

# Nathan Jacobs

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## Areas of Expertise

Computer Vision, Deep Learning, Remote Sensing, Medical Imaging, Multimodal Integration

## Contents

|                                 |           |
|---------------------------------|-----------|
| <b>1 Education</b>              | <b>1</b>  |
| <b>2 Awards</b>                 | <b>2</b>  |
| <b>3 Publications</b>           | <b>2</b>  |
| <b>4 Funding</b>                | <b>11</b> |
| <b>5 Talks</b>                  | <b>15</b> |
| <b>6 Service</b>                | <b>18</b> |
| <b>7 Teaching and Mentoring</b> | <b>20</b> |

## 1 Education

|           |   |                                    |
|-----------|---|------------------------------------|
| 2005–2010 | Ph.D. in Computer Science<br>Adviser: Robert Pless<br>Thesis: Calibrating and Using the Global Network of Outdoor Webcams | Washington University in St. Louis |
| 1995–1999 | B.S. in Computer Science (Minor in Mathematics)<br><i>Summa Cum Laude</i> with Honors                                     | University of Missouri             |

## Appointments and Affiliations

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|--|--|
| <b>Professor</b><br>2021–present                                   | Dept. of Computer Science, University of Kentucky<br><i>Lexington, KY</i>            |
| <b>Director of Graduate Studies (Data Science)</b><br>2020–present | Dept. of Computer Science, University of Kentucky<br><i>Lexington, KY</i>            |
| <b>Owner</b><br>2019–present                                       | Multidomain Vision Research, LLC<br><i>Lexington, KY</i>                             |
| <b>Member</b><br>2017–present                                      | Institute for Biomedical Informatics, University of Kentucky<br><i>Lexington, KY</i> |

|  |   |
|--|---|
| <b>Affiliated Faculty</b><br>2013–present                    | Unmanned Systems Research Consortium, University of Kentucky<br><i>Lexington, KY</i>              |
| <b>Associate Professor</b><br>2016–2021                      | Dept. of Computer Science, University of Kentucky<br><i>Lexington, KY</i>                         |
| <b>co-Department Chair (interim)</b><br>2019–2020            | Dept. of Computer Science, University of Kentucky<br><i>Lexington, KY</i>                         |
| <b>Affiliated Faculty</b><br>2010–2019                       | Center for Visualization and Virtual Environments, University of Kentucky<br><i>Lexington, KY</i> |
| <b>Visiting Research Scientist</b><br>2017–2018 (sabbatical) | Orbital Insight, Inc.<br><i>Mountain View, CA</i>   |
| <b>Assistant Professor</b><br>2010–2016                      | Dept. of Computer Science, University of Kentucky<br><i>Lexington, KY</i>                         |
| <b>Computer Vision Research Intern</b><br>2008 (May–Aug)     | ObjectVideo, Inc.<br><i>Reston, VA</i>  |
| <b>Graduate Research Assistant</b><br>2005–2010              | Dept. of Computer Science & Engineering, Washington University<br><i>St. Louis, MO</i>            |

## 2 Awards

- Outstanding Reviewer Recognition (top 10%) [NeurIPS 2020]
- Outstanding Reviewer Recognition [ICCV 2019]
- University of Kentucky, College of Engineering Dean’s Award for Excellence in Research [2018]
- Google Faculty Research Award [2018]
- Outstanding Reviewer Recognition [CVPR 2017]
- National Science Foundation CAREER Award [2016]
- Google Faculty Research Award [2016]
- Best Student Paper Award at Applied Imagery Pattern Recognition [2009]
- Ph.D. Forum Prize at the ACM/IEEE International Conference on Distributed Smart Cameras [2009]
- Best Talk Award for the Doctoral Student Seminar, Department of Computer Science, the Washington University in St. Louis, [Fall 2006]

## 3 Publications

### Journal Articles

- [1] G. Liang, C. Greenwell, Y. Zhang, *et al.*, “Contrastive cross-modal pre-training: A general strategy for small sample medical imaging,” *IEEE Journal of Biomedical and Health Informatics*, 2021. DOI: [10.1109/JBHI.2021.3110805](https://doi.org/10.1109/JBHI.2021.3110805).
- [2] Y. Su, Y. Zhang, G. Liang, *et al.*, “A deep learning view of the census of galaxy clusters in IllustrisTNG,” *Monthly Notices of the Royal Astronomical Society (MNRAS)*, 2020, Impact factor: 5.356. DOI: [10.1093/mnras/staa2690](https://doi.org/10.1093/mnras/staa2690).

- [3] T. C. Hammond, X. Xing, C. Wang, *et al.*, “Beta-amyloid and tau drive early Alzheimer’s disease decline while glucose hypometabolism drives late decline,” *Communications Biology*, vol. 3, no. 1, p. 352, Jul. 2020. DOI: [10.1038/s42003-020-1079-x](https://doi.org/10.1038/s42003-020-1079-x).
- [4] J. Zhu, A. Nolte, N. Jacobs, and M. Ye, “Machine learning in identifying karst sinkholes from LiDAR-derived topographic depressions in the Bluegrass region of Kentucky,” *Journal of Hydrology*, Sep. 2020, Impact factor: 4.405. DOI: [10.1016/j.jhydrol.2020.125049](https://doi.org/10.1016/j.jhydrol.2020.125049).
- [5] X. Wang, G. Liang, Y. Zhang, H. Blanton, Z. Bessinger, and N. Jacobs, “Inconsistent performance of deep learning models on mammogram classification,” *Journal of the American College of Radiology*, 2020, Impact factor: 3.785. DOI: [10.1016/j.jacr.2020.01.006](https://doi.org/10.1016/j.jacr.2020.01.006).
- [6] R. V. Mareto, L. M. G. Fonseca, N. B. Jacobs, T. S. Körting, H. N. Bendini, and L. L. Parente, “Spatio-temporal deep learning approach to map deforestation in Amazon rainforest,” *IEEE Geoscience and Remote Sensing Letters*, vol. 18, no. 5, pp. 771–775, 2021, Impact factor: 3.534. DOI: [10.1109/LGRS.2020.2986407](https://doi.org/10.1109/LGRS.2020.2986407).
- [7] H. Hamraz, N. B. Jacobs, M. A. Contreras, and C. H. Clark, “Deep Learning for Conifer/Deciduous Classification of Airborne LiDAR 3D Point Clouds Representing Individual Trees,” *ISPRS Journal of Photogrammetry and Remote Sensing*, vol. 158, pp. 219–230, 2019, Impact factor: 6.946, ISSN: 0924-2716. DOI: [10.1016/j.isprsjprs.2019.10.011](https://doi.org/10.1016/j.isprsjprs.2019.10.011).
- [8] R. P. Mihail, G. Liang, and N. Jacobs, “Automatic hand skeletal shape estimation from radiographs,” *IEEE Transactions on NanoBioscience*, 2019, Impact factor: 1.927. DOI: [10.1109/TNB.2019.2911026](https://doi.org/10.1109/TNB.2019.2911026).
- [9] H. Sajid, N. Jacobs, and S.-c. S. Cheung, “Motion and appearance based background subtraction for freely moving cameras,” *Signal Processing: Image Communication*, 2019, Impact factor: 2.814. DOI: [10.1016/j.image.2019.03.003](https://doi.org/10.1016/j.image.2019.03.003).
- [10] X. Zhang, Y. Zhang, E. Han, *et al.*, “Classification of whole mammogram and tomosynthesis images using deep convolutional neural networks,” *IEEE Transactions on NanoBioscience*, 2018, Impact factor: 1.927. DOI: [10.1109/TNB.2018.2845103](https://doi.org/10.1109/TNB.2018.2845103).
- [11] H. Sajid, S.-c. S. Cheung, and N. Jacobs, “Appearance based background subtraction for PTZ cameras,” *Signal Processing: Image Communication*, Jul. 2016, Impact factor: 1.602. DOI: [10.1016/j.image.2016.07.008](https://doi.org/10.1016/j.image.2016.07.008).
- [12] N. Jacobs, S. Workman, and R. Souvenir, “Cloudmaps from static ground-view video,” *Image and Vision Computing (IVC)*, vol. 52, pp. 154–166, Aug. 2016, Impact factor: 1.766. DOI: [10.1016/j.imavis.2016.05.013](https://doi.org/10.1016/j.imavis.2016.05.013).
- [13] M. T. Islam, C. Greenwell, R. Souvenir, and N. Jacobs, “Large-scale geo-facial image analysis,” *EURASIP Journal on Image and Video Processing (JIVP)*, vol. 2015, no. 1, pp. 1–14, Jun. 2015, Impact factor: 1.060. DOI: [10.1186/s13640-015-0070-9](https://doi.org/10.1186/s13640-015-0070-9).
- [14] S. Workman, R. Souvenir, and N. Jacobs, “Scene shape estimation from multiple partly cloudy days,” *Computer Vision and Image Understanding (CVIU)*, pp. 116–129, Apr. 2015, Impact factor: 1.54. DOI: [10.1016/j.cviu.2014.10.002](https://doi.org/10.1016/j.cviu.2014.10.002).
- [15] N. Jacobs, A. Abrams, and R. Pless, “Two cloud-based cues for estimating scene structure and camera calibration,” *IEEE Transactions on Pattern Analysis and Machine Intelligence (PAMI)*, vol. 35, no. 10, pp. 2526–2538, 2013, Impact factor: 4.795, ISSN: 0162-8828. DOI: [10.1109/TPAMI.2013.55](https://doi.org/10.1109/TPAMI.2013.55).
- [16] N. Jacobs and R. Pless, “Time scales in video surveillance,” *IEEE Transactions on Circuits and Systems for Video Technology (CSVT)*, vol. 18, no. 8, pp. 1106–1113, 2008, Impact factor: 2.615. DOI: [10.1109/TCSVT.2008.928215](https://doi.org/10.1109/TCSVT.2008.928215).

## Patents

- [1] N. Jacobs and S. Workman, *Network architecture for generating a labeled overhead image*, US Patent App. 16/045,606, Jan. 2020.

- [2] J. A. G. Whitney, J. T. Fessler, Z. C. N. Kratzer, N. B. Jacobs, A. M. Whitney, *et al.*, *Method and system for estimating error in predicted distance using RSSI signature*, Jan. 2016.

## Book Chapters

- [1] R. P. Mihail, N. Jacobs, J. Goldsmith, and K. Lohr, “Using visual analytics to inform rheumatoid arthritis patient choices,” in *Serious Games Analytics*, ser. Advances in Game-Based Learning, C. S. Loh, Y. Sheng, and D. Ifenthaler, Eds., Springer International Publishing, 2015, pp. 211–231, ISBN: 978-3-319-05833-7. DOI: [10.1007/978-3-319-05833-7\\_9](https://doi.org/10.1007/978-3-319-05833-7_9).

## Refereed Conference Papers

- [1] G. Liang, X. Xing, L. Liu, *et al.*, “2d convolutional neural networks for alzheimer’s disease mri classification,” in *International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, Oct. 2021.
- [2] Q. Ying, X. Xing, L. Liu, A.-L. Lin, N. Jacobs, and G. Liang, “Multi-modal data analysis for alzheimer’s disease diagnosis: An ensemble model using imagery and genetic features,” in *International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, Oct. 2021.
- [3] B. Brodie, S. Khanal, M. U. Rafique, C. Greenwell, and N. Jacobs, “Hierarchical probabilistic embeddings for multi-view image classification,” in *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, Jul. 2021.
- [4] D. Jones and N. Jacobs, “Intensity harmonization for airborne LiDAR,” in *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, Jul. 2021.
- [5] Y. Zhang, G. Liang, Y. Su, and N. Jacobs, “Multi-branch attention networks for classifying galaxy clusters,” in *International Conference on Pattern Recognition (ICPR 2020)*, Acceptance rate: 28.47%, Jan. 2021.
- [6] M. U. Rafique, H. Blanton, N. Snively, and N. Jacobs, “Generative Appearance Flow: A hybrid approach for outdoor view synthesis,” in *British Machine Vision Conference (BMVC)*, Sep. 2020.
- [7] G. Liang, Y. Zhang, X. Wang, and N. Jacobs, “Improved trainable calibration method for neural networks,” in *British Machine Vision Conference (BMVC)*, Sep. 2020.
- [8] A. Hadzic, G. Christie, J. Freeman, *et al.*, “Estimating displaced populations from overhead,” in *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, 2020.
- [9] S. Workman, M. U. Rafique, H. Blanton, C. Greenwell, and N. Jacobs, “Single image cloud detection via multi-image fusion,” in *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, (oral), 2020.
- [10] H. Blanton, S. Grate, and N. Jacobs, “Surface modeling for airborne LiDAR,” in *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, (oral), 2020.
- [11] G. Liang, X. Wang, Y. Zhang, and N. Jacobs, “Weakly-supervised self-training for breast cancer localization,” in *International Conference of the IEEE Engineering in Medicine and Biology Society (EMBC)*, (oral), 2020. DOI: [10.1109/EMBC44109.2020.9176617](https://doi.org/10.1109/EMBC44109.2020.9176617).
- [12] T. Salem, S. Workman, and N. Jacobs, “Learning a dynamic map of visual appearance,” in *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Acceptance rate: 25%, 2020. DOI: [10.1109/CVPR42600.2020.01245](https://doi.org/10.1109/CVPR42600.2020.01245).
- [13] S. Workman and N. Jacobs, “Dynamic traffic modeling from overhead imagery,” in *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Acceptance rate: 5.7% (oral), 2020. DOI: [10.1109/CVPR42600.2020.01233](https://doi.org/10.1109/CVPR42600.2020.01233).
- [14] Y. Zhang, X. Wang, H. Blanton, G. Liang, X. Xing, and N. Jacobs, “2d convolutional neural networks for 3d digital breast tomosynthesis classification,” in *IEEE International Conference on Bioinformatics and Biomedicine (BIBM)*, Acceptance rate: 18% (oral), 2019. DOI: [10.1109/BIBM47256.2019.8983097](https://doi.org/10.1109/BIBM47256.2019.8983097).

- [15] G. Liang, X. Wang, Y. Zhang, *et al.*, “Joint 2d-3d breast cancer classification,” in *IEEE International Conference on Bioinformatics and Biomedicine (BIBM)*, Acceptance rate: 18% (oral), 2019. DOI: [10.1109/BIBM47256.2019.8983048](https://doi.org/10.1109/BIBM47256.2019.8983048).
- [16] T. Salem, C. Greenwell, H. Blanton, and N. Jacobs, “Learning to map nearly anything,” in *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, (oral), 2019. DOI: [10.1109/IGARSS.2019.8900646](https://doi.org/10.1109/IGARSS.2019.8900646).
- [17] W. Song, T. Salem, H. Blanton, and N. Jacobs, “Remote estimation of free-flow speeds,” in *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, (oral), 2019. DOI: [10.1109/IGARSS.2019.8900286](https://doi.org/10.1109/IGARSS.2019.8900286).
- [18] M. U. Rafique and N. Jacobs, “Weakly supervised building segmentation from aerial images,” in *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, 2019. DOI: [10.1109/IGARSS.2019.8898812](https://doi.org/10.1109/IGARSS.2019.8898812).
- [19] G. Liang, S. Fouladvand, J. Zhang, M. A. Brooks, N. Jacobs, and J. Chen, “GANai: Standardizing CT images using generative adversarial network with alternative improvement,” in *IEEE International Conference on Healthcare Informatics (ICHI)*, 2019. DOI: [10.1109/ICHI.2019.8904763](https://doi.org/10.1109/ICHI.2019.8904763).
- [20] Z. Bessinger and N. Jacobs, “A generative model of worldwide facial appearance,” in *IEEE Winter Conference on Applications of Computer Vision (WACV)*, (oral), 2019. DOI: [10.1109/WACV.2019.00172](https://doi.org/10.1109/WACV.2019.00172).
- [21] R. P. Mihail and N. Jacobs, “Automatic hand skeletal shape estimation from radiographs,” in *IEEE International Conference on Bioinformatics and Biomedicine (BIBM)*, Acceptance rate: 19.6%, 2018. DOI: [10.1109/BIBM.2018.8621196](https://doi.org/10.1109/BIBM.2018.8621196).
- [22] N. Jacobs, A. Kraft, M. U. Rafique, and R. D. Sharma, “A weakly supervised approach for estimating spatial density functions from high-resolution satellite imagery,” in *ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM SIGSPATIAL)*, Acceptance rate: 22.5% (oral), 2018. DOI: [10.1145/3274895.3274934](https://doi.org/10.1145/3274895.3274934).
- [23] S. Schuster, M. Zhai, N. Jacobs, and M. Chandraker, “Learning to look around objects for top-view representations of outdoor scenes,” in *European Conference on Computer Vision (ECCV)*, Acceptance rate: 31.8%, 2018. DOI: [10.1007/978-3-030-01267-0\\_48](https://doi.org/10.1007/978-3-030-01267-0_48).
- [24] M. Zhai, T. Salem, C. Greenwell, S. Workman, R. Pless, and N. Jacobs, “Learning geo-temporal image features,” in *British Machine Vision Conference (BMVC)*, Acceptance rate: 29.5%, 2018.
- [25] W. Song, S. Workman, A. Hadzic, *et al.*, “FARSA: Fully automated roadway safety assessment,” in *IEEE Winter Conference on Applications of Computer Vision (WACV)*, 2018. DOI: [10.1109/WACV.2018.00063](https://doi.org/10.1109/WACV.2018.00063).
- [26] C. Greenwell, S. Workman, and N. Jacobs, “What goes where: Predicting object distributions from above,” in *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, 2018. DOI: [10.1109/IGARSS.2018.8519251](https://doi.org/10.1109/IGARSS.2018.8519251).
- [27] T. Salem, M. Zhai, S. Workman, and N. Jacobs, “A multimodal approach to mapping soundscapes,” in *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, 2018. DOI: [10.1109/IGARSS.2018.8517977](https://doi.org/10.1109/IGARSS.2018.8517977).
- [28] D. Jones, J. Bopaiah, F. Alghamedy, *et al.*, “Polypharmacology within the full kinome: A machine learning approach,” in *AMIA Informatics Summit*, 2018.
- [29] X. Zhang, Y. Zhang, E. Han, *et al.*, “Whole mammogram image classification with convolutional neural networks,” in *IEEE International Conference on Bioinformatics and Biomedicine (BIBM)*, Acceptance rate: 19%, 2017. DOI: [10.1109/BIBM.2017.8217738](https://doi.org/10.1109/BIBM.2017.8217738).
- [30] S. Workman, M. Zhai, D. Crandall, and N. Jacobs, “A unified model for near and remote sensing,” in *IEEE International Conference on Computer Vision (ICCV)*, Acceptance rate: 28.9%, 2017. DOI: [10.1109/ICCV.2017.293](https://doi.org/10.1109/ICCV.2017.293).

- [31] S. Workman, R. Souvenir, and N. Jacobs, “Understanding and mapping natural beauty,” in *IEEE International Conference on Computer Vision (ICCV)*, Acceptance rate: 28.9%, 2017. DOI: [10.1109/ICCV.2017.596](https://doi.org/10.1109/ICCV.2017.596).
- [32] N. Vo, N. Jacobs, and J. Hays, “Revisiting IM2GPS in the deep learning era,” in *IEEE International Conference on Computer Vision (ICCV)*, Acceptance rate: 28.9%, 2017. DOI: [10.1109/ICCV.2017.286](https://doi.org/10.1109/ICCV.2017.286).
- [33] M. Zhai, Z. Bessinger, S. Workman, and N. Jacobs, “Predicting ground-level scene layout from aerial imagery,” in *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Acceptance rate: 29.2%, 2017. DOI: [10.1109/CVPR.2017.440](https://doi.org/10.1109/CVPR.2017.440).
- [34] Z. Bessinger, C. Stauffer, and N. Jacobs, “Who goes there? Approaches to mapping facial appearance diversity,” in *ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM SIGSPATIAL)*, 2016. DOI: [10.1145/2996913.2996997](https://doi.org/10.1145/2996913.2996997).
- [35] S. Workman, M. Zhai, and N. Jacobs, “Horizon lines in the wild,” in *British Machine Vision Conference (BMVC)*, Acceptance rate: 39.4%, 2016.
- [36] M. Zhai, S. Workman, and N. Jacobs, “Camera geo-calibration using an MCMC approach,” in *IEEE International Conference on Image Processing (ICIP)*, Acceptance rate: 45%, 2016. DOI: [10.1109/ICIP.2016.7532905](https://doi.org/10.1109/ICIP.2016.7532905).
- [37] Z. Bessinger and N. Jacobs, “Quantifying curb appeal,” in *IEEE International Conference on Image Processing (ICIP)*, Acceptance rate: 45%, 2016. DOI: [10.1109/ICIP.2016.7533189](https://doi.org/10.1109/ICIP.2016.7533189).
- [38] M. Zhai, S. Workman, and N. Jacobs, “Detecting vanishing points using global image context in a non-Manhattan world,” in *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Acceptance rate: 29.9%, 2016. DOI: [10.1109/CVPR.2016.610](https://doi.org/10.1109/CVPR.2016.610).
- [39] T. Salem, S. Workman, M. Zhai, and N. Jacobs, “Analyzing human appearance as a cue for dating images,” in *IEEE Winter Conference on Applications of Computer Vision (WACV)*, Acceptance rate: 42.3%, 2016, pp. 1–8. DOI: [10.1109/WACV.2016.7477678](https://doi.org/10.1109/WACV.2016.7477678).
- [40] R. Baltenberger, M. Zhai, C. Greenwell, S. Workman, and N. Jacobs, “A fast method for estimating transient scene properties,” in *IEEE Winter Conference on Applications of Computer Vision (WACV)*, Acceptance rate: 42.3%, 2016, pp. 1–8. DOI: [10.1109/WACV.2016.7477713](https://doi.org/10.1109/WACV.2016.7477713).
- [41] R. P. Mihail, S. Workman, Z. Bessinger, and N. Jacobs, “Sky segmentation in the wild: An empirical study,” in *IEEE Winter Conference on Applications of Computer Vision (WACV)*, Acceptance rate: 42.3%, 2016, pp. 1–6. DOI: [10.1109/WACV.2016.7477637](https://doi.org/10.1109/WACV.2016.7477637).
- [42] S. Workman, R. Souvenir, and N. Jacobs, “Wide-area image geolocation with aerial reference imagery,” in *IEEE International Conference on Computer Vision (ICCV)*, Acceptance rate: 30.3%, 2015, pp. 1–9. DOI: [10.1109/ICCV.2015.451](https://doi.org/10.1109/ICCV.2015.451).
- [43] C. Murdock, N. Jacobs, and R. Pless, “Building dynamic cloud maps from the ground up,” in *IEEE International Conference on Computer Vision (ICCV)*, Acceptance rate: 30.3%, 2015, pp. 1–9. DOI: [10.1109/ICCV.2015.85](https://doi.org/10.1109/ICCV.2015.85).
- [44] S. Workman, C. Greenwell, M. Zhai, R. Baltenberger, and N. Jacobs, “DeepFocal: A method for direct focal length estimation,” in *IEEE International Conference on Image Processing (ICIP)*, Acceptance rate: 45% (overall), 2015. DOI: [10.1109/ICIP.2015.7351024](https://doi.org/10.1109/ICIP.2015.7351024).
- [45] M. T. Islam, S. Workman, and N. Jacobs, “Face2GPS: Estimating geographic location from facial features,” in *IEEE International Conference on Image Processing (ICIP)*, Acceptance rate: 45% (overall), 2015. DOI: [10.1109/ICIP.2015.7351072](https://doi.org/10.1109/ICIP.2015.7351072).
- [46] S. Workman, R. P. Mihail, and N. Jacobs, “A Pot of Gold: Rainbows as a calibration cue,” in *European Conference on Computer Vision (ECCV)*, Acceptance rate: 25%, 2014, pp. 820–835. DOI: [10.1007/978-3-319-10602-1\\_53](https://doi.org/10.1007/978-3-319-10602-1_53).
- [47] F. Shi, M. Zhai, D. Duncan, and N. Jacobs, “MPCA: EM-based PCA for mixed-size image datasets,” in *IEEE International Conference on Image Processing (ICIP)*, Acceptance rate: 40%, 2014, pp. 1807–1811. DOI: [10.1109/ICIP.2014.7025362](https://doi.org/10.1109/ICIP.2014.7025362).



- [48] A. Whitney, J. Fessler, J. Parker, and N. Jacobs, “Received signal strength indication signature for passive UHF tags,” in *IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM)*, 2014, pp. 1183–1187. DOI: [10.1109/AIM.2014.6878242](https://doi.org/10.1109/AIM.2014.6878242).
- [49] M. Zhai, F. Shi, D. Duncan, and N. Jacobs, “Covariance-based PCA for multi-size data,” in *International Conference on Pattern Recognition (ICPR)*, Acceptance rate: 56.2%, 2014, pp. 1603–1608. DOI: [10.1109/ICPR.2014.284](https://doi.org/10.1109/ICPR.2014.284).
- [50] M. T. Islam, S. Workman, H. Wu, R. Souvenir, and N. Jacobs, “Exploring the geo-dependence of human face appearance,” in *IEEE Winter Conference on Applications of Computer Vision (WACV)*, Acceptance rate: 40%, 2014, pp. 1042–1049. DOI: [10.1109/WACV.2014.6835989](https://doi.org/10.1109/WACV.2014.6835989).
- [51] N. Jacobs, J. King, D. Bowers, and R. Souvenir, “Estimating cloud maps from outdoor image sequences,” in *IEEE Winter Conference on Applications of Computer Vision (WACV)*, Acceptance rate: 40%, 2014, pp. 961–968. DOI: [10.1109/WACV.2014.6836000](https://doi.org/10.1109/WACV.2014.6836000).
- [52] R. P. Mihail, G. Blomquist, and N. Jacobs, “A CRF approach to fitting a generalized hand skeleton model,” in *IEEE Winter Conference on Applications of Computer Vision (WACV)*, Acceptance rate: 40%, 2014, pp. 409–416. DOI: [10.1109/WACV.2014.6836070](https://doi.org/10.1109/WACV.2014.6836070).
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## Workshop Papers

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- [3] H. Blanton, C. Greenwell, S. Workman, and N. Jacobs, “Extending absolute pose regression to multiple scenes,” in *Joint Workshop on Long-Term Visual Localization, Visual Odometry and Geometric and Learning-based SLAM (CVPR Workshop)*, 2020.
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## Abstracts

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- [4] C. Greenwell, S. Workman, and N. Jacobs, “Implicit land use mapping using social media imagery,” in *IEEE Applied Imagery and Pattern Recognition (AIPR)*, (oral), 2019. DOI: [10.1109/AIPR47015.2019.9174570](https://doi.org/10.1109/AIPR47015.2019.9174570).
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- [11] D. Jones, N. Jacobs, and S. Ellingson, “Learning deep feature representations for kinase polypharmacology,” in *ACM Richard Tapia Celebration of Diversity in Computing Conference*, 2018.
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## Technical Reports

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## Datasets

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- [2] S. Workman and N. Jacobs, *Crossview USA (CVUSA): A large dataset containing millions of pairs of ground-level and aerial/satellite images from across the United States*. <https://mvrl.github.io/CVUSA>.
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- [4] T. Salem, S. Workman, M. Zhai, and N. Jacobs, *Face2Year: A large number of images extracted from highschool yearbooks*, <https://mvrl.github.io/Face2Year>.
- [5] S. Workman, M. Zhai, and N. Jacobs, *Horizon Lines in the Wild (HLW): A large database of images with known horizon-line location*, <http://mvrl.github.io/HLW>.
- [6] A. Abrams, J. Tucek, J. Little, N. Jacobs, and R. Pless, *LOST: Longterm observation of scenes (with tracks)*, <http://mvrl.github.io/LOST>.
- [7] M. U. Rafique, H. Blanton, and N. Jacobs, *Brooklyn Panorama Synthesis: A large dataset of panoramic images suitable for view synthesis evaluation*. <https://mvrl.github.io/GAF>.
- [8] S. Workman and N. Jacobs, *Cross-View ScenicOrNot (CVSoN)*, <https://mvrl.github.io/CVSoN>.
- [9] T. Salem, S. Workman, M. Zhai, and N. Jacobs, *Cross-View Time (CVT)*, <https://mvrl.github.io/CVT>.
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## 4 Funding

### Grants (awarded/active)

1. *WATCH: Wide Area Terrestrial Change Hypercube*  
PI: **Nathan Jacobs**  
Sponsor: Kitware / Intelligence Advanced Research Projects Activity (IARPA)  
Total Award: \$305,941.48 (Phase 1); \$851,489 (Phase 1–3)  
Duration: 2020–2022 (Phase 1); 2020–2024 (Phase 1–3)
2. *NURI: Semantic Representations for Multi-Viewpoint Multimodal Geolocation*  
PI: **Nathan Jacobs**  
Sponsor: Johns Hopkins University, Applied Physics Laboratory / National Geospatial-Intelligence Agency (NGA)  
Total Award: \$196,000 (base)  
Duration: 2020–2022
3. *Measures of Information via Representation Learning*  
PI: Luis Sanchez-Giraldo  
Co-PI(s)/Co-I(s): **Nathan Jacobs**  
Sponsor: Department of Defense (DEPSCoR)  
Total Award: \$582,376  
Duration: 2021–2024
4. *R01: Ex vivo single molecule tools to analyze membrane receptor dynamics*  
PI: Christopher Richards  
Co-PI(s)/Co-I(s): Jim Pauly, Ahmed Abdel-Latif, David Heidary, **Nathan Jacobs**

Sponsor: National Institutes of Health (NIH)  
Total Award: \$1,510,803  
Duration: 2021–2024

5. *UL1: Kentucky Center for Clinical and Translational Science*

PI: Philip A. Kern  
Co-PI(s)/Co-I(s): **Nathan Jacobs** and many others  
Sponsor: National Institutes of Health (NIH)  
Total Award: \$28,893,663  
Duration: 2021–2026

6. *CCT: Context and Colorization for Tracking (Phase 2)*

PI: **Nathan Jacobs**  
Sponsor: Intelligent Automation Inc. / Defense Advanced Research Projects Agency (DARPA)  
Total Award: \$200,000  
Duration: 2020–2021

7. *GeoSearch: Image-based Geolocation using Rank Aggregated Hash Index (Phase 2, direct)*

PI: **Nathan Jacobs**  
Sponsor: Intelligent Automation Inc. / National Geospatial-Intelligence Agency (NGA)  
Total Award: \$250,000  
Duration: 2021–2023

8. *Spatio-Temporal Association and Curve Kernel Networks (STACKNet)*

PI: **Nathan Jacobs**  
Sponsor: \$483,000 (Phase 1 and 2)  
Total Award: Intelligent Automation Inc.  
Duration: 2020–2023

9. *ToFENet: Topographic Feature Extraction Network*

PI: **Nathan Jacobs**  
Sponsor: Intelligent Automation Inc. / National Geospatial-Intelligence Agency (NGA)  
Total Award: \$19,944 (Phase 1), \$249,988 (Phase 2), \$153,261 (Phase 3, Year 1)  
Duration: 2018–2022

10. *Video to Feature Data Association and Geolocation*

PI: **Nathan Jacobs**  
Sponsor: Novateur Research Solutions / National Geospatial-Intelligence Agency (NGA)  
Total Award: \$29,503 (Phase 1), \$149,883 (Phase 2)  
Duration: 2018–2021

## Grants (completed)

1. *CAREER: Learning and Using Models of Geo-Temporal Appearance*

PI: **Nathan Jacobs**  
Sponsor: National Science Foundation (NSF)  
Total Award: \$499,426  
Duration: 2016–2021

2. *R01: Monomeric G-proteins and Cardioprotection from Heart Failure*

PI: John Satin  
Co-PI(s)/Co-I(s): Douglas Andres, Ahmed Abdel-Latif, **Nathan Jacobs**, Peter Kekenyes-Huskey  
Sponsor: National Institutes of Health (NIH)

Total Award: \$1,575,279

Duration: 2016–2020

3. *Group Travel Grant for the Doctoral Consortium to be Held in Conjunction with IEEE Conference on Computer Vision and Pattern Recognition*

PI: **Nathan Jacobs**

Sponsor: National Science Foundation (NSF)

Total Award: \$22,500

Duration: 2019–2020

4. *DLALA: Deep Learning for Airborne LiDAR Analysis*

PI: **Nathan Jacobs**

Sponsor: Orbital Insight

Total Award: \$104,927

Duration: 2019–2020

5. *Listening to Markets: A Temporal Convolutional Net (TCN) Analysis of Conservatism in Company Reporting*

PI: Dan Stone

Co-PI(s)/Co-I(s): **Nathan Jacobs**, Mark Lauersdorf, Hong Xie

Sponsor: University of Kentucky

Total Award: \$33,315

Duration: 2018–2019

6. *Calibrated Pose Regression Networks*

PI: **Nathan Jacobs**

Sponsor: The Design Knowledge Company / Air Force Research Lab (Wright-Patterson AFB)

Total Award: \$155,700 (Phase 3)

Duration: 2018–2019

7. *Group Travel Grant for the PhD Forum to be Held in Conjunction with IEEE Winter Conference on Applications of Computer Vision*

PI: **Nathan Jacobs**

Sponsor: National Science Foundation (NSF)

Total Award: \$13,625

Duration: 2018–2019

8. *ASER Multi Center Review of Blunt Splenic Trauma: Optimal CT Diagnosis, Characterization*

PI: James Lee (Radiology)

Co-PI(s)/Co-I(s): David Nickels, **Nathan Jacobs**, Emily Slade

Sponsor: American Society of Emergency Radiology

Total Award: \$5,000

Duration: 2018–2019

9. *Mechanism of a Novel Stable Compensatory Cardiac Hypertrophy Model*

PI: Jonathan Satin

Co-PI(s)/Co-I(s): Douglas Andres, **Nathan Jacobs**, Moriel Vandsburger

Sponsor: American Heart Association

Total Award: \$154,000

Duration: 2016–2018

10. *NIP: GeoLookbook: Modeling Worldwide Human Visual Appearance*

PI: **Nathan Jacobs**

Sponsor: National Geospatial-Intelligence Agency (NGA)

Total Award: \$299,204

Duration: 2014–2018

11. *Crossview ConvNets for Near/Remote Sensing*  
PI: **Nathan Jacobs**  
Sponsor: Google  
Total Award: \$46,209  
Duration: 2016–2017
12. *WALDO: Wide Area Localization of Depicted Objects*  
PI: **Nathan Jacobs**  
Sponsor: Object Video / Intelligence Advanced Research Projects Activity (IARPA)  
Total Award: \$373,395  
Duration: 2012–2016
13. *CSSG: ContextualEyes: A Context-Aware Surveillance System*  
PI: **Nathan Jacobs**  
Sponsor: Defense Advanced Research Projects Agency (DARPA)  
Total Award: \$743,131  
Duration: 2011–2015
14. *Image-Net: Discriminatory Imaging and Network Advancement for Missiles, Aviation, and Space*  
PI: Brent Seales  
Co-PI(s)/Co-I(s): Ken Calvert, James Griffioen, Jane Hayes, **Nathan Jacobs**, Victor Marek, Thomas Seigler, Suzanne Smith, Mirosław Truszczyński, Ruigang Yang  
Sponsor: United States Army Space and Missile Defense Command / United States Army Forces Strategic Command  
Total Award: \$2,092,905  
Duration: 2011–2012

## Donations

1. *Google Cloud Compute Research Credits*  
PI: **Nathan Jacobs**  
Sponsor: Google  
Amount/Value: \$5,000  
Date: Aug 2018
2. *NVIDIA Titan X GPU*  
PI: **Nathan Jacobs**  
Sponsor: NVIDIA  
Amount/Value: \$778  
Date: Oct 2016
3. *AWS Research Education Grant*  
PI: **Nathan Jacobs**  
Sponsor: Amazon  
Amount/Value: \$5,000  
Date: Jul 2015
4. *NVIDIA Tesla K40 GPU*  
PI: **Nathan Jacobs**  
Sponsor: NVIDIA  
Amount/Value: \$3,900  
Date: Dec 2014



## 5 Talks

- “Mapping the Visual World Using Webcams, Cell Phones, and Satellites”, Dec 2020, University of Campinas, Unicamp, Brazil (virtual)
- “Exploring the Intersection of Localization, Mapping, and Image Understanding”, Aug 2020, ECCV Workshop on Long-Term Visual Localization (virtual)
- “Deep Convolutional Neural Networks: Foundations to Frontiers (a 2-day short course)”, Mar 2020, Brazilian Space Agency (INPE), Sao Jose dos Campos, Brazil
- “What, Where, and When: Mapping the World Using Webcams, Cell Phones, and Satellites”, Mar 2020, Brazilian Space Agency (INPE), Sao Jose dos Campos, Brazil
- “Learning to Map Visual Appearance”, Feb 2020, Keeping Current Seminar, University of Kentucky (Computer Science), Lexington, KY
- “Learning to Map Visual Appearance”, Jan 2020, Wageningen University, Netherlands
- “What, Where, and When: Mapping the World Using Webcams, Cell Phones, and Satellites”, Nov 2019, University of Kentucky (Forestry), Lexington, KY
- “Learning to Map the Visual World”, Jul 2019, Wright State University, Dayton, OH
- “Keynote: Understanding Places Using Ground-Level and Overhead Views”, May 2019, Kentucky Geological Society (Annual Symposium), Lexington, KY
- “Understanding Places Using Ground-Level and Overhead Views”, Feb 2019, Notre Dame University, South Bend, IN
- “A Generative Model of Worldwide Facial Appearance (Extended Keynote)”, Jan 2019, Workshop on Demographic Variations in Performance of Biometric Algorithms, Waikoloa Village, HI
- “A Generative Model of Worldwide Facial Appearance”, Jan 2019, IEEE Winter Conference on Applications of Computer Vision, Waikoloa Village, HI
- “A Weakly Supervised Approach for Estimating Spatial Density Functions from High-Resolution Satellite Imagery”, Nov 2018, ACM SIGSPATIAL, Seattle, WA
- “Understanding Places Using Ground-Level and Overhead Views”, Oct 2018, Commonwealth Computational Summit, Lexington, KY
- “GeoLookbook: Modeling Worldwide Human Visual Appearance (Year 4)”, Sep 2018, National Academy of Sciences (IC Academic Research Symposium), Washington, DC
- “Understanding Places Using Ground-Level and Overhead Views”, Aug 2018, Oak Ridge National Lab, Oak Ridge, TN
- “WhatGoesWhere: Predicting Object Distributions from Above”, Jul 2018, IGARSS, Valencia, Spain
- “Building World Models for Situated Training and Planning”, May 2018, Air Force Science and Technology 2030 Workshop, Bloomington, IN
- “Recent Advances in Image Understanding”, May 2018, DASC, Lexington, KY
- “(Tutorial) Recent Advances in Deep Learning: Fusing Overhead and Ground-Level Views for Remote Sensing”, April 2018, USGIF Annual Symposium, Tampa, FL

- “Understanding Places Using Ground-Level and Overhead Views”, Feb 2018, CVPR Area Chair Meeting, Toronto, Canada
- “GeoLookbook: Modeling Worldwide Human Visual Appearance (Year 3)”, Sep 2017, National Academy of Sciences (IC Academic Research Symposium), Washington, DC
- “GPU Accelerated Computer Vision, Remote Sensing, and Machine Learning”, Aug 2017, Kentucky Geological Service, Lexington, KY
- “Fusing Overhead and Ground-Level Imagery to Improve Scene Understanding”, Jul 2017, Planet, San Francisco, CA
- “Learning about When and Where from Imagery”, Jun 2017, Orbital Insight, Mountain View, CA
- “(Tutorial) Recent Advances in Deep Learning: Fusing Overhead and Ground-Level Views for Remote Sensing”, Jun 2017, USGIF Annual Symposium, San Antonio, TX
- “How Computers See People (extended)”, May 2017, CCTS Biomedical Informatics Seminar Series, Lexington, KY
- “Understanding Places Using Ground-Level and Overhead Views”, May 2017, Midwest Vision Meeting, Chicago, IL
- “How Computers See People”, Feb 2017, Suds’n’Science Speaker Series, West Sixth Brewing, Lexington, KY
- “Learning about When and Where from Imagery”, Feb 2017, University of Missouri, Department of Computer Science
- “Localization, Mapping, and Image Understanding”, Feb 2017, USGIF Machine Learning Symposium
- “Deep Convolutional Neural Networks: Concepts and Examples (in Computer Vision)”, Nov 2016, University of Kentucky, Society of Industrial and Applied Mathematics
- “Crossview Convolutional Networks”, Oct 2016, Applied Imagery and Pattern Recognition, Washington, D.C.
- “GeoLookbook: Modeling Worldwide Human Visual Appearance (Year 2)”, Sep 2016, National Academy of Sciences (IC Academic Research Symposium), Washington, DC
- “Deep Convolutional Neural Networks: Concepts and Examples”, Jul 2016, University of Kentucky: Systems Biology and Omics Integration Seminar
- “Crossview Methods for Localization and Mapping”, Jun 2016, IEEE CVPR Workshop on “Vision from Satellite to Street” (invited talk)
- “A Fast Method for Estimating Transient Scene Properties”, Mar 2016, Winter Conference on Applications of Computer Vision, Lake Placid, NY
- “Novel Cues for Geocalibration”, Feb 2016, Indiana University, Bloomington, IN
- “Novel Cues for Camera Geocalibration”, Jan 2016, Uber Advanced Technology Center, Pittsburgh, PA
- “Novel Cues for Geocalibration: Cloudy Days, Rainbows, and More”, Oct 2015, Carnegie Mellon University, Pittsburgh, PA
- “Using Geotagged Internet Imagery to Understand the World”, Sep 2015, Université Laval, Quebec City, Canada
- “face2gps: Estimating Geographic Location from Facial Features”, Sep 2015, International Conference on Image Processing, Quebec City, Canada

- “GeoLookbook: Modeling Worldwide Human Visual Appearance”, Sep 2015, National Academy of Sciences (IC Academic Research Symposium), Washington, DC
- “Exploring the Geo-Dependence of Human Face Appearance”, Mar 2014, Winter Conference on Applications of Computer Vision, Steamboat Springs, CO
- “Estimating Cloudmaps from Outdoor Image Sequences”, Mar 2014, Winter Conference on Applications of Computer Vision, Steamboat Springs, CO
- “Scene Geometry from Several Partly Cloudy Days”, Oct 2013, International Conference on Distributed Smart Cameras, Palm Springs, CA
- “Unlocking the Potential of the Global Network of Outdoor Webcams”, Apr 2013, Rochester Institute of Technology
- “Geo-temporal Computer Vision: Applications to the NGA”, Nov 2011, National Geospatial-Intelligence Agency
- “Geo-temporal Computer Vision: Applications to the Army”, Oct 2011, Army Research Lab
- “Localizing, Calibrating, and Using Thousands of Outdoor Webcams”, Feb 2011, University of North Carolina–Charlotte
- “Using Clouds Shadows to Infer Scene Structure and Camera Calibration”, Jun 2010, CVPR, San Francisco, CA
- “Passive Vision and The Power of Collective Imaging”, Apr 2010, Object Video Inc., Reston, VA
- “Localizing, Calibrating, and Using Thousands of Outdoor Webcams”, Apr 2010, University of Kentucky
- “Time-Lapse Vision: Localizing, Calibrating, and Using Thousands Outdoor Webcams”, Apr 2010, Google, Mountain View, CA
- “Passive Vision and The Power of Collective Imaging”, Jan 2010, Google, Mountain View, CA
- “Incorporating Domain Constraints in Urban Vehicle Tracking”, Nov 2010, University of Missouri, Columbia, MO
- “Compressive Sensing and Differential Image-Motion Estimation”, Mar 2010, ICASSP, Dallas, TX
- “The Global Network of Outdoor Webcams: Properties and Applications ”, Nov 2009, ACM GIS, Seattle, WA
- “Passive Vision: The Global Webcam Imaging Network”, Oct 2009, AIPR, Washington, DC
- “Calibrating and Using the Global Network of Outdoor Webcams”, Aug 2009, ICDSC, Italy
- “Adventures in Archiving and Using Three Years of Webcam Images”, Jun 2009, CVPR Workshop on Internet Vision, Miami, FL
- “Recent Work: Webcams and Grooves”, Aug 2009, Object Video, Reston, VA
- “Location-Specific Models for Tracking”, Jan 2008, WMVC, Copper Mountain, CO
- “Using natural cues to geo-locate and geo-orient distributed cameras”, Jan 2008, VISN, Copper Mountain, CO
- “Foreground Modeling: The Shape of Things That Came”, Feb 2007, WMVC, Austin, Texas

## 6 Service

### University Service

- 2019–present: Computer Science Department: Executive Committee
- 2019–present: College of Engineering: Master Planning/Space Committee
- 2018–2019, 2020–present: College of Engineering: Research Advisory Committee
- 2020–present: College of Engineering: Graduate Studies Team
- 2013–2017, 2018–present: Computer Science Department: Faculty Search Committee
- 2020–2021: Computer Science Department: Chair Search Committee
- 2020: College of Engineering: Recruiting Advisory Committee
- 2018–2019: University Senate (Academic Facilities Committee, Technology Committee)
- 2017: Member (Information Technology Task Force for Research Enablement and Outreach)
- 2015–2016: Computer Science Department: ABET Committee
- 2010–2012, 2015–2016: Computer Science Department: Media and Outreach
- 2013: Center for Visualization and Virtual Environment: Director Search Committee
- 2013: Computer Science Department: Chair Search Committee
- 2012–2013: Computer Science Department: Curriculum Development Committee
- 2012–2013, 2015: University of Kentucky Engineering Day (oral presentation and/or software demonstration)

### Professional Service

- Area Chair:
  - IEEE Conference on Computer Vision and Pattern Recognition (CVPR) [2018, 2019, 2021, 2022]
  - IEEE Winter Conference on Applications of Computer Vision (WACV) [2014, 2022 (Round 2)]
- Organizing Committees:
  - IEEE/ISPRS Workshop on Large Scale Computer Vision for Remote Sensing Imagery (EARTHVISION) [2019, 2020]
  - Doctoral Consortium Co-Chair: IEEE Conference on Computer Vision and Pattern Recognition (CVPR) [2017, 2019]
  - Doctoral Consortium Chair: IEEE Winter Conference on Applications of Computer Vision (WACV) [2018, 2022]
  - Video Proceedings Chair: IEEE Conference on Computer Vision and Pattern Recognition (CVPR) [2015]
  - IEEE Workshop on Motion and Video Computing [2011]
- Guest Editor:
  - Elsevier Computer Vision and Image Understanding (CVIU) [2019], Special Issue “Computer Vision for Remote Sensing”

- Session Chair:
  - IEEE International Geoscience and Remote Sensing Symposium (IGARSS) [2020]
  - IEEE/ISPRS Workshop on Large Scale Computer Vision for Remote Sensing Imagery (EARTHVISION) [2019]
  - IEEE Winter Conference on Applications of Computer Vision (WACV) [2016, 2019]
  - IEEE Conference on Computer Vision and Pattern Recognition (CVPR) [2018]
  - IEEE/ACM International Conference on Distributed Smart Cameras [2013]
- Reviewing for Journals:
  - IEEE Transactions on Geoscience and Remote Sensing [2020]
  - ISPRS Journal of Photogrammetry and Remote Sensing [2020]
  - IEEE Transactions on Pattern Analysis and Machine Intelligence [2011, 2011, 2012, 2018, 2019]
  - ISPRS Journal of Photogrammetry and Remote Sensing [2019]
  - IEEE Transactions on Geoscience and Remote Sensing [2017]
  - IEEE Transactions on Multimedia [2011, 2016]
  - Elsevier Computer Vision and Image Understanding [2010, 2013, 2016×2]
  - IEEE Transactions on Computational Imaging [2016]
  - IEEE Journal on Selected Topics in Remote Sensing [2015]
  - Springer Machine Vision and Applications [2014]
  - IEEE Sensors [2014]
  - Elsevier Image and Vision Computing [2013]
  - IEEE Transactions on Circuits and Systems for Video Technology [2007, 2008, 2009, 2010, 2011]
  - IEEE Computer Graphics and Applications [2010]
  - IEEE Transactions on Aerospace and Electronic Systems [2010]
  - Elsevier Computers and Electronics in Agriculture [2010]
  - Cartography and Geographic Information Science [2010]
- Program Committee / Reviewer for:
  - Conferences
    - \* International Conference on Learning Representations (ICLR) [2022]
    - \* IEEE Winter Conference on Applications of Computer Vision (WACV) [2021]
    - \* IEEE International Geoscience and Remote Sensing Symposium (IGARSS) [2020]
    - \* British Machine Vision Conference (BMVC) [2020]
    - \* IEEE Conference on Computer Vision and Pattern Recognition (CVPR) [2006–2017, 2020]
    - \* European Conference on Computer Vision (ECCV) [2010, 2014, 2020]
    - \* Neural Information Processing Systems (NeurIPS) [2010–2012, 2020]
    - \* AAAI Conference on Artificial Intelligence (AAAI) [2020]
    - \* IEEE International Conference on Computer Vision (ICCV) [2007, 2009, 2019, 2021]
    - \* Asian Conference on Computer Vision (ACCV) [2010, 2016]
    - \* IEEE International Conference on Robotics and Automation (ICRA) [2016]
    - \* International Conference on Machine Learning (ICML) [2012]

- \* IEEE International Conference on Advanced Video and Signal-Based Surveillance (AVSS) [2010]
- Workshops
  - \* IEEE/ISPRS Workshop on Large Scale Computer Vision for Remote Sensing Imagery (EARTHVISION) [2017, 2019, 2020]
  - \* CVPR Workshop on Photogrammetric Computer Vision [2019]
  - \* CVPR Workshop on DeepGlobe Satellite Challenge [2018]
  - \* ACM International Workshop on Geotagging and Its Applications [2013]
  - \* ICCV Workshop on Computer Vision for Converging Perspectives [2013]
  - \* IEEE Workshop on Applications of Computer Vision [2012–2013]
  - \* ECCV Workshop on Visual Analysis and Geo-Localization of Large-Scale Imagery [2012]
  - \* ACM Workshop on Geotagging and Its Applications in Multimedia [2012]
  - \* IEEE Workshop on Motion and Video Computation [2009–2011]
- Reviewing for Funding Agencies:
  - Panelist for NSF Information and Intelligent Systems Division [2019]
  - Panelist for NSF Information and Intelligent Systems Division [2018]
  - Panelist for NSF Information and Intelligent Systems Division [2017]
  - Panelist for NSF Division of Industrial Innovation and Partnerships [2016]
  - Panelist for NSF Information and Intelligent Systems Division [2016]
  - Panelist for NSF Information and Intelligent Systems Division [2015]
  - External reviewer for NSF Information and Intelligent Systems Division [2015]
  - External reviewer for Fonds de recherche du Quebec [2014]

## Memberships

- Senior Member: Institute of Electrical and Electronics Engineers
- Full Member: British Machine Vision Association and Society for Pattern Recognition
- Affiliate Member: International Association of Pattern Recognition

## 7 Teaching and Mentoring

### Courses Taught

- *Introduction to Machine Learning*, CS 460g, [F2012, F2013, F2014, F2016, F2018, F2019], University of Kentucky
- *Computer Vision*, CS 636, [S2011, S2013, S2017], University of Kentucky
- *Learning-Based Methods for Computer Vision*, CS 585/685, [S2015], University of Kentucky
- *Advanced Topics in Computer Science: Machine Learning*, CS 685, [S2012], University of Kentucky
- *Intermediate Topics in Computer Science: Computational Photography*, CS 585, [F2010, F2011], University of Kentucky
- *Theory of Computation*, CECS 341, [F2002], University of Missouri



- *Independent Work in Computer Science, CS 395/612, University of Kentucky:*

- F2019, “Applied Deep Learning”
- S2019, “Applied Deep Learning” (×5)
- F2018, “Applied Deep Learning” (×5)
- S2018, “Applied Deep Learning” (×4)
- F2017, “Applied Deep Learning”
- F2016, “Applied Deep Learning” (×6)
- S2016, “Applied Deep Learning: Understanding Urban Areas”
- S2015, “Understanding Real-Estate Imagery”
- F2014, “Recent Techniques in Machine Learning” (×4)
- F2014, “Learning-Based Methods for Background Subtraction”
- F2014, “A Novel Approach for Category-Level Object Detection from Partial Pose Estimation of Symmetric Objects”
- S2013, “Extracting Geo-Temporal Image Appearance Patterns from Flickr Imagery”
- S2013, “Automatic Camera Calibration Methods”
- S2013, “Deep-Learning Architectures for Computer Vision”
- F2012, “Automatic Image Geolocalization”
- S2012, “Image Calibration using Natural Scene Variations”
- F2011, “Practical Methods in Crowd Sourcing”

## Mentoring

### Postdoctoral Scholars

| Name            | Degree                                    | Research Focus                                      | Dates |
|-----------------|---|---|-------|
| Benjamin Brodie | Ph.D. Mathematics, University of Kentucky | Object Tracking, Re-Identification, Metric Learning | 2020– |

### Ph.D. Students

| Student Name                | Role                         | Thesis Title  | Date     |
|-----------------------------|------------------------------|---|----------|
| <a href="#">Paul Mihail</a> | <i>co-chair</i> w/ Goldsmith | Visualizing and Predicting the Effects of Rheumatoid Arthritis on Hands                         | May 2014 |
| Ju Shen                     | member                       | Computational Multimedia for Video Self Modeling  | May 2014 |
| Chenxi Zhang                | member                       | Depth-assisted Image Segmentation, Enhancement and Visualization                                | Dec 2014 |
| Mao Ye                      | member                       | 3D Reconstruction and Motion Analysis of Deformable Objects with Consumer Depth Cameras         | Dec 2014 |
| Yan Huang                   | member                       | Novel Computational Methods for Transcript Reconstruction and Quantification using RNA-SEQ Data | Dec 2014 |
| Shaoceng Wei                | outside examiner             | Multi-state Models for Interval Censored Data with Competing Risk                               | May 2015 |
| Bo Fu                       | member                       | Towards Intelligent Telerobotics: Visualization and Control of Remote Robot                     | May 2015 |

|  |                              |   |          |
|--|------------------------------|---|----------|
| Harikrishnan Unnikrishnan                                | member                       | Analysis of Vocal Fold Kinematics using High Speed Video  | Dec 2015 |
| Mohammad T. Islam  | <i>chair</i>                 | Analyzing the Geo-Dependence of Human Face Appearance and Its Applications  | Jul 2016 |
| Hasan Sajid  | member                       | Robust Background Subtraction for Moving Cameras and their Applications in Ego-vision Systems                     | Jul 2016 |
| Wesley Hough   | outside examiner             | On Independence, Matching, and Homomorphism Complexes   | May 2017 |
| Yajie Zhao   | member                       | 3D Human Face Reconstruction and 2D Appearance Synthesis  | Dec 2017 |
| Po-Chang Su  | member                       | Real-time Capture and Rendering of Physical Scene with an Efficiently Calibrated RGB-D Camera Network             | Dec 2017 |
| Hamid Hamraz   | <i>co-chair</i> w/ Contreras | Computational Forest Modeling using Airborne LiDAR  | Apr 2018 |
| <a href="#">Scott Workman</a>                            | <i>chair</i>                 | Leveraging Overhead Imagery for Localization, Mapping, and Understanding  | Apr 2018 |
| Anthony Rios   | member                       | Deep Neural Networks for Multi-Label Text Classification: Application to Coding Electronic Medical Records        | Jun 2018 |
| Ethan Welty (University of Colorado–Boulder)             | member                       | High-Precision Photogrammetry for Glaciology  | Jul 2018 |
| Yannick Hold-Geoffroy (Laval University, Quebec, CA)     | member                       | Learning Geometric and Lighting priors from Natural Images  | Aug 2018 |
| Nkiruka Uzuegbunam                                       | member                       | Self-Image Multimedia Technologies for Feedforward Observational Learning   | Oct 2018 |
| Menghua “Ted” Zhai                                       | <i>chair</i>                 | Deep Probabilistic Models for Camera Geo-Calibration  | Dec 2018 |
| <a href="#">Zach Bessinger</a>                           | <i>chair</i>                 | Modeling and Mapping Location-Dependent Human Appearance  | Dec 2018 |
| Nam Vo (Georgia Institute of Technology)                 | member                       | Image Geolocalization with Deep Learning  | May 2019 |
| Jinping Zhuge  | outside examiner             | Boundary layers in periodic homogenization  | May 2019 |
| Tawfiq Salem   | <i>chair</i>                 | Learning to Map the Visual and Auditory World   | Jul 2019 |
| Sifei Han  | member                       | Text Mining Methods for Analyzing Online Health Information and Communication                                     | Dec 2019 |
| Shivangi Srivastava (Wageningen University, Netherlands) | member                       | Mapping of urban landuse and landcover with multiple sensors: joining close and remote sensing with deep learning | Feb 2020 |
| Raian Maretto (National Institute for Space Research)    | member                       | Deep Learning techniques applied to classification of Remote Sensing Images                                       | Feb 2020 |

|   |                           |   |             |
|---|---------------------------|---|-------------|
| Kyle Helfrich   | member                    | Orthogonal Recurrent Neural Networks and Batch Normalization in Deep Neural Networks  | Apr 2020    |
| Xinxin Zuo  | member                    | Depth Enhancement and Surface Reconstruction with RGB-D sequence  | Oct 2019    |
| Narjes Bozorg   | member                    | Articulatory-Wavenet: Deep Autoregressive Model for Acoustic-to-Articulatory Inversion  | Nov 2020    |
| <a href="#">Gongbo Liang</a>                          | <i>chair</i>              | Clinical-Inspired Multi-Modal Deep Learning Medical Imaging Analysis  | Oct 2020    |
| Céline Portenier (University of Bern)                 | external referee          | High-resolution snow cover retrieval using public webcams   | May 2021    |
| Ahmed Nassar (IRISA, Université Bretagne Sud, Vannes) | external referee          | Learning to map street-side objects using multiple views  | May 2021    |
| <a href="#">Usman Rafique</a>                         | <i>co-chair</i> w/ Cheung | Weakly Supervised Learning for Multi-Image Synthesis  | Jul 2021    |
| <a href="#">Hunter Blanton</a>                        | <i>chair</i>              | Explicit Constraints for CNN Based Absolute Pose Regression   | in progress |
| Sajad Javadinasab Hormozabad                          | member                    | Artificial Intelligence and Soft Computing in Smart Structural Systems  | in progress |
| Tarannum Shaila Zaman                                 | member                    | Debugging Concurrent Programs   | in progress |
| Arnab Sarkar  | member                    | Machine Learning for Astro-Physics  | in progress |
| <a href="#">Connor Greenwell</a>                      | <i>chair</i>              | Probabilistic Cross-Domain Representation Learning  | in progress |
| <a href="#">Yu Zhang</a>                              | <i>chair</i>              | Multimodal Domain Generalization  | in progress |
| Paul Eberhart   | member                    | TBD   | in progress |
| Chengxi Li  | member                    | TBD   | in progress |
| Mohammad Soleymanpour                                 | member                    | Parallel and non-parallel voice conversion based data augmentation for dysarthric speech applications   | in progress |
| David Adeniji   | member                    | Establishing a Digital Process Twin for Aerospace Alloy Machining using In-situ Process Characterization and Physics Embedded Machine Learning Models | in progress |
| Alireza Shirvani                                      | member                    | A Model of Personality and Emotion for Believable Story Characters  | in progress |
| Anastasia Kazadi                                      | member                    | Depth Map Processing for Accurate Face Reconstruction and Modeling  | in progress |
| Md Sultan Al Nahian                                   | member                    | Value Aligned AI Agent with Explainability  | in progress |
| Sidrah Liaqat   | member                    | Model-based Deep Learning Techniques for Detecting Behaviors Related to Autism Spectrum Disorder from Video   | in progress |
| Xin Xing  | <i>chair</i>              | TBD   | in progress |
| Subash Khanal   | <i>chair</i>              | TBD   | in progress |
| Hui Lin   | member                    | TBD   | in progress |
| Chao Du   | member                    | TBD   | in progress |
| Shunnan Chen  | member                    | TBD   | in progress |
| Yong Song   | member                    | TBD   | in progress |
| Fujun Liu   | member                    | TBD   | in progress |

|                    |        |     |             |
|--------------------|--------|-----|-------------|
| Stephen Parsons    | member | TBD | in progress |
| Minoo Hosseinzadeh | member | TBD | in progress |
| Ashutosh Timilsina | member | TBD | in progress |
| Sheng-Chieh Lin    | member | TBD | in progress |

## Masters Students

| Student Name                    | Role                         | Thesis/Project Title  | Date        |
|---------------------------------|------------------------------|---|-------------|
| Edwin Prem Kumar Sathiyamoorthy | member                       | Global Change Reactive Background Subtraction   | Mar 2011    |
| Feiyu Shi                       | <i>chair</i>                 | Principal Component Analysis For Multi-size Images  | Dec 2013    |
| Hasan Sajid                     | member                       | A Universal Background Subtraction System   | Jul 2014    |
| Ryan Baltenberger               | <i>chair</i>                 | Estimating Transient Scene Attributes Using Deep Convolutional Neural Networks  | May 2016    |
| Sean Karlage                    | member                       | Diachronic Volume Registration for Analysis of Antiquities  | May 2016    |
| Stanley Rosenbaum               | member                       | A method for presenting volume and color of 3D objects via audio for the visually impaired                                | Dec 2016    |
| DhiShankar Bhattacharya         | member                       | Analyzing Sybil Attacks and Similar Phenomena in Twitter Data   | Apr 2017    |
| Xiaofei Zhang                   | member                       | Mammogram and Tomosynthesis Classification Using Convolutional Neural Networks  | Jul 2017    |
| Qingguo Xu                      | member                       | 3D Body Tracking using Deep Learning  | May 2017    |
| William “Derek” Jones           | <i>co-chair</i> w/ Ellingson | Scalable Feature Selection and Extraction with Applications in Kinase Polypharmacology                                    | May 2018    |
| Weilian “William” Song          | <i>chair</i>                 | Image-Based Roadway Assessment using Convolutional Neural Networks  | May 2019    |
| Ryan Zembrodt                   | member                       | Open-World Story Generation with Sequence-to-Sequence and Hierarchical Recurrent Encoder-Decoder Models                   | May 2019    |
| Jonathan Dingess                | member                       | Epsilon-Superposition and Truncation Dimension in Average and Probabilistic Settings for Infinite-Variate Linear Problems | May 2019    |
| Genghis Goodman                 | member                       | A Machine Learning Approach to Artificial Floorplan Generation  | Jul 2019    |
| <a href="#">Armin Hadzic</a>    | <i>chair</i>                 | Estimating Free-Flow Speed with LiDAR and Overhead Imagery  | May 2020    |
| Subash Khanal                   | member                       | Mispronunciation Detection and Diagnosis in Mandarin Accented English Speech  | May 2020    |
| David Jones                     | <i>chair</i>                 | TBD   | in progress |

## Undergraduate Research Students

| Student Name    | Project Title                            | Dates     |
|-----------------|--|-----------|
| Jim Knochelmann | User-Tools for Aerial Image Registration | 2011–2012 |
| Kyle Kolpek     | Aerial Image Registration                | 2012      |
| Noora Aljabi    | Using Flickr to Map Phenological Trends  | 2013      |

|                     |   |           |
|---------------------|---|-----------|
| J. David Smith      | User-in-the-loop Camera Calibration   | 2013–2015 |
| Angelo Stekardis    | Understanding Facial Expressions  | 2014–2015 |
| Ryan Baltenberger   | Understanding Outdoor Scene Appearance  | 2012–2015 |
| Connor Greenwell    | Interactive Methods for Aerial Imagery Understanding                            | 2014–2016 |
| Sam Davidson        | Applications of Generative Adversarial Networks to Social Media Imagery         | 2016–2017 |
| Aaron Mueller       | Deep Learning for Educational Data  | 2018      |
| Weilian Song        | Applications of Deep Convolutional Neural Networks to Geometric Computer Vision | 2016–2019 |
| Yuhan Long          | Deep Learning for Medical Imaging   | 2019      |
| Thomas Barber       | Deep Learning for Remote Sensing  | 2019      |
| Sean Grate          | Deep Learning for Point Clouds  | 2019–2020 |
| Shashank Bhatt      | TBD   | 2020–     |
| Cohen Archbold      | TBD   | 2020–     |
| Aurek Chattopadhyay | Multimodal Retrieval  | 2020–     |

## High School Research Students

| Student Name      | Project Title  | Dates        |
|-------------------|--|--------------|
| Ryan Baltenberger | Gesture-Based User Interaction with the Microsoft Kinect                     | 2011–2012    |
| Alex Lucas        | Evaluation of Automatic Face Detection Methods                               | 2014–2013    |
| Andrew Tapia      | Estimating Surface Reflectivity  | 2014–2015    |
| Andrew Albrecht   | Mapping Social Media Imagery   | 2016–2017    |
| C. J. Labianca    | Evaluation of Optimization Algorithms for Deep Convolutional Neural Networks | 2016–2017    |
| Ryan Landry       | RRADCL: Rapid Roadway Assessment with Deep Convolutional Learning            | 2017–2018    |
| Cohen Archbold    | Photo-Geolocation using Convolutional Neural Networks                        | 2017–2018    |
| Nicole Wong       | Learning-Based View Synthesis  | 2019–2020    |
| Chris Wang        | Multimodal Medical Imaging for Alzheimer's Disease Classification            | 2019–2021    |
| William Greenlee  | TBD  | 2021–ongoing |