Morteza Rezanejad

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CURRENT APPOINTMENTS

Postdoctoral Fellow, University of Toronto *Jan. 2020 - Present*

Head of Pix2Props Research Group

Academic advisors: Dirk B. Walther, Michael Gruninger and Sven Dickinson

Role description: I am leading the Pixels to Propositions (Pix2Props) research team. Our team works on visual perception problems in collaboration with the Department of Computer Science, Psychology, and Mechanical & Industrial Engineering at the University of Toronto. I also have an active research collaboration with Rosalind & Morris Goodman Cancer Institute where I contribute to various tasks in medical image analysis.

Advisory Board Member, The Dexign Studio *Sept. 2019 - Present*

Scientific advisory board member (https://thedexignstudio.com)

Co-founder of PenPlay game (https://penplay.ca)

Role description: As a scientific advisory board member, I provide machine learning teams at the Dexign Studio with the current state-of-the-art methods in Artificial Intelligence. I am also a co-founder of Penplay game, a machine learning based iOS game that has been created in the Dexign Studio.

EDUCATION

Ph.D. in Computer Science, McGill University *Sept. 2013 - Oct. 2019*

Thesis: *Medial Measures for Recognition, Mapping, and Categorization*

Advisor: Kaleem Siddiqi

Committee: Gregory Dudek, David Meger, Frank Ferrie

Available on Google Books: `https://bit.ly/2RkE6MO`

M.Sc. in Computer Science, McGill University *Sept. 2009 - May 2013* *

Thesis: *Flux Graphs for 2D Shape Analysis*

Advisor: Kaleem Siddiqi

Available on McGill's Library: `https://bit.ly/3bC7m8q`

* *I was on a leave of absence from May 2011 to May 2012, working as an iOS developer for Neda Rayaneh.*

B.Sc. in Computer Engineering, Sharif University of Technology *Sept. 2005 - July 2009*

Thesis: *Online Signature Verification Using Symbiotic Feature Selection*

Advisor: Saeed Bagheri Shouraki & Ramin Halavati

Mini-MBA, McGill University *Sept. 2018 - Jan 2019*

Executive Development Course (EDC)

I was awarded the Clark SELF Scholarship for this program.

Undergraduate Trainee and Research Assistant *Oct. 2007 - Aug. 2009*

Computer Vision Group, Institute for Research in Fundamental Science (IPM)

Project title: *Automatic Detection of Melanoma*

Advisor: Mehrdad Shahshahani

AWARDS AND HONOURS

2021 Elsevier/Vision Research Award March. 2021

VSS2021, St. Pete Beach, Florida, United States

Arts & Science Postdoctoral Fellowship March. 2020

University of Toronto, Toronto, Canada

GREAT Travel Award Sept. 2019

School of Computer Science, McGill University, Montreal, Canada

Mini-MBA Clark SELF Scholarship Sept. 2018 - Jan. 2019

Desautels Faculty of Management, McGill University, Montreal, Canada

Grad Excellence Award x 3 July 2015, July 2016, and Jan. 2018

School of Computer Science, McGill University, Montreal, Canada

IEEE RAS/IES IROS Travel Award Oct. 2015

Institute of Electrical and Electronics Engineers (IEEE), Hamburg, Germany

K40 Tesla GPU Award Oct. 2014

NVIDIA Corporation, Santa Clara, USA

McGill Differential Fee Waiver Award x 3 July 2010, July 2013, and July 2014

Faculty of Science, McGill University, Montreal, Canada

National Elite Foundation Award Nov. 2007

Ministry of Education, Tehran, Iran

Ranked 154^{th} in the National University Entrance Examination Aug. 2005

Among more than 400,000 participants, National Organization of Educational Test, Tehran, Iran

Bronze Medal in 22^{nd} Iranian National Mathematics Olympiad Sept. 2004

National Organization for Development of Exceptional Talents, Tehran, Iran

Prize winner of the 5^{th} Kharazmi Youth Festival Oct. 2003

Iranian Research Organization for Science and Technology, Tehran, Iran

PREVIOUS EXPERIENCE

Graduate Research Assistant *Sept. 2009 - Dec. 2019*

Shape Analysis Group, McGill University

Role description: This includes my M.Sc. and Ph.D. research work on computing medial representations and investigating their roles in recognition, mapping, and categorization problems. During my time as a graduate student, I implemented different frameworks that are now available on my personal Github page: https://github.com/mrezanejad:

- *2D & 3D Average Outward Flux Skeletons:* /AOFSkeletons & /3DAOFSkeletons
- *2D Environment Mapping:* /IROS2015
- *Medial Axis Based Salience Measures for Scene Categorization:* /SalienceScoresForScene

Research Engineer *July. 2017 - Nov. 2017*

Software Group, NeuroRX

Role description: I worked on automated quality assessment of Magnetic Resonance Images. I implemented a deep learning-based framework that was able to find missing 3D MRI scan slices as well as determine whether a slice is misplaced within the neighboring slices.

iOS Developer *July. 2011 - May 2012*

iOS Team, Neda Rayaneh Institute

Role description: I contributed to the development of iOS applications. I was involved in two products:

- *Chare*, a mobile user interface to the first Persian online shopping store.
- *iPersia*, a tourist guide for iPad users who want to access professional photographers' landscapes.

Software Engineer Intern *May 2008 - Sept. 2008*

Software Group, Cybiran

Role description: I contributed the project that localized a web-based CRM for the Iranian market. I also worked on image compression of map photos for J2ME platforms.

PROFESSIONAL ACTIVITIES

Reviewer for Conference on Computer Vision and Pattern Recognition (CVPR)	2021-2022
Reviewer for International Conference on Computer Vision (ICCV)	2021
Reviewer for European Conference on Computer Vision (ECCV)	2014
Reviewer for Conference on Cognitive Computational Neuroscience (CCN)	2019
Reviewer for IET Computer Vision	2014
Reviewer and Committee Member for Conference on Robots and Vision (CRV)	2015-Present
Committee Member for UCORE Research Symposium, McGill University	2015
The Canadian Society for Brain, Behaviour and Cognitive Science's member	2021-Present
Vision Sciences Society's member	2017-Present
Student IEEE member	2015-2019
Iran's National Elites Foundation member	2005-2013
Young Scholar's Club Member	2004-2005

PUBLICATIONS

Journal articles

1. S.A. McDowell, R.B. Luo, A. Arabzadeh, S. Doré, N.C. Bennett, V. Breton, E. Karimi, **M. Rezanejad**, R.R. Yang, K.D. Lach, M.S. Issac, 2021. Neutrophil oxidative stress mediates obesity-associated vascular dysfunction and metastatic transmigration. *Nature Cancer*, 2021, pp.1-18.
   DOI:10.1038/s43018-021-00194-9

2. J. Wilder, **M. Rezanejad**, S. Dickinson, K. Siddiqi, A. Jepson and D. Bernhardt-Walther. Local contour symmetry facilitates scene categorization. *Cognition*, 182 (2019): 307-317.
   DOI: 10.1016/j.cognition.2018.09.014

3. **M. Rezanejad** and K. Siddiqi. View Sphere Partitioning via Flux Graphs Boosts Recognition from Sparse Views. *Frontiers in ICT: Computer Image Analysis*, 2 (2015) 24.
   DOI: 10.3389/fict.2015.00024

4. P. Savadjiev, B. Gallix, **M. Rezanejad**, S. Bhatnagar, A. Semionov, K. Siddiqi, R. Forghani, C. Reinhold, D. Eidelman, R. Dandurand. Mean curvature of isophotes: a computational method for disease detection in chest CT and its evaluation against traditional quantitative and deep learning approaches. *Radiology: Artificial Intelligence*, pp. e210105.
   DOI: 10.1148/ryai.210105

5. J. Wilder, **M. Rezanejad**, S. Dickinson, K. Siddiqi, A. Jepson and D. Bernhardt-Walther. Neural correlates of local symmetry during naturalistic vision. *PLOS One*.
   DOI: in press

Conference articles, abstracts and preprints

6. **M. Rezanejad**, G. Downs, J. Wilder, D. Bernhardt-Walther, A. Jepson, S. Dickinson, and K. Siddiqi. Scene categorization from contours: Medial axis based salience. *IEEE International Conference on Computer Vision and Pattern Recognition (CVPR)*, Long Beach CA, 2020.
   DOI: 10.1109/CVPR.2019.00424

7. C-O-D Camaro, **M. Rezanejad**, S. Tsogkas, K Siddiqi, and S. Dickinson. Appearance Shock Grammar for Fast Medial Axis Extraction From Real Images. *IEEE International Conference on Computer Vision and Pattern Recognition (CVPR)*, Seattle WA, 2020.
   DOI: 10.1109/CVPR42600.2020.01439

8. **M. Rezanejad**, S. Gupta, C. Gummaluru, R. Marten, J. Wilder, M. Gruninger, D. Walther. Contour-guided Image Completion with Perceptual Grouping. *The British Machine Vision Conference (BMVC)*, Virtual Conference, 2021.
   URL: https://bit.ly/3F310M0.

9. **M. Rezanejad**, B. Samari, I. Rekleitis, K. Siddiqi, and G. Dudek. Robust environment mapping using flux skeletons. In *2015 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 5700-–5705, Hamburg, Germany, 2015, (IEEE Award).
DOI: 10.1109/IROS.2015.7354186

10. **M. Rezanejad**, B. Samari, E. Karimi, I. Rekleitis, K. Siddiqi and G. Dudek. Average Outward Flux Skeletons for Environment Mapping and Topology Matching. *Preprint*, November 2021.
arXiv:2111.13826

11. **M. Rezanejad**, M. Khodadad, K. Siddiqi, M. Gruninger, D. Walther. Medial Spectral Coordinates for 3D Shape Analysis. *Preprint*, November 2021.
arXiv:2111.13295

12. **M. Rezanejad**, G. Downs, J. Wilder, D. Bernhardt-Walther, A. Jepson, S. Dickinson, and K. Siddiqi. Perceptually Weighted Contours For CNN-Based Scene Categorization. *Conference on Cognitive Computational Neuroscience (CCN)*, Berlin, Germany, September 2019 (Student Travel Award).
URL: https://bit.ly/3dY2BHf

13. J. Wilder, **M. Rezanejad**, K. Siddiqi, A. Jepson, S. Dickinson, and D. Bernhardt-Walther. Local contour symmetry facilitates the neural representation of scene categories in the PPA. *Conference on Cognitive Computational Neuroscience (CCN)*, Berlin, Germany, September 2019 (Academic Travel Award).
URL: https://bit.ly/3m3ADhJ

14. **M. Rezanejad**, G. Downs, J. Wilder, D. Bernhardt-Walther, S. Dickinson, A. Jepson and K. Siddiqi. Perceptual grouping aids recognition of line drawings of scenes by CNNs. *Vision Science Society*, St. Pete Beach, United States, 2019 (Oral Presentation).
DOI: 10.1167/19.10.129

15. J. Wilder, **M. Rezanejad**, K. Siddiqi, A. Jepson, S. Dickinson, and D. Bernhardt-Walther. The neural basis of local contour symmetry in scene perception. *Vision Science Society*, St. Pete Beach, United States, 2019 (National Eye Institute Travel Grant).
DOI: 10.1167/19.10.189a

16. J. Wilder^{+}, **M. Rezanejad**$^{+}$, K. Siddiqi, S. Dickinson, A. Jepson and D. Bernhardt-Walther. Measuring Local Symmetry in Real-World Scenes. In *Journal of Vision*, 18 (2018) 749–749.
$^{+}$: Equal contribution.
DOI: 10.1167/18.10.749

17. **M. Rezanejad**, J. Wilder, K. Siddiqi, S. Dickinson, A. Jepson, and D. Bernhardt-Walther. Measuring Local Symmetry in Real-World Scenes Using Derivatives of the Medial Axis Radius Function. In *Computational and Mathematical Models in Vision (MODVIS)*, St. Pete Beach, United States, 2018. URL: https://bit.ly/3yuwQ1O

18. J. Wilder, **M. Rezanejad**, S. Dickinson, A. Jepson, K. Siddiqi and D. Bernhardt-Walther. The Perceptual Advantage of Symmetry for Scene Perception. In *Journal of Vision*, 17 (2017) 1091–1091 (Oral Presentation).
DOI: 10.1167/17.10.1091

19. J. Wilder, **M. Rezanejad**, S. Dickinson, A. Jepson, K. Siddiqi and D. Bernhardt-Walther. The role of symmetry in scene categorization by human observers. In *Computational and Mathematical Models in Vision (MODVIS)*, St. Pete Beach, United States, 2017.
URL: https://bit.ly/3oZKhDQ

20. **M. Rezanejad**, J. Wilder, S. Dickinson, A. Jepson, D. Bernhardt-Walther and K. Siddiqi. Scoring Scene Symmetry. In *Computational and Mathematical Models in Vision (MODVIS)*, St. Pete Beach, United States, 2017.
URL: https://bit.ly/322iKcj

21. S. Hong, J. Fishbaugh, **M. Rezanejad,** K. Siddiqi, H. Johnson, J. Paulsen, E. Y. Kim, and G. Gerig. Subject-Specific Longitudinal Shape Analysis by Coupling Spatiotemporal Shape Modeling with Medial Analysis. In *Proc SPIE Int Soc Opt Eng*, 10133(2017) 101331A. 28966430[pmid].
DOI: 10.1117/12.2254675

22. Y. Xie, J. Wilder, **M. Rezanejad**, Dirk B. Walther. Local Symmetry in Human and Artificial Neural Networks. In *Journal of Vision*, 2021.
DOI: 10.1167/jov.21.9.2266

23. **M. Rezanejad**, S. Gupta, C. Gummaluru, R. Marten, J. Wilder, M. Gruninger, D. Walther. Implementing and integrating contour completion using Perceptual Grouping. In *Virtual Vision Futures*, 2021.
URL: https://bit.ly/3ITs03a

24. **M. Rezanejad**, S. Gupta, C. Gummaluru, R. Marten, J. Wilder, M. Gruninger, D. Walther. Object completion with stochastic completion fields predicts human behavior in recognizing degraded object drawings. In *Journal of Vision*, 2021 (Vision Research Award - Oral presentation).
DOI: 10.1167/jov.21.9.2482

25. **M. Rezanejad**, S. Gupta, C. Gummaluru, R. Marten, J. Wilder, M. Gruninger, D. Walther. Perceptual Grouping of Fragmented Contours Using Stochastic Completion Fields. In *Canadian Society for Brain, Behaviour & Cognitive Science*, 2021.
URL: https://bit.ly/3ITs03a

26. **M. Rezanejad**, S. Gupta, C. Gummaluru, R. Marten, J. Wilder, M. Gruninger, D. Walther. Object completion with stochastic completion fields. In *Ontario Workshop on Computer Vision*, 2021.
URL: https://owcv2021.github.io/

Book and book chapters

27. **M. Rezanejad** and K. Siddiqi. Flux graphs for 2D shape analysis. Chapter 3 in *Shape Perception in Human and Computer Vision: An Interdisciplinary Perspective*. Editors: Sven Dickinson and Zygmunt Pizlo, Springer, 2013.

28. **M. Rezanejad**, A. Mokhtarian, M. Zaeri Amirani and M. Mohammadabadi. Mathematics Olympiad in Iran. ISBN: 9789647685962, Publisher: Danesh Pajouhan Javan.

Theses

29. *Ph.D. Thesis*: **M. Rezanejad** and K. Siddiqi. Medial measures for recognition, mapping, and categorization. McGill University. Available: https://bit.ly/3ITB8EL

30. *M.Sc. Thesis*: **M. Rezanejad** and K. Siddiqi. Flux Graphs for shape analysis. McGill University Available : https://bit.ly/3ysIeeC

31. *B.Sc. Thesis*: **M. Rezanejad** and H. Hajimiri. Online Signature Verification Using Symbiotic Feature Selection. Sharif University of Technology.

Journal articles under review

32. **M. Rezanejad***, Elham Karimi*, Benoit Fiset, Lucas Perus, Sheri A. C. McDowell, Azadeh Arabzadeh, Gaspard Beugnot, Daniela F. Quail, Kaleem Siddiqi, Logan A. Walsh, *CIRCLE*: Combining classical and modern machine learning-based computer vision algorithms for accurate cell segmentation, *Nature Cell Biology*
* Co-first authorship

33. **M. Rezanejad**, J. Wilder, J. Bettencourt, D. Bernhardt-Walther, A. Jepson, S. Dickinson, and K. Siddiqi. Shape-Based Measures Improve Scene Categorization, *Computer Vision and Image Understanding (CVIU)*.

TEACHING EXPERIENCE

Lecturer, University of Toronto *May. 2020 - Dec. 2020*
Introduction to Image Understanding
Department: Electrical & Computer Engineering
Academic Session(s): Summer 2020, Fall 2020

Lecturer, University of Toronto *Jan. 2020 - April 2020*
APS 105 - Computer Fundamentals
Department: Electrical & Computer Engineering
Academic Session(s): Winter 2020

Lecturer, McGill University *Sept. 2015 - Jan. 2016*
COMP 208 - Computers in Engineering

Department: School of Computer Science
Academic Session(s): Fall 2015

Teaching Assistant, McGill University *Jan. 2013 - April 2017*
COMP 558 - Computer Vision
Department: School of Computer Science
Academic Session(s): Winter 2017, Winter 2015, Fall 2013, Winter 2013

Teaching Assistant, McGill University *Fall. 2017 - Dec. 2018*
ECSE 202 - Introduction to Software Development
Department: Electrical and Computer Engineering
Academic Session(s): Winter 2019, Fall 2018, Winter 2018, Fall 2017

Teaching Assistant, McGill University *Jan. 2014 - Dec. 2018*
COMP 208 - Computers in Engineering
Department: School of Computer Science
Academic Session(s): Fall 2019, Winter 2019, Fall 2018, Winter 2018, Fall 2017, Fall 2016, Winter 2016, Fall 2015, Fall 2014, and Winter 2014

Teaching Assistant, Sharif University of Technology *Jan. 2008 - Apr. 2008*
CE 121 - Electrical Circuits
Department: Computer Engineering
Academic Session(s): Winter 2007

Teaching Assistant, Sharif University of Technology *Jan. 2007 - Apr. 2007*
CE 115b - Discrete Mathematics
Department: Computer Engineering
Academic Session(s): Winter 2007

Teaching Assistant, Sharif University of Technology *Sept. 2008 - Dec. 2008*
MATH 22071 - Numerical Computing
Department: Mathematical Science
Academic Session(s): Fall 2008

Teaching Assistant, Sharif University of Technology *Sept. 2007 - Dec. 2007*
MATH 22046 - Calculus I
Department: Mathematical Science
Academic Session(s): Fall 2007

Lecturer, Iran's Mathematical Olympiad Team *Sept. 2005 - May. 2009*
I served as a lecturer at the Young Scholar Club of Iranian's national elite's foundation where I taught topics in mathematics, geometry, and linear algebra to students preparing for the International Mathematics Olympiad.

INVITED TALKS

Classical and Modern Computer Vision
The W Booth School of Engineering Practice and Technology, McMaster University, Hamilton, Canada, October 2021

Mechanisms of Visual Perception
The Center for Vision Research (CVR), York University, Toronto, Canada, September, 2021
Talk URL: shorturl.at/bnJM2

Medial Measures for Recognition, Mapping, and Categorization
Toronto Rehabilitation Institute, The KITE Research Institute, Toronto, Canada, March, 2021
Talk URL: https://bit.ly/3q344Bt

3D Medial Representations for Shape Analysis
CREATE MIA Summer School, Montreal, Canada, May 20l6

Object Representation using 2D and 3D Medial Axes
CIM Student Research Showcase, Montreal,Canada, November 2016

The role of symmetry in scene categorization by human observers
CREATE-MIA Retreat, Montreal, Canada, September 20l6

Robust Environment Mapping Using Flux Skeletons
IROS Conference, Hamburg, Germany, September 2015

View Sphere Partitioning via Flux Graphs
CIM Student Research Showcase, Montreal, Canada, March 2015

Online Signature Verification Using Genetic Algorithm
Institute For Research in Fundamental Science (IPM), Tehran, Iran, September 2008

Automated Melanoma Recognition Using Computer Generated Features
Institute For Research in Fundamental Science (IPM), Tehran, Iran, May 2008

RELEVANT ACADEMIC COURSES

Computer Vision
Computer Graphics
Probabilistic Analysis of Algorithms
Applied Machine Learning
Algorithmic Game Theory
Academic Writing
Multimodal Neuroimaging
GPU Computing with MATLAB
Machine Learning
Advanced Mobile Robotics
Shape Analysis
Matrix Computations
Statistical Computer Vision (audit)
Digital Imaging and Communications
Geometric Paradigms for MRI Analysis
Image-guided Interventions

MENTORSHIP

Ali Shiraee *Oct. 2021 - Present*

Presently M.Sc. student of Computer Science at Sharif University of Technology

Mohammad Khodadad *Oct. 2021 - Present*

Presently M.Sc. student of Computer Science at Sharif University of Technology

Chandra Gummaluru *Aug. 2020 - Aug. 2021*

Presently M.Sc. student of Computer Engineering at the University of Toronto

Sidharth Gupta *Aug. 2020 - Aug. 2021*

Presently machine learning research at the University Health Network (UHN)

Ryan Marten *Aug. 2020 - March 2021*

Presently M.Sc. student of Computer Science at the University of Illinois Urbana Champaign

Amir Mousavi *May 2020 - Feb. 2021*

Presently M.Sc. student of Computer Science at Simon Fraser University (SFU)

Jacob Bettencourt* *Sept. 2019 - Dec. 2019*

Presently M.Sc. student of Computer Science at McGill University

Gabriel Downs* *May. 2018 - Dec. 2018*

Presently researcher at Society for Arts and Technology

* joint supervision with Professor Kaleem Siddiqi

LANGUAGE SKILLS

English: Fluent, **Persian & Gilaki**: Native, **French, Spanish & Arabic**: Intermediate

COMMUNITY AND VOLUNTEER ACTIVITIES

Co-organizer and Volunteer, McGill University 2013/5 - 2017/5

I was an active participant and co-organizer of some of the training events of summer workshops for the NSERC CREATE Program in medical image analysis for summers of 2013 to 2017.

Math and Computer Instructor, Centre Communautaire Iranien Zagros 2010/5 - 2011/3

I taught topics in mathematics and computer science to the children of families from the Persian community of Montreal (mostly newcomers to Canada).

INTERNATIONAL COLLABORATION ACTIVITIES

Collaborator, New York University, United States 2016/3 - 2017/2

My Ph.D. supervisor's group at McGill has an ongoing research collaboration with Prof. Gerig's group and I worked with them on using the medial surface for the shape analysis of anatomical structures modeled from human brain MRI which resulted in a publication.