

Nathan Jacobs

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Areas of Expertise

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

Education

2005–2010	Ph.D. in Computer Science Adviser: Robert Pless 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) <i>Summa Cum Laude</i> with Honors	University of Missouri

Appointments and Affiliations

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

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]

Publications

Journal Articles

- [1] 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).
- [2] 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).
- [3] 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).
- [4] 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).
- [5] R. V. Maretto, 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*, 2020, Impact factor: 3.534. DOI: [10.1109/LGRS.2020.2986407](https://doi.org/10.1109/LGRS.2020.2986407).
- [6] 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).
- [7] 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).
- [8] 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).

- [9] 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).
- [10] 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).
- [11] 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).
- [12] 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).
- [13] 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).
- [14] 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).
- [15] 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] 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.
- [2] M. U. Rafique, H. Blanton, N. Snavely, and N. Jacobs, “Generative Appearance Flow: A hybrid approach for outdoor view synthesis,” in *British Machine Vision Conference (BMVC)*, Sep. 2020.
- [3] G. Liang, Y. Zhang, X. Wang, and N. Jacobs, “Improved trainable calibration method for neural networks,” in *British Machine Vision Conference (BMVC)*, Sep. 2020.
- [4] A. Hadzic, G. Christie, J. Freeman, *et al.*, “Estimating displaced populations from overhead,” in *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, 2020.

- [5] 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.
- [6] H. Blanton, S. Grate, and N. Jacobs, "Surface modeling for airborne LiDAR," in *IEEE International Geoscience and Remote Sensing Symposium (IGARSS)*, (oral), 2020.
- [7] 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).
- [8] 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).
- [9] 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).
- [10] 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).
- [11] 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).
- [12] 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).
- [13] 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).
- [14] 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).
- [15] 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).
- [16] 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).
- [17] 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).
- [18] 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).
- [19] 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).
- [20] 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.

- [21] 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).
- [22] 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).
- [23] 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).
- [24] D. Jones, J. Bopaiah, F. Alghamedy, *et al.*, “Polypharmacology within the full kinome: A machine learning approach,” in *AMIA Informatics Summit*, 2018.
- [25] 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).
- [26] 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).
- [27] 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).
- [28] 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).
- [29] 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).
- [30] 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).
- [31] S. Workman, M. Zhai, and N. Jacobs, “Horizon lines in the wild,” in *British Machine Vision Conference (BMVC)*, Acceptance rate: 39.4%, 2016.
- [32] 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).
- [33] 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).
- [34] 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).
- [35] 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).
- [36] 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).
- [37] 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).

- [38] S. Workman, R. Souvenir, and N. Jacobs, “Wide-area image geolocalization 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).
- [39] 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).
- [40] 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).
- [41] 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).
- [42] 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).
- [43] 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).
- [44] 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).
- [45] 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).
- [46] 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).
- [47] 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).
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- [54] N. Jacobs, B. Bies, and R. Pless, “Using cloud shadows to infer scene structure and camera calibration,” in *IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, Acceptance rate: 4.5% (oral), Jun. 2010, pp. 1102–1109. DOI: [10.1109/CVPR.2010.5540093](https://doi.org/10.1109/CVPR.2010.5540093).
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- [2] 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.
- [3] A. Hadzic, H. Blanton, W. Song, M. Chen, S. Workman, and N. Jacobs, “RasterNet: Modeling free-flow speed using lidar and overhead imagery,” in *EARTHVISION: Large Scale Computer Vision for Remote Sensing Imagery*, Acceptance rate: 26%, 2020. DOI: [10.1109/CVPRW50498.2020.00112](https://doi.org/10.1109/CVPRW50498.2020.00112).
- [4] Y. Zhang, G. Liang, T. Salem, and N. Jacobs, “Defense-PointNet: Protecting pointnet against adversarial attacks,” in *The Next Frontier of Big Data From LiDAR Workshop (co-located with IEEE Big Data)*, 2019.
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Abstracts

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- [3] G. Liang, Y. Zhang, and N. Jacobs, “Neural network calibration for medical imaging classification using DCA regularization,” in *ICML 2020 workshop on Uncertainty and Robustness in Deep Learning (UDL)*, 2020.
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- [10] G. Liang, X. Wang, and N. Jacobs, “Evaluating the publicly available mammography datasets for deep learning model training,” in *SBI/ACR Breast Imaging Symposium*, 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>.
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- [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>.
- [10] M. T. Islam, C. Greenwell, and N. Jacobs, *GeoFaces: A large database of geolocated face patches*, <http://mvrl.github.io/GeoFaces>.

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. *CAREER: Learning and Using Models of Geo-Temporal Appearance*
PI: Nathan Jacobs
 Sponsor: National Science Foundation (NSF)
 Total Award: \$499,426
 Duration: 2016–2021
3. *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
4. *CCT: Context and Colorization for Tracking (Phase 2)*
PI: Nathan Jacobs
 Sponsor: Intelligent Automation Inc. / Defense Advanced Research Projects Agency (DARPA)
 Total Award: \$100,000 (Year 1); \$200,000 (Year 1–2)
 Duration: 2020–2021 (Year 1); 2020–2022 (Year 1–2)
5. *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. *Spatio-Temporal Association and Curve Kernel Networks (STACKNet)*
PI: Nathan Jacobs
 Sponsor: Intelligent Automation Inc.
 Total Award: \$33,000 (Phase 1)
 Duration: 2020–2020
2. *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)
 Duration: 2018–2020
3. *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 Kekenes-Huskey
 Sponsor: National Institutes of Health (NIH)
 Total Award: \$1,575,279
 Duration: 2016–2020
4. *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

5. *DLALA: Deep Learning for Airborne LiDAR Analysis*
PI: **Nathan Jacobs**
Sponsor: Orbital Insight
Total Award: \$104,927
Duration: 2019–2020
6. *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
7. *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
8. *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
9. *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
10. *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
11. *NIP: GeoLookbook: Modeling Worldwide Human Visual Appearance*
PI: **Nathan Jacobs**
Sponsor: National Geospatial-Intelligence Agency (NGA)
Total Award: \$299,204
Duration: 2014–2018
12. *Crossview ConvNets for Near/Remote Sensing*
PI: **Nathan Jacobs**
Sponsor: Google
Total Award: \$46,209
Duration: 2016–2017
13. *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

14. *CSSG: ContextualEyes: A Context-Aware Surveillance System*

PI: **Nathan Jacobs**

Sponsor: Defense Advanced Research Projects Agency (DARPA)
Total Award: \$743,131
Duration: 2011–2015

15. *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

Proposals (under review)

This list does not include letters of intent, pre-proposals, or proposals where I was listed as Senior Personnel.

1. *GeoSearch: Image-based Geolocation using Rank Aggregated Hash Index*

PI: **Nathan Jacobs**

Sponsor: Intelligent Automation Inc. / National Geospatial-Intelligence Agency (NGA)
Total Award: \$250,000
Duration: 2020

2. *Spatio-Temporal Association and Curve Kernel Networks (STACKNet)*
PI: Nathan Jacobs
 Sponsor: Intelligent Automation Inc.
 Total Award: \$450,000 (Phase 2)
 Duration: 2020
3. *Clinical Translation of an Artificial Intelligence (AI) System for Breast Cancer Screening: Multicenter Retrospective and Prospective Application Studies*
PI: Nathan Jacobs
 Sponsor: Dept. of the Army (USAMRAA)
 Total Award: \$643,412
 Submission Year: 2020
4. *Algorithm Performance Evaluation with Low Sample Size*
PI: Nathan Jacobs
 Sponsor: Intelligent Automation Inc. / National Geospatial-Intelligence Agency (NGA)
 Total Award: \$30,000
 Submission Year: 2020
5. *Vehicles Identification and Traffic camera Localization (VITAL)*
PI: Nathan Jacobs
 Sponsor: Intelligent Automation Inc. / National Geospatial-Intelligence Agency (NGA)
 Total Award: \$25,000
 Submission Year: 2020
6. *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: \$1,510,308
 Submission Year: 2020
7. *R01: Ketogenic diet for reducing Alzheimer's disease risk in an APOE4 mouse model via gut-brain axis*
PI: Ai-Ling Lin
 Co-PI(s)/Co-I(s): Arnold Stromberg, Josh Morganti, **Nathan Jacobs**, Anika Hartz
 Sponsor: National Institutes of Health (NIH)
 Total Award: \$3,481,533
 Submission Year: 2020

Proposals (not funded)

This list does not include letters of intent, pre-proposals, or proposals where I was listed as Senior Personnel.

1. *GeoRank*
PI: Nathan Jacobs
 Sponsor: Intelligent Automation Inc. / National Geospatial-Intelligence Agency (NGA)
 Total Award: \$40,000 (awarded but failed during contract negotiations)
 Submission Year: 2020
2. *Machine and Deep Learning Methods to Identify Potential Targets for Alzheimer's Disease Therapeutics Alternative to Amyloid Hypothesis*
PI: Ai-Ling Lin
 Co-PI(s)/Co-I(s): **Nathan Jacobs**

Sponsor: National Institutes of Health (NIH)
Total Award: \$420,750
Submission Year: 2020

3. *NRT: Intelligent Sensing for Data-Driven Understanding of Complex Systems*

PI: Michael Renfro
Co-PI(s)/Co-I(s): Suzanne Smith, Michael Sama, Shannon Sampson, Sean Bailey, Marcelo Guzman, Jesse Hoagg, **Nathan Jacobs**, Jian Yang, Christoph Brehm
Sponsor: National Science Foundation (NSF)
Total Award: \$1,510,803
Submission Year: 2020

4. *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
Submission Year: 2020

5. *Ex vivo single molecule tools to analyze membrane receptor dynamics*

PI: Christopher Richards
Co-PI(s)/Co-I(s): Jim Pauly, David Heidary, **Nathan Jacobs**
Sponsor: National Institutes of Health (NIH)
Total Award: \$1,891,300
Submission Year: 2019 (Oct)

6. *Assessing molecular and cellular level structural changes in the adolescent brain due to nicotine consumption*

PI: Christopher Richards
Co-PI(s)/Co-I(s): Jim Pauly, **Nathan Jacobs**
Sponsor: National Institutes of Health (NIH)
Total Award: \$2,147,884
Submission Year: 2019 (Oct)

7. *NSF Engineering Research Center for Precision Meteorology (CPM)*

PI: Suzanne Smith
Co-PI(s)/Co-I(s): Michael Sama, Tyler Mark, Sean Bailey, Marcelo Guzman, Jesse Hoagg, **Nathan Jacobs**, Michael Renfro, Simone Silvestri, Hasan Poonawala
Sponsor: National Science Foundation (NSF)
Total Award: \$2,147,884
Submission Year: 2019

8. *Assessing molecular and cellular level structural changes in the adolescent brain due to nicotine consumption*

PI: Christopher Richards
Co-PI(s)/Co-I(s): Jim Pauly, **Nathan Jacobs**
Sponsor: National Institutes of Health (NIH)
Total Award: \$2,456,763
Submission Year: 2019 (Feb)

9. *Development of a single molecule methods to monitor changes in protein dimerization in animals*

PI: Christopher Richards
Co-PI(s)/Co-I(s): Phoebe Glazer, David Heidary, **Nathan Jacobs**
Sponsor: National Institutes of Health (NIH)
Total Award: \$1,886,000
Submission Year: 2019 (Feb)

10. *Rail Crossing Risk Assessment*
PI: Reginald Souleyrette
Co-PI(s)/Co-I(s): **Nathan Jacobs**
Sponsor: University of Tennessee / Federal Railroad Administration
Total Award: \$380,230
Submission Year: 2019
11. *Transfer Learning and Deep Transfer Learning for Military Applications*
PI: **Nathan Jacobs**
Sponsor: DZYNE Technologies / Air Force
Total Award: \$45,000
Submission Year: 2019
12. *AVA-3D: Accurate Video Alignment for 3D Modeling*
PI: **Nathan Jacobs**
Sponsor: Intelligent Automation Inc. / Army
Total Award: \$40,000
Submission Year: 2019
13. *Long-term Patterns of Life from Sporadic Observations*
PI: **Nathan Jacobs**
Sponsor: Intelligent Automation Inc. / National Geospatial-Intelligence Agency (NGA)
Total Award: \$20,000
Submission Year: 2019
14. *Rail Crossing Risk Assessment*
PI: Reginald Souleyrette
Co-PI(s)/Co-I(s): **Nathan Jacobs**
Sponsor: University of Tennessee / Federal Railroad Administration
Total Award: \$240,031
Submission Year: 2018
15. *A Multimodal Deep Learning Framework to Reduce Callbacks of Screening Mammography*
PI: Jennifer Wang
Co-PI(s)/Co-I(s): **Nathan Jacobs**
Sponsor: Department of Defense
Total Award: \$550,261
Submission Year: 2018
16. *Motion Compensation for Background Estimation from On-The-Move Ground Platforms*
PI: **Nathan Jacobs**
Sponsor: Intelligent Automation Inc. / Army
Total Award: \$30,000
Submission Year: 2018
17. *Contour Based Image Segmentation*
PI: **Nathan Jacobs**
Sponsor: Novateur Research Solutions / Air Force
Total Award: \$49,869
Submission Year: 2018
18. *Evaluating the performance of automated LiDAR-based tree detection methods across different forest conditions in Kentucky*
PI: Marco Contreras

Co-PI(s)/Co-I(s): **Nathan Jacobs**
Sponsor: Kentucky Science and Engineering Foundation
Total Award: \$150,000
Submission Year: 2018

19. *Geospatial Cloud Analytics TA-2 Proposal*

PI: **Nathan Jacobs**
Sponsor: Orbital Insight / Defense Advanced Research Projects Agency (DARPA)
Total Award: \$347,840
Submission Year: 2017

20. *Cloud Analytics of Geospatial Imagery (CAGI)*

PI: **Nathan Jacobs**
Sponsor: Dzyne Technologies / Defense Advanced Research Projects Agency (DARPA)
Total Award: \$353,341 (awarded but failed during contract negotiations)
Submission Year: 2017

21. *Global Video Analysis Network*

PI: **Nathan Jacobs**
Co-PI(s)/Co-I(s): James Griffioen, Cody Bumgardner
Sponsor: NSF
Total Award: \$999,975
Submission Year: 2016

22. *NURI: Semantic Segmentation for Improved 3D Scene Generation*

PI: **Nathan Jacobs**
Sponsor: Lockheed Martin / Intelligence Advanced Research Projects Activity (IARPA)
Total Award: \$1,004,562
Submission Year: 2016

23. *Automatic Joint Verification of Calibration, Motion, and Lighting*

PI: **Nathan Jacobs**
Sponsor: Washington University in St. Louis / Defense Advanced Research Projects Agency (DARPA)
Total Award: \$447,828
Submission Year: 2015

24. *Remote Non-contact Multispectral Imaging for Monitoring of Respiration and End Tidal Carbon Dioxide*

PI: Abhijit Patwardhan
Co-PI(s)/Co-I(s): **Nathan Jacobs**, Dong-Sheng Yang
Sponsor: National Institutes of Health (NIH)
Total Award: \$363,249
Submission Year: 2015

25. *US Ignite: Track 1: PERSDN: A Personalized Emergency Response Software Defined Network*

PI: Jim Griffioen
Co-PI(s)/Co-I(s): **Nathan Jacobs**, Jeannette Sutton
Sponsor: National Science Foundation (NSF)
Total Award: \$599,110
Submission Year: 2015

26. *Recognizing Objects from the Air*

PI: **Nathan Jacobs**
Sponsor: National Geospatial-Intelligence Agency (NGA)
Total Award: \$745,819
Submission Year: 2015

27. *Firebrands and Fire Whirls in Large-Scale Wildland Fires*
PI: James M McDonough
Co-PI(s)/Co-I(s): **Nathan Jacobs**, Kozo Saito, Sean Bailey, Jian Yang
Sponsor: National Science Foundation (NSF)
Total Award: \$1,955,823
Submission Year: 2014
28. *CAREER: Geo-Temporal Understanding of Outdoor Images and Video*
PI: **Nathan Jacobs**
Sponsor: National Science Foundation (NSF)
Total Award: \$523,850
Submission Year: 2014
29. *Toward a Geotemporal Model for Human Appearance*
PI: **Nathan Jacobs**
Sponsor: Intelligence Community Postdoc Program
Total Award: \$359,463
Submission Year: 2014
30. *Remote Non-contact Multispectral Imaging for Monitoring of Respiration and End Tidal Carbon Dioxide*
PI: Abhijit Patwardhan
Co-PI(s)/Co-I(s): **Nathan Jacobs**
Sponsor: Department of Defense
Total Award: \$259,968
Submission Year: 2014
31. *Rad-GTPase L-type Calcium Channel Signaling in the Heart*
PI: Jonathan Satin
Co-PI(s)/Co-I(s): **Nathan Jacobs**, Douglas Andres, Kenneth Campbell, Moriel Vandsburger, Haining Zhu
Sponsor: National Institutes of Health (NIH)
Total Award: \$3,338,710
Submission Year: 2014
32. *A Novel Mechanism of Post-Myocardial Infarction Cardioprotection*
PI: Jonathan Satin
Co-PI(s)/Co-I(s): **Nathan Jacobs**, Douglas Andres, Kenneth Campbell, Moriel Vandsburger, Haining Zhu
Sponsor: American Heart Association (AHA)
Total Award: \$118,045
Submission Year: 2014
33. *Novel Inotropic Support By Targeting Rad GTPase*
PI: Jonathan Satin
Co-PI(s)/Co-I(s): **Nathan Jacobs**, Douglas Andres, Kenneth Campbell, Moriel Vandsburger, Haining Zhu
Sponsor: National Institutes of Health (NIH)
Total Award: \$3,060,642
Submission Year: 2013
34. *SCH: INT: Game-based Decision Aid for Rheumatoid Arthritis Patients*
PI: Judy Goldsmith
Co-PI(s)/Co-I(s): **Nathan Jacobs**, Kristine Lohr, Zixue Tai, Melody Carswell
Sponsor: National Science Foundation (NSF)
Total Award: \$1,864,219
Submission Year: 2013

35. *CAREER: Toward a Geo-Temporal Framework for Outdoor Scene Understanding*
PI: **Nathan Jacobs**
Sponsor: National Science Foundation (NSF)
Total Award: \$499,975
Submission Year: 2012
36. *An Interactive Decision Aid for Rheumatoid Arthritis Patients*
PI: Judy Goldsmith
Co-PI(s)/Co-I(s): **Nathan Jacobs**, Malachy Bishop, Kristine Lohr, Gustav Blomquist
Sponsor: National Science Foundation (NSF)
Total Award: \$600,000
Submission Year: 2012
37. *Geo-Temporal Context for Outdoor Scene Understanding*
PI: **Nathan Jacobs**
Co-PI(s)/Co-I(s): National Science Foundation (NSF)
Sponsor: \$341,563
Total Award: 2010
Submission Year:

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

Service

University Service

- 2020–2021: Computer Science Department: Chair Search Committee
- 2019–present: Computer Science Department: Executive 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: 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]
 - IEEE Winter Conference on Applications of Computer Vision (WACV) [2014]
- 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]
 - PhD Forum Chair: IEEE Winter Conference on Applications of Computer Vision (WACV) [2018]
 - 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
 - * 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

Teaching

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
Paul Mihail	<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
Scott Workman	<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
Zach Bessinger	<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
Gongbo Liang	<i>chair</i>	Clinical-Inspired Multi-Modal Deep Learning Medical Imaging Analysis	Oct 2020
Céline Portenier (University of Bern)	external referee	TBD (public webcam images to analyze snow cover)	Mar 2021
Ahmed Nassar (IRISA, Université Bretagne Sud, Vannes)	external referee	TBD (multi-view object detection in street-view panoramas)	Mar 2021
Usman Rafique	<i>co-chair</i> w/ Cheung	Weakly Supervised Learning for Multi-Image Synthesis	in progress
Hunter Blanton	<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
Connor Greenwell	<i>chair</i>	Probabilistic Cross-Domain Representation Learning	in progress
Yu Zhang	<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
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
Anastasia Kazadi	member	TBD	in progress
Shunnan Chen	member	TBD	in progress
Md Sultan Al Nahian	member	TBD	in progress
Alireza Shirvani	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
Sidrah Liaqat	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
Armin Hadzic	<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–