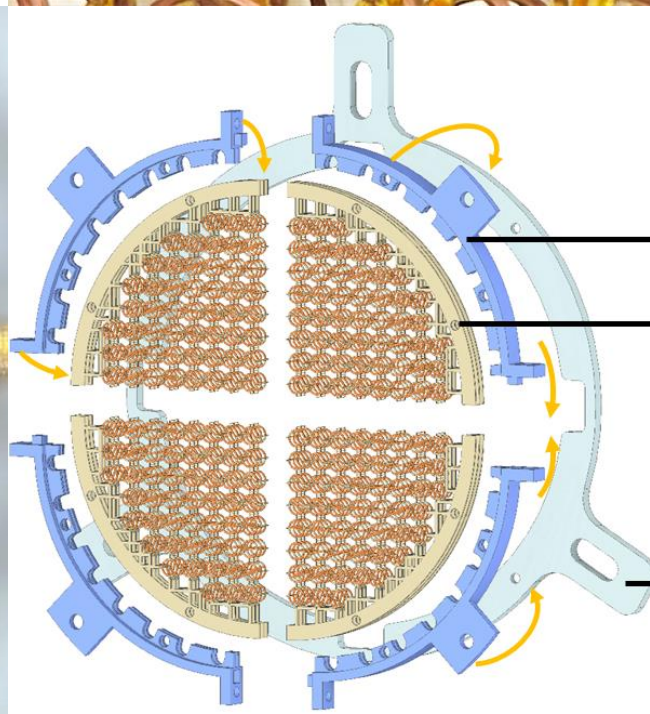
- Designed and printed large-scale multi-material antennas.
- Demonstrate a tiled antenna fabrication method, which removes restrictions in the printer build area, allowing larger antenna diameters (12 – 20 cm).
- The fabricated transmitarray prototype was measured in the spherical near-field range at UCLA, showing excellent performance.

Transmitarray antenna

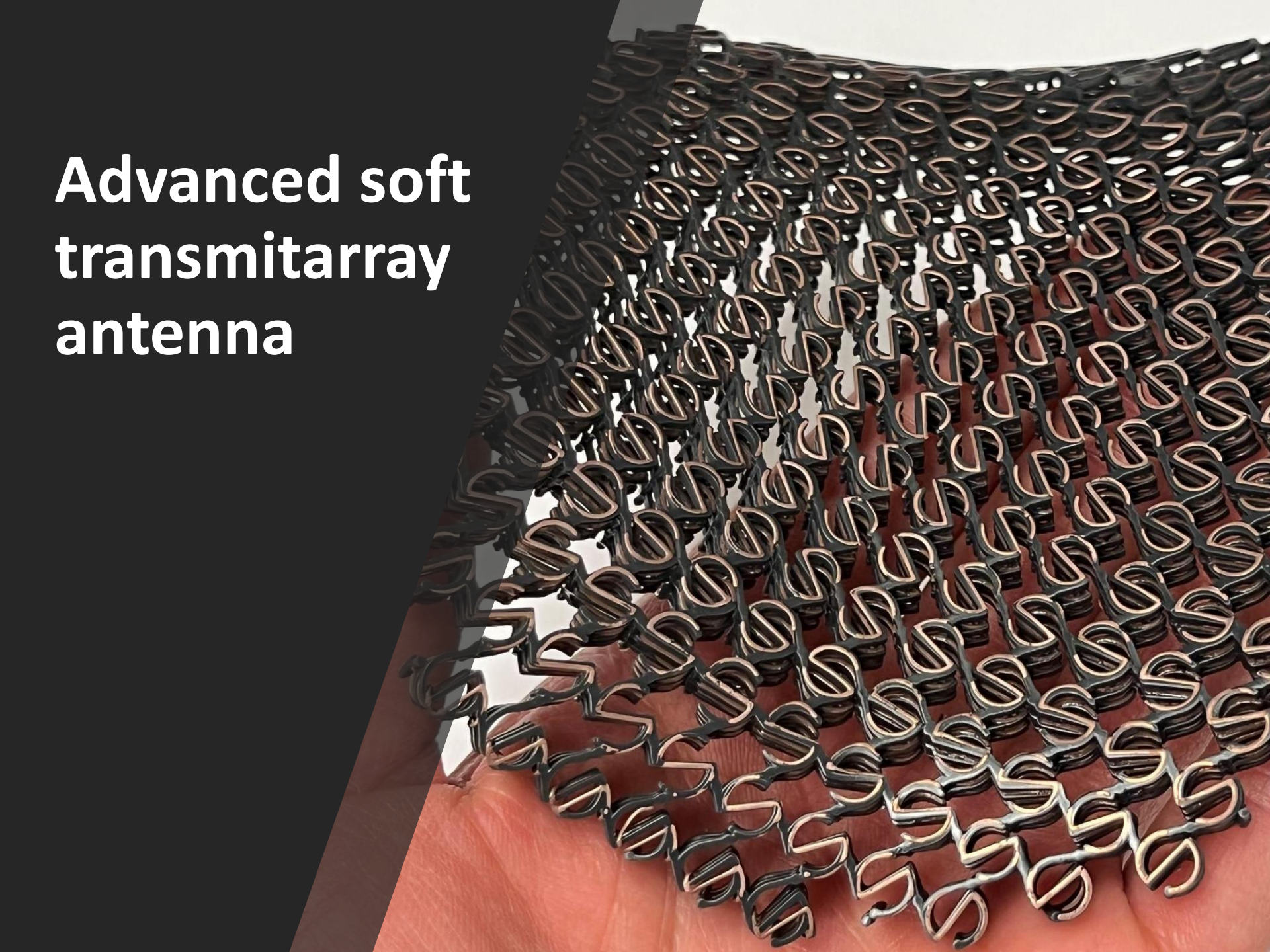








Advanced soft transmitarray antenna



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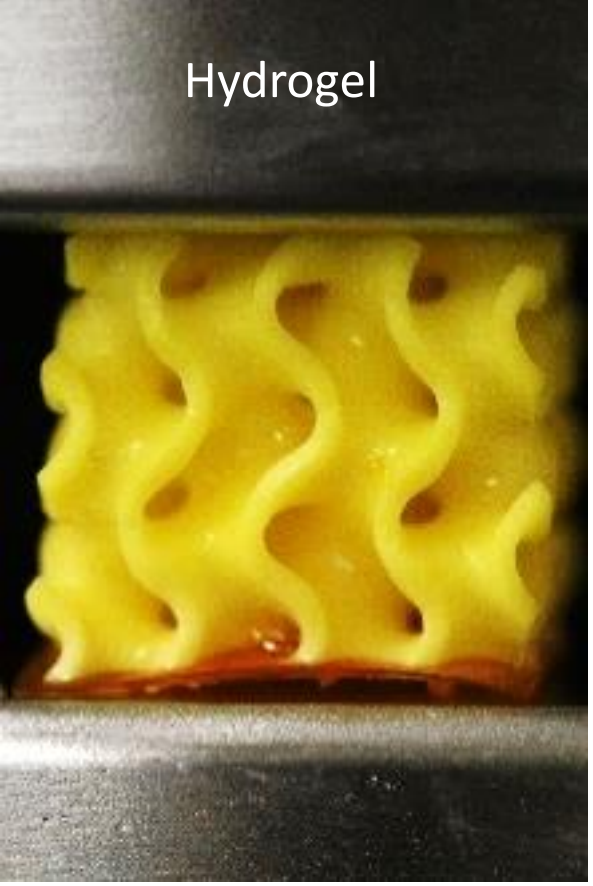
Metamaterials

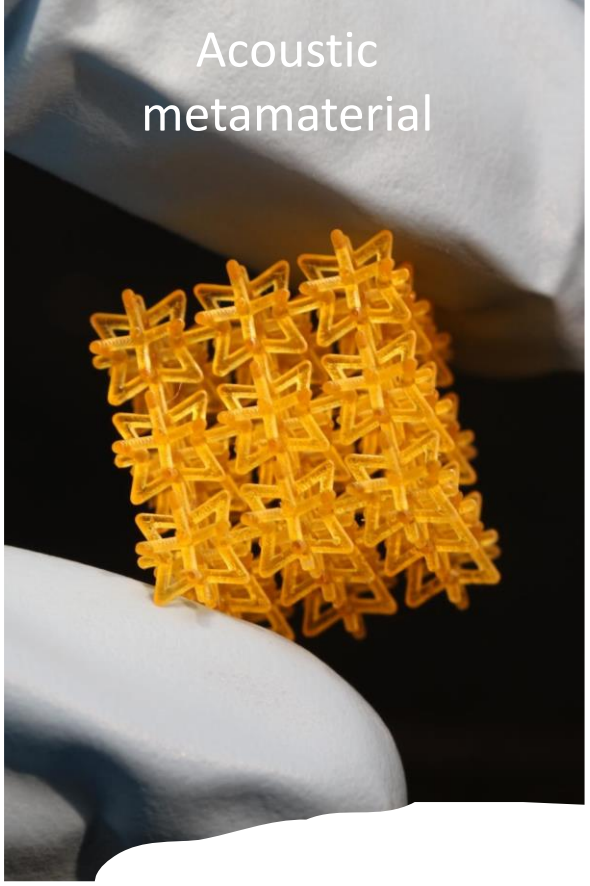
Development of metamaterials

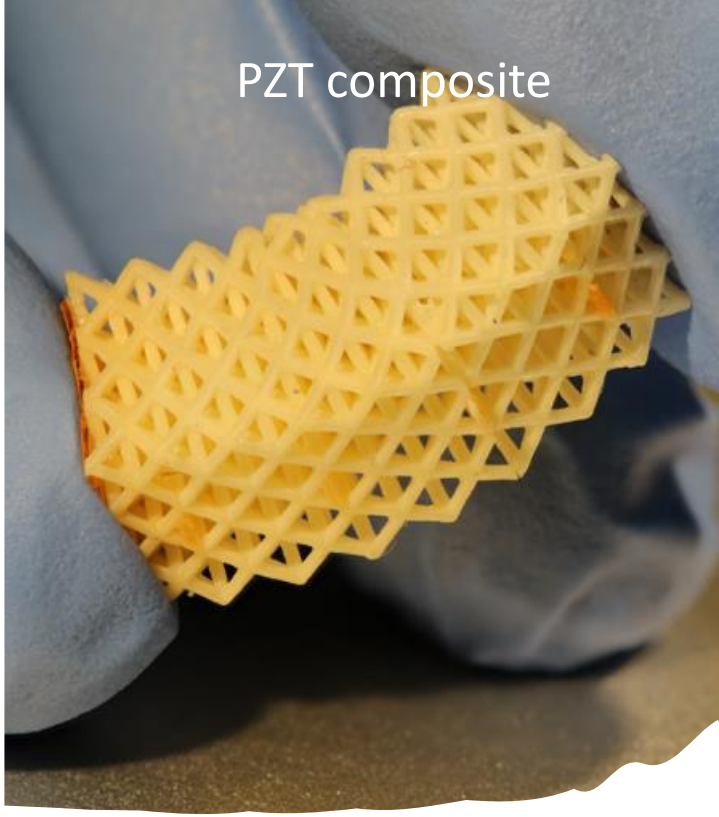
AMML, UCLA, CA, USA

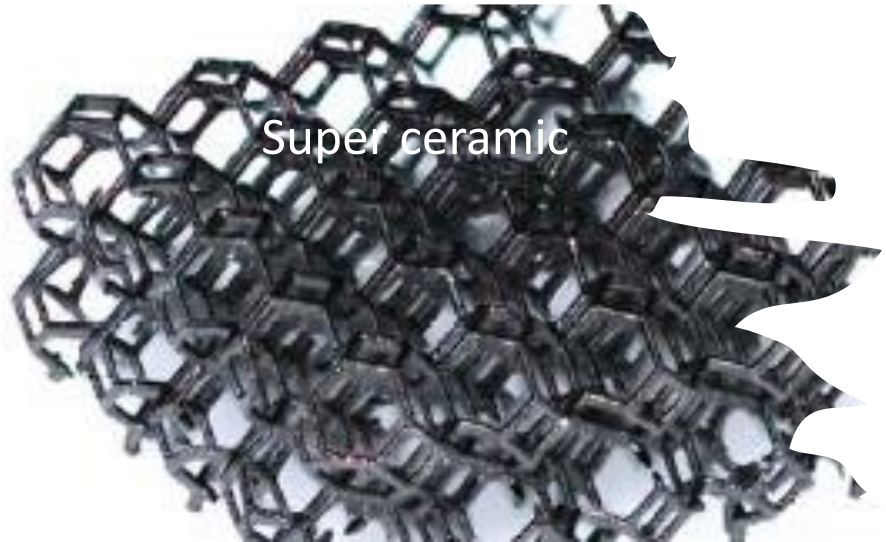
July. 2018 - Present

- During my Ph.D. period, I worked with many collaborators on the applications of additive manufacturing techniques. I developed many metamaterials for various applications in materials science, acoustics, magnetics, and antenna areas.









Metamaterials

Acknowledgements and license

I commit that I led or participated in the production of all the above 3D printed samples. The work during my PhD period was sponsored by Prof. Xiaoyu Zheng's funding recourses from various projects.