Pedro F. Felzenszwalb

Professor
School of Engineering
Brown University
Email: pff@brown.edu

Education

Massachusetts Institute of Technology, Ph.D. in Computer Science, 2003.
Thesis: Representation and Detection of Shapes in Images, Advisor: W. Eric. L. Grimson.

Massachusetts Institute of Technology, M.S. in Computer Science, 2001.
Thesis: Object Recognition with Pictorial Structures, Advisor: W. Eric. L. Grimson.

Cornell University, B.S. in Computer Science, 1999.

Appointments

Brown University, Professor, 2016-present.

Brown University, Associate Professor, 2011-2016.

Cornell University, Visiting Professor, 2009-2010.

University of Chicago, Associate Professor, 2008-2011.

University of Chicago, Assistant Professor, 2004-2008.

Cornell University, Postdoctoral Fellow, 2003-2004.

Honors and Awards

Longuet-Higgins Prize, IEEE CVPR 2018.

2013 ACM Grace Murray Hopper Award.

IEEE Technical Achievement Award, 2014.

PASCAL Visual Object Challenge "Lifetime Achievement" Prize, 2010.

Longuet-Higgins Prize, IEEE CVPR 2010.

1st Place, PASCAL Visual Object Detection Challenge, 2008, 2009.

NSF Faculty Early Career Development (CAREER) Award, 2008.

Best paper Award, Mini Symposium on Machine Understanding of People and Their Responses, Rank Prize Funds, 2005.

Best poster Award, IEEE CVPR 2004.

Runner up, CRA Outstanding Undergraduate Award, 1998.

Service to the Profession

Organizer, AMS special session on Applied Combinatorics, 2021.

Organizer (chair), ICERM semester program on Computer Vision, 2019.

Organizer, ICERM workshop on Computational Imaging, 2019.

Organizer, ICERM workshop on Optimization Methods in Computer Vision and Image Processing, 2019.

Program Chair, IEEE Conference on Computer Vision and Pattern Recognition, 2011.

Associate Editor, IEEE Transactions on Pattern Analysis and Machine Intelligence, 2009-2013.

Editorial Board, International Journal of Computer Vision, 2009-2018.

Senior Program Committee Member, AAAI Conference on Artificial Intelligence 2017.

Area Chair, IEEE Conference on Computer Vision and Pattern Recognition, 2009, 2010, 2015.

Area Chair, European Conference on Computer Vision, 2008, 2012.

Area Chair, IEEE International Conference on Computer Vision, 2007.

Program Committee:
- IEEE CVPR, 2004, 2005, 2006, 2007, 2012, 2014.
- IEEE ICCV 2013.
- ECCV 2014.
- Int. Workshop on Structured Prediction, Tractability, Learning and Inference, 2013.
- Int. Workshop on Stochastic Image Grammars, 2011.
- Int. Workshop on Parts and Attributes, 2010.
- Int. Workshop on Computer Vision Applications for Developing Regions, 2007.

Tutorial on Object Recognition at the SIAM Conference on Imaging Science, 2010.

Tutorial on Discrete Optimization Methods in Computer Vision at CVPR 2005.

Service to the University

ECE Masters program Academic Director 2023-2025.

ECE Grad Committee 2022-2023.

School of Engineering DEI committee, 2021, 2022.

Computer Engineering ABET review 2013-2014, 2019-2020.

Concentration Advisor and Undergraduate Program Committee, 2013-2017.

Freshman and Sophomore Advisor, 2013-2025.

Grants Awarded

NSF Award 1447413, Structured Nearest Neighbor Search in High Dimensions, 2015-2018.

Brown University Seed Award, 2014.

Google Research Award, Scalable Visual Object Detection, 2013.

DARPA, Hierarchical Representation for the Evaluation of Sensed Data (co-PI), 2013-2015.

NSF Award 1161282, Graph Cut Algorithms for Domain-specific Higher Order Priors, 2012-2015.

NSF CAREER Award 0746569, Object Recognition with Hierarchical Models, 2008-2013.

NSF Award 0534820, The Generalized A* Architecture for Perceptual Systems, 2006-2009.

Teaching

Courses at Brown University

Pattern Recognition and Machine Learning (ENGN 2520), Spring 2025.

Linear System Analysis (ENGN 1570), Fall 2024.

Pattern Recognition and Machine Learning (ENGN 2520), Spring 2024.

Topics in Optimization (ENGN 2912P), Spring 2023.
Linear System Analysis (ENGN 1570), Fall 2022.
Pattern Recognition and Machine Learning (ENGN 2520), Spring 2022.
Linear System Analysis (ENGN 1570), Fall 2021.
Pattern Recognition and Machine Learning (ENGN 2520), Spring 2021.
Linear System Analysis (ENGN 1570), Fall 2020.
Image Understanding (ENGN 1610), Spring 2020.
Pattern Recognition and Machine Learning (ENGN 2520), Fall 2019.
Topics in Image Analysis (ENGN 2912S), Spring 2019.
Image Understanding (ENGN 1610), Fall 2018.
Pattern Recognition and Machine Learning (ENGN 2520 / CSCI 1420), Spring 2017.
Image Understanding (ENGN 1610), Fall 2016.
Topics in Optimization (ENGN 2912P), Spring 2016.
Linear System Analysis (ENGN 1570), Fall 2015.
Pattern Recognition and Machine Learning (ENGN 2520 / CSCI 1420), Spring 2015.
Linear System Analysis (ENGN 1570), Fall 2014.
Topics in Optimization (ENGN 2912P), Spring 2014.
Introduction to Engineering (ENGN 0030), Fall 2013.
Pattern Recognition and Machine Learning (ENGN 2520 / CSCI 1950F), Spring 2013.
Introduction to Engineering (ENGN 0030), Fall 2012.
Pattern Recognition and Machine Learning (ENGN 2520), Spring 2012.

Courses at the University of Chicago

Computer Vision (CMSC 25040/35040), Spring 2011.
Theory of Algorithms (CMSC 27200), Winter 2011.
Introduction to Artificial Intelligence (CMSC 25000), Winter 2009.
Theory of Algorithms (CMSC 27200), Winter 2009.
Topics in AI: Statistical Models for Image Analysis (CMSC 35900), Fall 2008.
Computer Vision (CMSC 25040/35040), Spring 2008.
Theory of Algorithms (CMSC 27200), Winter 2008.
Theory of Algorithms (CMSC 27200), Winter 2007.
Introduction to CS 2 (CMSC 15200), Winter 2007.
Computer Vision (CMSC 25040/35040), Fall 2006.
Theory of Algorithms (CMSC 27200), Winter 2006.
Introduction to CS 2 (CMSC 15200), Winter 2006.
Computer Vision (CMSC 25040/35040), Fall 2005.
Introduction to Programming for the WWW II (CMSC 10200), Spring 2005.
Introduction to CS 2 (CMSC 15200), Winter 2005.
Topics in AI: Computer Vision (CMSC 35900), Fall 2004.

Invited Talks

Clustering and Iterated Linear Optimization
DavidFest, TTI-C, August 2023.

Appearance Models for Image Segmentation
International Symposium on Visual Computing, October 2021.

Iterated Linear Optimization
AMS Special Session on Applied Combinatorics, March 2021.

Scene Grammars, Factor Graphs, and Belief Propagation
UC Berkeley, October 2017.
Google, November 2017.

The Grammar of Vision
Indiana University, Computer Science Colloquium, December 2016.

Graphical Models for Computer Vision
Pure and Applied Math Institute (IMPA), Rio de Janeiro, Brazil, August 2014.

Contour Completion with Fields-of-Patterns
Workshop on Structured Prediction, Tractability, Learning and Inference, July 2013.

Graphical Models for Computer Vision
Conference on Uncertanty in Artificial Intelligence, August 2012.

Tiered Scene Labeling
IEEE Workshop on Perceptual Organization in Computer Vision, June 2012.

Object Detection with Grammar Models
New England Machine Learning Day, MSR New England, May 2012.

Object Detection Grammars
Boston University, Computer Vision seminar, February 2012.
Int. Workshop on Stochastic Image Grammars, November 2011.

Compositional Models
Frontiers in Computer Vision, NSF workshop, August 2011.

Object Detetection with Discriminatively Trained Part Based Models
University of Pennsylvania, GRASP Seminar, February 2011.
Theory and Practice of Computational Learning (Summer School/Workshop), June 2009.

Metric Labeling With Tree Metrics
Cornell Theory seminar, April 2010.

Hierarchical Models for Shape Recognition
Int. Workshop on Shape Perception in Human and Computer Vision, October 2008.
CMU VASC Seminar, November 2007.
Workshop on Geometry and Statistics of Shape Spaces, SAMSI, July 2007.

Efficient Belief Propagation for Early Vision
IPAM, February 2008.

Object Recognition with Deformable Models
University of Vermont, January 2008.
Penn State University, February 2008.
University of Iowa, February 2008.
University of Washington, March 2008.
UC Berkeley, March 2008.

Models and Algorithms for Image Parsing

NIPS workshop, The Grammar of Vision, December 2007.

Hierarchical Matching of Deformable Shapes
Harvard University, April 2007.
MIT, April 2007.
Brown University, April 2007.

A Hierarchical Representation for Matching Deformable Shapes
Workshop on Category-Level Object Recognition, Siracusa, Italy, September 2006.

Representation and Detection of Deformable Shapes
Workshop on Mathematics and Image Analysis, Paris, France, September 2006.

Deformable Templates
IMA, Visual learning and recognition workshop, 2006.

A Global Model and Algorithm for Finding the Curves in an Image
University of Illinois at Urbana-Champaign, November 2005.

Representation and Detection of Shapes in Images
Johns Hopkins University, October 2005.
Cornell University, April 2004.
University of Illinois at Urbana-Champaign, March 2004.
University of Chicago, March 2004.

Pictorial Structures for Object Recognition
Machine Understanding of People and Their Responses, Grasmere, UK, February 2005.

Learning Models for Object Recognition with the Hausdorff Distance
Cornell University, AI Seminar, February 2004.

Representation and Detection of Non-rigid Objects
UC Berkeley, Computer Vision Seminar, 2003.

Efficient Graph-based Image Segmentation
ALADDIN Workshop on Graph Partitioning in Vision and Machine Learning, CMU, 2003.

Learning Models for Object Recognition
MIT AI Lab Student Seminar, 2001.

Computer Vision
MIT Applied Mathematics Student Seminar, May 2001.

Efficient Matching of Pictorial Structures
Siemens Research, 2000.

Efficiently Computing a Good Segmentation
DIMACS Workshop on Graph Theoretic Methods in Computer Vision, May 1999.

Advising

Current Ph.D. Students

Gabby Litterio

Former Ph.D. Students

Ross B. Girshick.
Thesis: From Rigid Templates to Grammars: Object Detection with Structured Models.
University of Chicago, 2012.

Eric Purdy.
Thesis: Grammatical Methods in Computer Vision.
University of Chicago, 2013.

Sobhan Naderi Parizi.
Thesis: Modeling and Optimization of Classifiers with Latent Variables.
Brown University, 2016.

Jeroen Chua.
Thesis: Probabilistic Scene Grammars: A General-Purpose Framework For Scene Understanding.
Brown University 2017.

Jeova Farias Sales Rocha Neto.
Thesis: New Algorithms for Appearance Modeling in Image Segmentation.
Brown University 2021.

Anna Grim.
Thesis: Dynamics of Belief Propagation Algorithms.
Brown University 2022.

Former Postdocs

Alice Paul, 2017-2019.

Marilyn Vazquez, 2018-2019.

Masters Thesis Advised

Sobhan Naderi Parizi.
Thesis: Image Classification with Reconfigurable Spatial Structures.
University of Chicago, 2011.

Ross B. Girshick.
Thesis: Object Detection with Heuristic Coarse-to-Fine Search.
University of Chicago, 2009.

Paolo Codenotti.
Thesis: Two-Dimensional Min-Filters with Polygons.
University of Chicago, 2006.

Undergraduate Student Research Supervised

Sarah Sachs, 2015-2016.

Michael Lazos, 2014-2015.

Gabriel Bender, 2006-2008.

Joshua Schwartz, 2005-2007.

Trevor Smith, 2005-2006.

Alexandra Shapiro, 2006.

Patent

Method and apparatus for image processing employing image segmentation using tokenization.
W. Rucklidge, D. Huttenlocher, P. Felzenszwalb. US Patent No. 6,295,371. September, 2001.

Publications

P. Felzenszwalb, D. Huttenlocher. Image Segmentation Using Local Variation. IEEE Conference on Computer Vision and Pattern Recognition, Pages 98-104, 1998.

P. Felzenszwalb, D. Huttenlocher. Efficiently Computing a Good Segmentation. DARPA Image Understanding workshop, 1998.

D. Huttenlocher, P. Felzenszwalb, W. Rucklidge. Digipaper: A Versatile Color Document Image Representation. International Conference on Image Processing, Pages, 219-223, 1999.

P. Felzenszwalb, D. Huttenlocher. Recognizing Flexible Objects. IEEE Workshop on Graph Algorithms and Computer Vision, 1999.

P. Felzenszwalb, D. Huttenlocher. Efficient Matching of Pictorial Structures. IEEE Conference on Computer Vision and Pattern Recognition, Pages 2066-2073, 2000.

T. Darrel, D. Demirdjian, N. Checka, P. Felzenszwalb. Plan-View Trajectory Estimation with Dense Stereo Background Models. International Conference on Computer Vision, Pages 628-635, 2001.

P. Felzenszwalb. Object Recognition with Pictorial Structures. Master's thesis. MIT Artificial Intelligence Laboratory, Technical Report 2001-002.

P. Felzenszwalb. Learning Models for Object Recognition. IEEE Conference on Computer Vision and Pattern Recognition, Pages 1056-1062, 2001.

P. Felzenszwalb. Representation and Detection of Deformable Shapes. IEEE Conference on Computer Vision and Pattern Recognition, Pages 102-108, 2003.

P. Felzenszwalb. Representation and Detection of Shapes in Images. Ph.D. thesis. MIT Artificial Intelligence Laboratory, Technical Report 2003-016.

P. Felzenszwalb, D. Huttenlocher, J. Kleinberg. Fast Algorithms for Large-State-Space HMMs with Applications to Web Usage Analysis. Neural Information Processing Systems, Pages 409-416, 2003.

P. Felzenszwalb, D. Huttenlocher. Distance Transforms of Sampled Functions. Cornell Computing and Information Science, Technical Report 2004-1963.

P. Felzenszwalb, D. Huttenlocher. Efficient Graph-based Image Segmentation. International Journal of Computer Vision, Vol. 59, No. 2, Pages 167-181, September 2004.

P. Felzenszwalb, D. Huttenlocher. Efficient Belief Propagation for Early Vision. IEEE Conference on Computer Vision and Pattern Recognition, Pages 261-268, 2004.

P. Felzenszwalb, D. Huttenlocher. Pictorial Structures for Object Recognition. International Journal of Computer Vision, Vol. 61, No. 1, Pages 55-79, January 2005.

P. Felzenszwalb. Representation and Detection of Deformable Shapes. IEEE Transactions of Pattern Analysis and Machine Intelligence, Vol. 27, No. 2, Pages 208-220, February 2005.

D. Crandall, P. Felzenszwalb, D. Huttenlocher. Spatial Priors for Part-Based Recognition using Statistical Models. IEEE Conference on Computer Vision and Pattern Recognition, Pages 10-17, 2005.

P. Felzenszwalb, D. McAllester. A Min-Cover Approach for Finding Salient Curves. IEEE Workshop on

Perceptual Organization in Computer Vision, 2006.

P. Felzenszwalb, D. Huttenlocher. Efficient Belief Propagation for Early Vision. International Journal of Computer Vision, Vol. 70, No. 1, Pages 41-54, October 2006.

D. Crandall, P. Felzenszwalb, D. Huttenlocher. Object Recognition by Combining Appearance and Geometry. In Towards Category-Level Object Recognition. LNCS Vol. 4170. Pages 462-482, Springer, 2006.

P. Felzenszwalb, J. Schwartz. Hierarchical Matching of Deformable Shapes. IEEE Conference on Computer Vision and Pattern Recognition, 2007.

P. Felzenszwalb, D. McAllester. The Generalized A* Architecture. Journal of Artificial Intelligence Research, Vol. 29, Pages 153-190, May 2007.

P. Codenotti, P. Felzenszwalb. 2D Min-Filters with Polygons. Fall Workshop on Computational and Combinatorial Geometry, 2007.

P. Felzenszwalb, D. McAllester, D. Ramanan. A Discriminatively Trained, Multiscale, Deformable Part Model. IEEE Conference on Computer Vision and Pattern Recognition, 2008.

R. Basri, P. Felzenszwalb, R. Girshick, D. Jacobs, C. Klivans. Visibility Constraints on Features of 3D Objects. IEEE Conference on Computer Vision and Pattern Recognition, Pages 1231-1238, 2009.

L. Babai, P. Felzenszwalb. Computing Rank Convolutions with a Mask. ACM Transactions on Algorithms, Vol. 6, Issue 1, Article 20, December 2009.

P. Felzenszwalb, D. McAllester. Object Detection Grammars. University of Chicago, Department of Computer Science, Technical Report 2010-02, February 2010.

P. Felzenszwalb, G. Pap, E. Tardos, R. Zabih. Globally Optimal Pixel Labeling Algorithms for Tree Metrics. IEEE Conference on Computer Vision and Pattern Recognition, Pages 3153-3160, 2010.

P. Felzenszwalb, O. Veksler. Tiered Scene Labeling with Dynamic Programming. IEEE Conference on Computer Vision and Pattern Recognition, Pages 3097-3104, 2010.

P. Felzenszwalb, R. Girshick, D. McAllester, D. Ramanan. Discriminative Latent Variable Models for Object Detection. International Conference on Machine Learning, Pages 11-12, 2010.

P. Felzenszwalb, R. Girshick, D. McAllester, D. Ramanan. Object Detection with Discriminatively Trained Part Based Models. IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. 32, No. 9, Pages 1627-1645, September 2010.

P. Felzenszwalb, R. Girshick, D. McAllester. Cascade Object Detection with Deformable Part Models. IEEE Conference on Computer Vision and Pattern Recognition, Pages 2241-2248, 2010.

R. Girshick, P. Felzenszwalb, D. McAllester. Object Detection with Grammar Models. Neural Information and Processing Systems, Pages 442-450, 2011.

P. Felzenszwalb, R. Zabih. Dynamic Programming and Graph Algorithms in Computer Vision. IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. 33, No. 4, Pages 721-740, April 2011.

P. Felzenszwalb, J. McAuley. Fast Inference with Min-Sum Matrix Product. IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. 33, No. 12, Pages 2549-2554, December 2011.

P. Felzenszwalb, D. Huttenlocher. Distance Transforms of Sampled Functions. Theory of Computing, Vol. 8, No. 19, Pages 415-428, September 2012.

S. Naderi Parizi, J. Oberlin, P. Felzenszwalb. Reconfigurable Models for Scene Recognition. IEEE Conference on Computer Vision and Pattern Recognition, Pages 2775-2782. 2012.

H.O. Song, S. Zickler, T. Althoff, R. Girshick, M. Fritz, C. Geyer, P. Felzenszwalb, T. Darrell. Sparselet Models for Efficient Multiclass Object Detection. European Conference on Computer Vision, Pages 802-815, 2012.

P. Felzenszwalb. A Stochastic Grammar for Natural Shapes. In Shape Perception in Human and Computer Vision. Advances in Computer Vision and Pattern Recognition. Editors: Sven Dickinson, Zygmunt Pizlo. Pages 229-310, Springer, 2013.

P. Felzenszwalb, R. Girshick, D. McAllester, D. Ramanan. Visual Object Detection with Deformable Part Models. Communications of the ACM, Vol. 56, No. 9, Pages 97-105, September 2013.

Y. Amit, P. Felzenszwalb. Object Detection. In Computer Vision, A Reference Guide. Pages 537-542, Springer, 2014.

P. Felzenszwalb, J. Oberlin. Multiscale Fields of Patterns. Neural Information Processing Systems, Pages 82-90, 2014.

S. Naderi Parizi, A. Vedaldi, A. Zisserman, P. Felzenszwalb. Automatic Discovery and Optimization of Parts for Image Classification. International Conference on Learning Representations, 2015.

H.O. Song, R. Girshick, S. Zickler, C. Geyer, P. Felzenszwalb, T. Darrell. Generalized Sparselet Models for Real-Time Multiclass Object Recognition. IEEE Transactions on Pattern Analysis and Machine Intelligence, Vol. 37, No. 5, Pages 1001-1012, May 2015.

P. Felzenszwalb. Similar Elements and Metric Labeling on Complete Graphs.
Technical report, arXiv:1803.08037, March 2018.

S. Naderi Parizi, K. He, S. Sclaroff, P. Felzenszwalb. Generalized Majorization-Minimization. International Conference on Machine Learning, Proceedings of Machine Learning Research, Vol 97, Pages 5022-5031, 2019.

P. Felzenszwalb, B. Svaiter. Diffusion Methods for Classification with Pairwise Relationships. Quarterly of Applied Math, Vol. 77, No. 4, Pages 793-810, December 2019.

J. Chua, P. Felzenszwalb. Scene Grammars, Factor Graphs, and Belief Propagation. Journal of the ACM, Vol. 67, No. 4, June 2020.

P. Felzenszwalb, C. Klivans. Flow-Firing Processes. Journal of Combinatorial Theory A, Vol. 177, January 2021.

P. Felzenszwalb, C. Klivans, A. Paul. Iterated Linear Optimization. Quarterly of Applied Math, Vol. 79, 2021.

J. F. S. Rocha Neto, P. Felzenszwalb, M. Vazquez. Direct Estimation of Appearance Models for Segmentation. SIAM Journal of Imaging Sciences, Vol. 15, No. 1, 2022.

J. F. S. Rocha Neto, P. Felzenszwalb. Spectral Image Segmentation with Global Appearance Modeling. arXiv Tech Rerport, 2022.

P. Felzenszwalb, C. Klivans, A. Paul. Clustering with Semidefinite Programming and Fixed Point Iteration. Journal of Machine Learning Research, Vol. 23, 2022.

A. Grim, P. Felzenszwalb. Convex combination belief propagation. Applied Mathematics and Computation, Vol. 438, 2023.

Jia, Shao, Burrow, Felzenszwalb, Sun, Toussaint, Howes, Dawson. Automated brightfield layerwise evaluation in three-dimensional micropatterning via two-photon polymerization. Optics Express, Vol. 7, No. 9, 2024.

P. Felzenszwalb. Deconvolution with a Box. arXiv Tech Report, July 2024.