Brian DeCost

Education

19 Aug. 2016 **Ph.D. Materials Science**, *Carnegie Mellon University*, Pittsburgh, PA.
Applied computer vision methods for microstructure characterization
Advisor: Elizabeth A. Holm

May 2014 **M.S. Materials Science**, *Carnegie Mellon University*, Pittsburgh, PA.

May 2012 **B.S. Chemical Engineering**, *University of Florida*, Gainesville, FL.
Summa cum Laude

Research Experience

Sept. 2016 **Postdoctoral Research Associate**, *Carnegie Mellon University*, Pittsburgh, PA.

Computer vision techniques for generic microstructure characterization
I apply image texture recognition methods to characterize general microstructure images. This approach can span a wide variety of structures and materials systems, enabling microstructure-based information retrieval systems and characterization of structures inaccessible to current quantitative metallographic techniques.

Understanding rare microstructural events using network features
I use Monte Carlo grain growth simulations to study abnormal grain growth in textured polycrystals. I apply machine learning techniques to characterize the network structure of the local microstructure in the neighborhood of abnormal grains.

2012–2016 **Graduate Research Assistant**, *Carnegie Mellon University*, Pittsburgh, PA.

2010–2012 **Undergraduate Research Assistant**, *University of Florida*, Gainesville, FL.
Monte Carlo modeling of diffusion in macroporous media

Publications

2017 B. L. DeCost et al. "Computer vision and machine learning for autonomous characterization of AM powder feedstocks". In: *JOM* (Mar. 2017), Accepted for publication.

B. L. DeCost and E. A. Holm. "Characterizing powder materials using keypoint-based computer vision methods". In: *Computational Materials Science* 126 (Jan. 2017), pp. 438–445. DOI: 10.1016/j.commatsci.2016.08.038.

2016 B. L. DeCost and E. A. Holm. "A large dataset of synthetic SEM images of powder materials and their ground truth 3D structures". In: *Data in Brief* 9 (Dec. 2016), pp. 727–731. DOI: 10.1016/j.dib.2016.10.011.

B. L. DeCost and E. A. Holm. "Vision-based methods in microstructure analysis". In: *To appear in: Statistical Methods for Materials Science: Data Analytics in Microstructure Characterization*. Ed. by J. Simmons et al. Boca Raton, FL: CRC Press, Sept. 2016. Chap. 17. ISBN: 978-1-498-73820-0.

B. L. DeCost and E. A. Holm. "Phenomenology of abnormal grain growth in systems with non-uniform grain boundary mobility". In: *Metallurgical and Materials Transactions A* (2016). DOI: 10.1007/s11661-016-3673-6.

bdecost [at] andrew [dot] cmu [dot] edu
www.andrew.cmu.edu/user/bdecost • *orcid.org/0000-0002-3459-5888*

2015 B. L. DeCost and E. A. Holm. "A computer vision approach for automated analysis and classification of microstructural image data". In: *Computational Materials Science* 110 (2015), pp. 126–133. DOI: 10.1016/j.commatsci.2015.08.011.

Presentations

2016 B.L. DeCost, H. Jain, A.D. Rollett, and E.A. Holm, *Exploring and evaluating powder micrographs with machine vision*, **Oral presentation**, MS&T 2016, Salt Lake City, UT, USA. 27 October 2016.

B.L. DeCost and E.A. Holm, *Modeling abnormal grain growth mechanisms with the transgranular network and generic graph kernels*, **Oral presentation**, Recrystallization and Grain Growth 2016, Pittsburgh, PA, USA. 19 July 2016.

E.A. Holm and B.L. DeCost, *Microstructure image analysis using computer vision and machine learning*, **Invited; presented for E.A. Holm**, 3D Materials Science, St. Charles, IL, USA. 12 July 2016.

B.L. DeCost and E.A. Holm, *Keypoint-based computer vision approach for characterizing additive manufacturing powder feedstocks*, **Oral presentation**, TMS 2016, Nashville, TN, USA. 18 February 2016.

B.L. DeCost and E.A. Holm, *Applying graph kernel methods for understanding abnormal grain growth*, **Oral presentation**, TMS 2016, Nashville, TN, USA. 18 February 2016.

B.L. DeCost, *Microstructure as visual texture: keypoint-based computer vision techniques for microstructure characterization*, **Invited oral presentation**, Air Force Research Laboratory, Dayton, OH, USA. 10 February 2016.

2015 B.L. DeCost and E.A. Holm, *Computer vision for automatic microstructure characterization*, **Oral presentation**, MS&T 2015, Columbus, OH, USA. 6 October 2015.

B.L. DeCost and E.A. Holm, *Network features and rare microstructural events*, **Poster presentation**, MS&T 2015, Columbus, OH, USA. 6 October 2015.

B.L. DeCost and E.A. Holm, *An automatic microstructure recognition system*, **Poster presentation**, Gordon Research Conference on Physical Metallurgy, Biddeford, ME, USA. 20 July 2015.

B.L. DeCost and E.A. Holm, *The transgranular network: predicting rare microstructural events*, **Oral presentation**, TMS 2015, Orlando, FL, USA. 17 March 2015.

B.L. DeCost and E.A. Holm, *An automatic microstructure recognition system*, **Poster presentation**, TMS 2015, Orlando, FL, USA. 16 March 2015.

2014 B.L. DeCost and E.A. Holm, *Abnormal grain growth due to non-uniform grain boundary mobility*, **Oral presentation**, MS&T 2014, Pittsburgh, PA, USA. 16 October 2014.

B.L. DeCost, *Using SPPARKS for microstructure science*, **Oral presentation**, Carnegie Mellon Summer School on 3D Microstructure, Pittsburgh, PA, USA. 11 July 2014.

B.L. DeCost, *Towards stable nanocrystalline metals: a computational approach*, **Oral presentation**, ASM Young Members Night, Pittsburgh, PA, USA. 20 February 2014.

2013 B.L. DeCost and E.A. Holm, *Monte Carlo study of low temperature abnormal grain growth: on the influence of high mobility boundaries*, **Poster presentation**, MS&T 2013, Montréal, QC, Canada. October 2013.

2012 B.L. DeCost, R. Mueller, and S. Vasenkov, *Monte Carlo simulation of long range self-diffusion in model porous membranes*, **Poster presentation**, University of Florida Undergraduate Research Symposium, Gainesville, FL, USA. March 2012.

Awards

March 2015 **Best Poster Presentation**, *MSE Graduate Symposium*, Carnegie Mellon University.
January 2015 **John and Claire Bertucci Graduate Fellowship**.
April 2008 **Eagle Scout Rank**, *Boy Scouts of America*.

Relevant Graduate Coursework

Fall 2014 **27-750**, *Advanced Characterization and Microstructural Analysis*.
Fall 2014 **06-640**, *Principles and Applications of Molecular (DFT) Simulations*.
Spring 2013 **24-623**, *Molecular Dynamics Simulations of Materials*.
Spring 2013 **15-618**, *Parallel Computer Architecture and Programming*.
Spring 2013 **27-705**, *Nanostructured Materials*.

Computing

Languages	Python, C/C++, UNIX shell, Julia, R, MATLAB		
Modeling	SPPARKS, VASP, LAMMPS	Platforms	GNU/Linux, MacOS, Windows
Parallel	MPI, CUDA, OpenMP	Typography	LaTeX, beamer
Development	git, emacs	Debugging	gdb, valgrind, linux perf

bdecost [at] andrew [dot] cmu [dot] edu
www.andrew.cmu.edu/user/bdecost • *orcid.org/0000-0002-3459-5888*