Jagannadh (Jag) Boddapati

Website | Google Scholar | Linkedin | Address | Strava

Email: pboddapa@caltech.edu
Phone: +1 (626) 365-2572

Education

California Institute of Technology — Pasadena, CA, USA
- *Masters and Ph.D. candidate in Mechanical Engineering;* — *Sep '18 – Dec '24*
  Minor: *Computer Science | GPA: 3.9/4.0 | Thesis Advisor: Prof. Chiara Daraio*

Indian Institute of Technology Madras — Chennai, TN, India
- *Bachelor of Technology (Honours) in Mechanical Engineering;* — *Jul '14 – May '18*
  Minor: *Microelectronics | CGPA: 9.28/10; GPA in Major 9.77/10*

About Me

- I am an avid machine learning enthusiast actively seeking an internship in artificial intelligence for scientific exploration. Based on my active participation and leadership in diverse scientific projects, I firmly believe that the advances in big-data can have a profound impact on scientific breakthroughs. I am a quick learner with strong passion for coding and enjoy solving complex interdisciplinary problems in a fast-paced environment. My research interests include deep learning applications, algorithms & NN architectures, computational & experimental mechanics, applied linear algebra, accelerated & parallel computing.

Journal Publications

- **Jagannadh Boddapati***, Moritz Flaschel*, Siddhant Kumar, Laura De Lorenzis, Chiara Daraio. Single-test evaluation of directional elastic properties of anisotropic structured materials, Journal of the Mechanics and Physics of Solids (2023).
- Liwei Wang, **Jagannadh Boddapati**, Ke Liu, Ping Zhu, Chiara Daraio, Wei Chen. Mechanical cloak via data-driven aperiodic metamaterial design, Proceedings of the National Academy of Sciences (2022).
- **Jagannadh Boddapati**, Shaswat Mohanty, Ratna Kumar Annabattula. An analytical model for shape morphing through combined bending and twisting in piezo composites, Mechanics of Materials (2020).

Work Experience

- **Graduate Technical Internship with Intel Corporation** — *Chandler, AZ, USA*
  Mentor: *Dr. Edwin Cetegen* - Assembly and Test Technology Development Group — *Sep '22 - Dec '22*
  - Applied machine learning techniques to enable mechanical property prediction for different materials used in the semiconductor industry. Evaluated and benchmarked different thermomechanical models for semiconductor packaging focusing on substrate design interactions.
- **IITMSAT - A student satellite initiative in collaboration with ISRO** — *IIT Madras, TN, India*
  Mentors: *Dr. David Koilpillai* & *Mr. Rewanth Ravindran* — *Oct '14 - Apr '18*
  - Member of the structural team responsible for conceiving and effectively executing the design (CAD) and assembly methodology for the payload and its sub-assemblies. Complex assignments include optical shielding of payload, rerouting optical fibers to minimize bending losses, and fabricating epoxy-based dampening sheets for photomultiplier tubes.
- **Internship with Tvasta** — *Chennai, TN, India*
  India's First 3D Printing Construction Startup — *Nov '16 - Dec '16*
  - Significant involvement in developing and constructing a functional prototype of a concrete 3D printer with a 60 cm scale. Explored the assembly of current galvo scanners for their integration into an SLS printer, enabling swift laser scanning of metal powders.

Technical Skills

- **Software Platforms and Languages:** Matlab, Python, C++, CUDA, Mathematica, SQL, Abaqus, Comsol, Git, Solidworks.
- **Machine Learning Libraries:** Tensorflow, Scikit-Learn, Keras, PyTorch.
- **Experimental:** 3D-printing (FDM, SLS, DLP), Universal testing machine, Machining, High-speed camera.

Relevant Coursework

- Computational Solid Mechanics (ME214ab), Learning Systems (CS156ab), Machine Learning and Data Mining (CS155), Applied Linear Analysis (ACM104, 107), Matrix Analysis (ACM 204), GPU Programming (CS179), Mechanics of Structures and Solids (ME102abc), Dynamics and Vibrations (AM 151ab), Physical Biology of the Cell (BE161).

Research Experience

- **Structure-Property Relations in Anisotropic Metamaterials** *Doctoral work*
  Thesis Advisor: *Prof. Chiara Daraio* *Aug '19 - Present*
  - Developed a methodology that identifies elastic anisotropic properties of structured materials leveraging full-field experimental data of a single-tension test and validated it using finite element simulations.
  - Investigating the expansive design possibilities using data-driven techniques such as generative modeling within a high-dimensional space of anisotropic linear elastic composite materials approaching theoretical limits.
- **Twisting Shape-Morphing in Piezo Bilayer Composites** *Bachelor's Thesis*
  Advisor: *Prof. Ratna Kumar Annabattula* *Jul '17 - May '18*
  - Numerically investigated the shape-morphing capabilities of bilayered anisotropic piezo composites by altering the relative polarization directions in each layer; Formulated an analytical framework to predict curvatures using tensor transformation, differential geometry, and total energy minimization concepts and validated it using the FEM.
- **Core-Shell Particle Fillers for Thermal Grease** *Research Internship at Purdue University*
  Advisors: *Prof. Liang Pan* and *Prof. Justin A Weibel* *May '17 - Jul '17*
  - Experimentally investigated the effectiveness of core-shell particles ($\sim 50\mu m$), with a high thermally conductive shell on a dielectric core, as efficient fillers in thermal grease by replacing the traditional high conductive copper fillers. Successfully developed a protocol for the preparation of alumina-copper core-shell particles using an electroless plating technique.

Course Projects

- **[CS 156b]: Predictive Modeling of Deaths due to Covid-19**
  - We developed a two-tier machine learning model for forecasting the number of deaths in a U.S. county due to Covid-19 in Spring 2020. The model is listed among top 10/50 teams and is rated as one of the best novel models.
  - The baseline model is a non-linear regression model that learns from previous daily death data, and the residual model is a linear regression model that learns from county demographics.
- **[CS 155]: Neural Networks**
  - Generated shakespearean sonnets by training hidden markov models (HMMs) and recurrent neural networks (RNNs) on the entire corpus of Shakespeare's sonnets.
  - Worked on classification of hand-written numbers in MNIST data using convolutional neural networks (CNNs).
- **[BE 107]: Pose estimation of beetle-on-a-ball**
  - Part of a team that investigated the behavior of a tethered beetle in response to oflactory and visual cues.
  - Pose of the beetle is estimated using *DeepLabCut*, a framework based on transfer learning with deep neural networks.
- **[CS 179]: CUDA Implementation of Finite Element Homogenization**
  - Executed a CUDA-based implementation of FFT based iterative solvers to calculate the mechanical properties of three-dimensional structured materials by solving a system of PDEs. *cuTENSOR, cuFFT, cuBLAS* packages are used.
  - With a mere CPU translation of the code, 25% improvement in the computation time is shown.
- **Mechanics**
  - **[ME 201]:** Implemented discrete element method using MATLAB. Applied the method on mono-disperse granular discs with friction and viscous damping to simulate shear banding and force chain buckling in granular systems.
  - **[AE 220]:** Performed wrinkling analysis of thin-films under shear using Abaqus. Studied the effects of imperfection amplitudes in accurately capturing the deformation of wrinkling structures.
  - **[AM 151b]:** Presented a demonstration of how to shield structures from surface (Rayleigh) waves using a tabletop LEGO block set, with the central concept centered around leveraging the resonance of LEGO blocks.

Service and Leadership

- Mentored three undergraduate Caltech students on various mechanical testing projects (SU '20, '22, '23).
- Teaching assistant for ME12c (SP '19), Ae102b (WI '21), and Ae104c (SP '22).
- Reviewer for *Advanced Materials* and *Extreme Mechanics Letters*.
- Officer and active member of the Caltech Cricket Club (May '19 - Present). Responsible for securing & managing club funding, scheduling matches & practices, advertising & outreach.
- Volunteer for Engineering Mechanics Institute Conference (2019) and Caltech's Eleventh Annual Knowles Solid Mechanics Symposium (2020).