

Bo Ni

184 Hope Street, Providence, RI 02912 | boni.mechanics@gmail.com or bo_ni@brown.edu

EDUCATION

Ph.D. in Solid Mechanics	Brown University	2020
Thesis: <i>Mechanics of fracture and toughening in 2D materials</i>		Advisor: Huajian Gao
M.Sc. in Solid Mechanics	Xi'an Jiaotong University (XJTU)	2013
Thesis: <i>Analytical study of surface-related dislocation nucleation under Hertzian contact in 2D</i>		Advisor: Lifeng Ma
B.Sc. in Engineering Mechanics	XJTU	2011

RESEARCH INTERESTS

Research assistant (Advisor: Prof. Huajian Gao), Brown University Providence, RI

- Fracture and toughening of 2D materials

- Study nonlinear coupling between *topological defects*, *curvature* and *crack* in 2D materials
- Propose a *mechanism-guided* design library for *topological toughening* of 2D materials
- Unveil the interaction between *asymmetric edge stress* and crack in *h*-BN theoretically
- Study the effect of *interlayer friction* on intralayer fracture in multilayered 2D materials

- Metamaterial design of 3D nanolattices

- Implement *snap-through* instability in *3D graphene* nanolattice through numerical simulation
- Propose theoretical model for rational design of *pseudo plasticity* in 3D graphene

- Advanced simulation of thin shell fracture

- Implement *phase field* fracture model for thin shell structures using *isogeometric analysis*
- Include the effects of large deformation, *anisotropic fracture energy* and *surface effect*

- Fracture mechanics in lithium batteries

- Theoretically study the effect of *applied T-stress* on *crack-inclusion interaction*

- Deep learning approach to inverse problems in mechanics

- Leverage *deep learning* models to solve *inverse problems* in *non-destructive evaluations*

PUBLICATIONS

Published

7. Kai Guo*, **Bo Ni***, Huajian Gao (2020). Tuning crack-inclusion interaction with an applied T-stress. *International Journal of Fracture*, 1-11 (*Co-first authors).
6. **Bo Ni**, Huajian Gao (2020). Harness the Power of Fracture: Controlled Fragmentation of Graphene via Substrate Necking. *Matter*, 2(3), 521-524.
5. **Bo Ni**, Huajian Gao (2020). Engineer Energy Dissipation in 3D Graphene Nanolattice Via Reversible Snap-Through Instability. *Journal of Applied Mechanics*, 87(3).
4. **Bo Ni**, Xing Liu, Zhigong Song, Huajian Gao (2020). A Century of Fracture Mechanics: from Griffith Theory to Machine Learning Based Modelling. *2020 Adhesion Society Annual Meeting*, (for Plenary Talk delivered by Prof. Huajian Gao).
3. **Bo Ni***, Teng Zhang*, Jiaoyan Li, Xiaoyan Li, Huajian Gao (2019). Topological design of graphene. *Handbook of Graphene, Volume 2: Physics, Chemistry, and Biology*, Chapter 1 (*Co-first authors).
2. Jiaoyan Li, **Bo Ni**, Teng Zhang, Huajian Gao (2018). Phase field crystal modeling of grain boundary structures and growth in polycrystalline graphene. *Journal of the Mechanics and Physics of Solids*, 120, 36-48.
1. Emily Hacopian*, Yingchao Yang*, **Bo Ni***, Yilun Li, Xing Li, Qing Chen, Hua Guo, James Tour, Huajian Gao, Jun Lou (2018). Toughening Graphene by Integrating Carbon Nanotubes. *ACS nano*, 12(8), 7901-7910 (*Co-first authors).

Under review

8. **Bo Ni**, Huajian Gao (2020). A deep learning approach to the inverse problem of modulus identification in elasticity. *under review*.
9. Guoxin Cao, Yunpeng Renb, **Bo Ni**, Tao Wang, Zhuo Zhuang (2020). Indentation response of freestanding two-dimensional materials with an adhesive boundary condition. *under review*.
10. Yingchao Yang, Zhigong Song, Guangyuan Lu, Qinghua Zhang, **Bo Ni**, Chao Wang, Xiaoyan Li, Lin Gu, Xiaoming Xie, Huajian Gao, Jun Lou (2020). Lattice Asymmetry Induced Intrinsic Toughening and Stable Crack Propagation in Monolayer h-BN. *under review*.

In preparation

- **Bo Ni**, Jiaoyan Li, Teng Zhang, Huajian Gao (2020). Topological toughening of graphene, *in preparation*.
- **Bo Ni**, Huajian Gao (2020). Crack propagation in multilayered 2D materials in the presence of interlayer sliding, *in preparation*.
- **Bo Ni**, Zhigong Song, Huajian Gao (2020). Phase field modeling of crack propagation under asymmetric surface stress, *in preparation*.

PRESENTATIONS**Topics on topological toughening of 2D materials**

Aspen center for physics 2020 winter conference: low-dimensional solids in hard and soft condensed matter: mechanics, thermodynamics and electrons, Aspen, CO	Feb 2020
56th Annual Technical Meeting of the Society of Engineering Science (SES), St. Louis, MO	Oct 2019
18th National Congress for Theoretical and Applied Mechanics (USNC-TAM), Chicago, IL	Jun 2018
AVS 64th International Symposium & Exhibition, Tampa, FL	Nov 2017
53th Annual Technical Meeting of the Society of Engineering Science (SES), Maryland, MD	Oct 2016

Topics on tuning crack-inclusion interaction via applied T-stress

56th Annual Technical Meeting of the Society of Engineering Science (SES), St. Louis, MO	Oct 2019
Engineering mechanics institute conference (EMI) 2019, Pasadena, CA	Jun 2019

Topics on 3D architected graphene nanolattices

54th Annual Technical Meeting of the Society of Engineering Science (SES), Boston, MA	Jul 2017
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TEACHING

Teaching assistant , Brown University		Providence, RI
-ENGN 2410: Thermodynamics of materials	Prof. David Paine	Fall 2017
-ENGN 1300: Structural Analysis	Prof. Huajian Gao	Spring 2018
-ENGN 1750: Advanced mechanics of solids	Prof. Allen Bower	Fall 2018

REVIEWERSHIP/SERVICES

- Serve as a **reviewer** for *Physics Review Letter (PRL)*, *Journal of the Mechanics and Physics of Solids (JMPS)*, *Physics Review B (PRB)*, *Modelling and Simulation in Materials Science and Engineering (MSMSE)* and *Journal of Materials Research (JMR)*.
- Assisted the advisor with **grant writing** for the application of National Science Foundation (NSF) Award #1634492, titled topological design of tough multi-functional 2D materials.

HONORS AND AWARDS

-Travel award, Aspen center for physics 2020 winter conference	Feb 2020
-Student travel award, 2D materials Focus topic, AVS-64 international symposium	Nov 2017
-The Scholarship in the name of <i>Tang Zhaoqian</i> , XJTU, China	2011
-National Scholarship for Encouragement, XJTU, China	2010
-National Scholarship, XJTU, China	2009
-National Scholarship, XJTU, China	2008
-The First Prize, Competition of Fundamental Mechanics, Shaanxi Province, China	2008